

Original Article

Health care personnel compliance with standards of eye and face protection and mask usage in operating rooms

Akram Aarabi*, Effat Kordi**, Hassan Farahmand*,
Farzaneh Gholami*, Soheila Bakhtiari*

Abstract

Background: Personal protection equipments (PPEs) should be easily accessible to decrease contact with infecting factors and also should be used purposefully to effectively keep the health care personnel in a safe distance from the patient blood and body fluid which can easily infect the operating rooms personnel. This study aimed to find the operating rooms' personnel compliance with standards of two PPE items, mask and eye/face protection and the effective factors on their compliance.

Methods: This was a descriptive correlative study. Sampling method was simple and 250 operating room personnel were selected. Data were collected by a questionnaire consisting of three parts; demographic characteristics and standards usage of mask and eye/face protection. Participants were divided into four groups of perfect, favorable, relatively acceptable and deficient based on their scores of their compliance with standards in the second and third parts of the questionnaire.

Results: The favorable compliance with standard usage of mask and eye/face protection was 33.9% and 46.4%, respectively. Participants said that lack of mask and eye/face protection was the main effective factor for their compliance. There was no significant relationship between work place and educational degree, and the personnel's compliance with standard usage of eye/face protection and mask.

Conclusion: Compliance with standard usage of mask is not acceptable and is almost in agreement with other studies. The important point is that there is no significant difference between personnel's compliance with standard usage of mask and eye/face protection in high risk and low risk environments.

Key words: Compliance with standards, personal protection equipments, effective factors, operating room personnel

IJNMR 2008; 13(2): 59-64

Infection control is a major issue in hospital environment especially operating rooms. It has two sides: patient and health care personnel. In the personnel side, two issues should be considered: transferring infection from personnel and to the personnel. Infection control has been studied with various approaches, one of which is Personal protection equipments (PPEs) that consider both transferring from and to personnel. PPEs include mask, gloves, eye/face protection and gown.¹

Mayhall (2004) says that some strategies are needed to reduce the professional contact with infective factors. These strategies include developing knowledge, changing habits, and improving PPE qualities. PPEs should be easily accessible and purposefully used to effectively provide a safe distance between the patient blood and body fluid and health care personnel. The health care personnel should be taught how to use PPEs and it should be assured that they are using the PPEs correctly.² Operating room

* MSc, Department of Operating Room Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.

** BSc, Manager of Operating Room, Al-Zahra Hospital, Isfahan University of Medical Sciences, Isfahan, Iran.

Correspondence to: Akram Aarabi MSc.

E-mail: aarabi@nm.mui.ac.ir

Research Article of Isfahan University of Medical Sciences, No: 286039

personnel are in danger of being infected by patient's blood and body fluid splash. The main risk factor in this regard is their behavior in the operating rooms, how they deal with minimum infection, how they wash their hands and how cautious they are in general.³ Phippen (2000) suggests that the eye/face protection must be used wherever there is a possibility of blood and body fluid splash.⁴ However, some personnel do not follow this rule for some reasons. Based on the researcher experiences, an effective factor in usage of eye/face protection is dealing with dangerous blood diseases such as AIDS or hepatitis and in other cases personnel do not find it necessary to use the eye/face protection. All hospital personnel who participate in operations or c-section should be cautious about skin contact with mucous membrane and it is necessary to use mask and eye protection during all operations which can transfer the infected components or pieces of bones.⁵ Angelillo et al (1999) in a study on 216 operating room personnel in 16 hospitals reported that just 38% were using the PPEs (gloves, mask, eyes protection) appropriately and based on standards.³ In Iran, Motamed et al, on a study on 54 health care personnel in two hospitals in Mazandaran in 2006, reported favorable usage of PPEs and hand washing. But, he reported that the participants knowledge of PPEs especially eye/face protection was low except about wound by needles, contact with vaginal secretions, usage of mask and gown and cleaning the splashed blood.⁶ Nursing services have played an effective role in health care services by keeping high professional standards.⁷

Considering the potential danger of working in an operating room without PPEs, this study aimed to find the operating rooms' personnel compliance with the standards of using mask and eye/face protection in selected hospitals administered by the Isfahan University of Medical Sciences. Also, the effective factors on their compliance with these standards were investigated. It is hoped that by finding the effective factors on the compliance with standards of using mask and eye/face protection, we can im-

prove the situation and make it closer to the standard level.

Methods

This was a descriptive correlative study. The research population included all the operating room personnel working under the Isfahan University of Medical Sciences. The sample included 250 personnel selected by simple method. The sample size was calculated based on a pilot study on 13 operating room personnel in Al-Zahra hospital with $p = 25\%$ and accuracy of 0.07 (d).

The inclusion criteria included working in operating rooms with education level of nursing diploma, operating room college degree, anesthesia college degree, bachelor degree or Master in nursing.

Data were collected by a questionnaire made by the researcher based on the standards of using PPEs cited in Waikato (DHB) in February 2006.¹ This questionnaire measured the usage of mask and eye/face protection separately. The first section of the questionnaire included demographic data and the second section included two parts, one on standard usage of mask and the other on eye/face protection. Since for the personnel of anesthesia just mask is important, these personnel were studied just for mask. Data were analyzed using SPSS software and descriptive and inferential statistics (U-Mann Whitney and Spearman correlation coefficient).

Since the questionnaire was made based on DHB standards, questions were formed in a standard form. Also, to assure the structure of questions, the content validity was obtained with the help of several faculty members of the Faculty of Nursing and Midwifery. To check the reliability of the questionnaire, re-test was used. The questionnaire was completed by 13 personnel twice and the correlation coefficient between questions was calculated 0.53 and the reliability obtained 0.69.

Results

Two hundred and fifty participants included

Table 1. Compliance with standards of using mask in risky and less risky operating rooms

Compliance with standards	Work Place Risky No(%)	Less Risky No(%)	Total No(%)	U-Mann Whitney test
Deficient	16(6.5)	4(1.6)	20(8.1)	Z = 0.046, p = 0.96
Relatively acceptable	81(32.9)	22(8.9)	103(41.9)	
Favorable	61(24.8)	22(8.9)	83(33.7)	
Perfect	35(14.2)	5(2)	40(16.3)	
Total	193(78.5)	53(21.5)	246(100)	

131 operating room personnel (scrubbing) and 109 anesthesia personnel. As it was mentioned, the data of compliance with standards of mask usage were from all 250 subjects, but the data related to eye/face protection usage were from 141 (because the rest were working just in anesthesia and didn't need eye/face protection). Results are shown in table 1 and 2. The highest rate of compliance with standards was relatively acceptable compliance (104 participants, 41.9%). Also, the highest frequency belonged to using mask (225 participants, 91.46%). From demographic data, two characteristic of work place in operating room and educational level was considered for correlation with compliance with standards. Operating rooms were divided into risky and less risky based on the dangers of transferring infection to personnel, which means in those operating rooms where the possibility of splash of blood and body fluid is more, such as orthopedic, women, heart, emergency, jaw and face and nerves considered risky and other operating rooms were less risky.

In this field, most personnel working in risky places were using masks relatively standard (32.9%).

The relation of compliance with standards of using mask and the educational level showed that the highest frequency belongs to the personnel with relatively acceptable compliance and a college degree (31.2%).

The frequency distribution of compliance with standards of using eye/face protection showed that the highest frequency belongs to those with favorable and perfect compliance respectively (46.4% and 30%) and just 13 personnel had deficient compliance with standards. Also, the highest frequency belonged to using eye/face protection (42.42%). From the demographic data, the relation between work place and educational degree with the personnel's compliance with standards were considered and the highest frequency belongs to those working in risky operating rooms and having a college degree (37% and 32.1%).

Table 2. Compliance with standards of using eye/face protection in risky and less risky operating rooms

Compliance with standards	Work Place Risky No(%)	Less Risky No(%)	Total No(%)	U-Mann Whitney test
Deficient	9(6.5)	4(2.9)	13(9.4)	Z = 0.046, p = 0.96
Relatively acceptable	12(8.7)	8(5.8)	20(14.5)	
Favorable	51(37)	13(9.4)	64(46.4)	
Perfect	27(19.6)	14(10.1)	41(29.7)	
Total	99(71.7)	39(28.3)	138(100)	

Discussion

In this research, the range of compliance with standards was very small. If we consider a wider range, we can add the personnel with favorable compliance to the perfect ones. Larson et al (1999) say that even the best surgery masks cannot cover the face in a way that the air cannot sneak into the edges.⁸ Therefore, this study considers the favorable compliance with standards and the perfect one in one group. Thus, the total number of personnel, who had acceptable usage of mask, is half of the sample. The effective factors on personnel's compliance with standards of using masks can be divided into three categories based on the subjects:

- 1) Mask quality related factors including being bothered by mask lint, elastic straps, nose skin sensitivity, and bad smell of some masks. Rivera et al (2000) about using low quality cheap masks in some health centers found that some health centers use N-90 masks because they are cheaper, so that they can reduce expenses, but studies show that these masks are not good to be used even once and therefore personnel have to change several masks per day and this makes the expenses increase and not decrease.⁹
- 2) Factors related to using mask: 46 subjects said that lack of mask is the main reason for not changing mask after each procedure. In mask usage standards, it is warned in big fonts that masks should not be kept around the neck when it is not used.¹ Considering the reasons that 26 participants mentioned for why they keep the mask around their neck (which include the need for immediate use of mask, habit, forgetfulness), it seems that education is necessary to remove these factors and improve the compliance with this standard. Rothrock et al (2003) write that mask should be enough big to cover the nose, mouth, lower jaw and facial hair.¹⁰ Five participants mentioned breathing problems as the reason they do not follow this standard, which seems to be a ridiculous excuse. In mask using standards it is mentioned that to remove the mask, the front part should not be touched but used the straps.¹ Nine partici-

pants mentioned that the factors for not following this standard include not being used to it, being negligent, not believing in it and lack of knowledge about standards, which all can be changed and improved by education. In the standards of using mask it is mentioned that personnel should not go to work when they catch a cold.¹ Ninety nine participants said that the reason they do not follow this standard is that the authorities do not consider their cold important. It is usual in Iranian hospitals that personnel who have cold work in the operating rooms while being cautious of some specific principles including using two masks over each other, working in a peripatetic position rather than scrub, none of which are in agreement with standards.

- 3) Factors related to mask usage style in scopy: in mask usage standards it is mentioned that during scopy operations, masks should be effectively used just like other operations.¹ The replies of 13 participants implied that they thought of using masks during scopy because of the patient's safety and not their own safety. They mentioned some reasons such as low risk of infection for the patient why they didn't follow this standard. This can also be fixed by education.

The relation of compliance with standards and two demographic items of work place and educational level were studied. Rothrock et al (2003) about the effective role of mask in risky operating rooms says that mask is important not only for protecting the patient from infection, but also protecting the operating room personnel from the potential infections due to blood and body fluid; especially in the cause of mask, personnel's protection is concerned more than patients.¹⁰ U-Mann Whitney test showed no significant relation between compliance with standards and working place. It means that working in risky or less risky operating rooms was not related to compliance with standards of mask usage. In regard with the educational degree, it seems that the different number of participants in various levels of education made this relation insignificant (there were more college degrees than others). Roup 1999 believes

that literacy has little role in effective factors of personnel's safety care. He mentioned some key components of protection, safety and effective use of PPEs, a significant one of which is educating personnel and follow-ups.¹¹

The data collected about compliance with standards of using eye/face protection show that most participants' compliance with standards were favorable and perfect respectively and just 13 participants' compliance with standards were deficient. Akdoman et al (1999) in a study on 597 health care personnel in operating rooms reported their compliance with standards of using protective glasses, 32% and eye-protections, 24%.¹³ The researcher made three categories of all factors introduced by the personnel as obstacles of their compliance with standards of using eye/face protection:

1) Factors related to correct use of eye/face protection: The most frequent reason was lack of eye/face protections, then shortage of eye/face protections, type of surgery, and emergency operations. The researcher investigated the issue of lack of eye/face protection and found that all the personnel of the selected hospitals received an eye/face protection at least once; in Al-Zahra hospital, recycle type was also distributed. Some participants believed that using eye/face protection during surgeries with infections is necessary. In the standards of using eye/face protections, it is mentioned that all personnel who are involved in orthopedic and women surgeries should use them all the time.¹ It means that using eye/face protection is not limited to infection surgeries or patients with infection. Four participants, mentioned emergency operations as the reason of not following these standards, and 1 participant mentioned lack of time as the reason. According to Rothrock et al (2003), during emergency operations (but not always) or during the work in emergency rooms using eye/face protection is necessary.¹⁰ One participants mentioned wearing eye-glasses as the obstacle to follow the standards. Buster (2006) introduced different types of eye/face protections, some of which are designed for those wearing eye-glasses.¹

Fortunately, eye/face protections are available in operating rooms in Al-Zahra hospital and it is not difficult to provide them for other hospitals.

- 2) Factors related to eye/face protections maintenance: In the standards of using eye/face protections, it is mentioned that recycle types should be demolished after being used once and the usual ones should be washed after being used each time and if they are too messy to be cleaned, should be demolished.¹ Ten participants mentioned lack of eye/face protections as the reason for reusing the recycle types. This case seems to need education.
- 3) Factors related to the quality of eye/face protections include being heavy, foggy glasses, discomfort around the ears and improper sight: The factor, foggy glasses, was reported by 5 personnel. Although a few personnel mentioned the low quality of eye/face protections as the reason for not following the standard rules, it should be paid attention and solved, because the quality of a product strongly affects its usage. To prevent discomfort of the holders around the ears, the elastic types can be used.

Regarding the relation between compliance with standards of eye/face protections usage and the risk of work place in operating rooms, Rothrock et al (2003) say that using eye/face protections in orthopedic operating rooms is absolutely necessary.¹⁰ Also, in the standards of using eye/face protections, it is mentioned that in those operating rooms where the possibility of blood and body fluid splash is high, eye/face protections must be used.¹ More than two third of participants in this study working in risky operating rooms and 39 personnel working in less risky operating rooms. The highest frequency belonged to those working in risky operating rooms and their compliance with standards was favorable and then perfect. The reason for this high number is that most participants in the study were working in risky operating rooms. The number of personnel with deficient and relatively deficient compliance with standards was higher in this group as well. Finally, because this relation was not significant,

we resulted that compliance with standards of eye/face protections usage is not related to how risky is the operating rooms. In other words, personnel's behavior is the same in risky and less risky operating rooms.

The relation of compliance with standards of eye/face protections usage and educational level followed the same pattern. The highest frequency belonged to the personnel with college degree whose compliance with standards was

favorable and perfect. Because the number of participants with a college degree was 40 personnel more than those with bachelor degrees, probably the high frequency of them in all four groups from deficit to perfect compliance in participants with college degree was related to this difference.

The researchers declare that have no conflict of interest in this study and they have surveyed under the research ethics.

References

1. Wiseman B. Procedure: Serious and Sentinel Event Review. Hamilton: Waikato district health board; 2005. p. 1-10.
2. Glen MC. Epidemiology and Infection control. 3rd ed. New York: Lippincott Williams and Wilkins 2004. p. 1453.
3. Angelillo IF, Mazziotta A, Nicotera G. Nurses and hospital infection control: knowledge, attitudes and behaviour of Italian operating theatre staff. *Journal of hospital infection* 1999; 42(2): 105-12.
4. Phippen ML, Wells M. Patient care during operative and invasive procedures. Philadelphia: W.B.Saunders; 2000. p. 713.
5. Ibrahimzadeh S. A study of nurses' knowledge about hospital infections control and prevention. *Quarterly of Nurse, scientific news of Gilan faculty of nursing and midwifery* 2001. 12(43-4): 29.
6. Motamed N, BabaMahmodi F, Khalilian A, Peykanheirati M, Nozari M. Knowledge and practices of health care workers and medical students towards universal precautions in hospitals in Mazandaran Province. *East Mediterr Health J* 2006; 12: 653-61.
7. Makkiabadi Z. First aid health care by nurses. *Behdasht Jahan* 2002; 15(1-2): 63-5.
8. Larson EL. APIC guideline for handwashing and hand antisepsis in health care settings. *Am J Infect Control* 1995; 23(4): 251-69.
9. Rivera P, Louthier J, Mohr J, Campbell A, DeHovitz J, Sepkowitz KA. Does a cheaper mask save money? The cost of implementing a respiratory personal protective equipment program. *Infect Control Hosp Epidemiol* 1997; 18(1): 24-7.
10. Roup BJ. OSHA's new standard: exposure to bloodborne pathogens. *AAOHN J* 1993; 41(3): 136-42.
11. McEwen RJD, Smith D, Editors. Alexander's Care of the Patient in Surgery. 12th ed. St Louis: Mosby-Year Book, Inc; 2003. p. 720.
12. Akduman D, Kim LE, Parks RL, L'Ecuyer PB, Mutha S, Jeffe DB, et al. Use of personal protective equipment and operating room behaviors in four surgical subspecialties: personal protective equipment and behaviors in surgery. *Infect Control Hosp Epidemiol* 1999; 20(2): 110-4.
13. Abdollahzadeh Mahlani F, Moghadasian S, Ghorbanian N. Use of personal protective equipment and operating room behaviors in three surgical sub-specialties. ThPeC7463. *Proceeding of the 15th International Conference on AIDS*. 2004 Jul 11-16; Bangkok, Thailand. p. 15.