

The Practice of Emergency Medicine Residents Regarding the Use of Personal Protective Equipment for Protection against Infectious Diseases

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Abstract

Objective: The aim of this study is to demonstrate the attitudes and practices regarding the use of personal protective equipment among emergency medicine residents.

Material and Methods: In this cross-sectional survey study, emergency medicine residents who had attended the 6th Emergency Medicine Resident's Symposium were included. In the first part of the survey, demographic characteristics, duration of residency and medical career and the institutions were investigated. In the second part, the attitudes of using personal protective equipment and also the physical status of the emergency rooms were assessed.

Results: Sixty-seven emergency medicine residents were surveyed. 83.6% of them was working at education and research hospitals and 16.4% was working at university hospitals. The question about the existence of personal protective equipment was affirmed by only 28.4% of the participants. 26.9% of the participants took lessons about protection from infectious diseases during their residency training. The statistical comparisons between the presence of isolation rooms and the type of the institution and being trained about personal protection against infectious diseases were not significant ($p>0.05$).

Conclusion: Emergency medicine residents, who make the first medical intervention with most patients, do not use personal protective methods effectively. There are also some deficiencies in medical institutions with regard to preparing the physical conditions of the emergency rooms and resident education programs. (*JAEM 2014; 13: 176-80*)

Key words: Emergency department, emergency medicine, personal protective equipment, infectious diseases

Introduction

Hospital environments are the most convenient way for infectious diseases, especially those transmitted through airway. The areas in which the potential transmission is most likely are the primary step healthcare organizations as first referral sites, where the diseases are not diagnosed yet, and the emergency services (1, 2). In the period while an incipient epidemic is not noticed yet by the infection control units, the healthcare providers are at first degree risk. As it is considered that infected healthcare providers continue to work in their duties until disease symptoms and findings develop, the likelihood of transmission of the disease to other friends and their colleagues also increases. During SARS infection epidemic at 2003, it is reported that 20% of 8096 cases were healthcare providers. This ratio went up to 42% in Canada (3). There is no doubt that the risk would increase in the emergency services with high patient intensity and inadequate personnel count. However, the risk is not limited with epidemic periods for emergency service physicians. *Neisseria meningi-*

tidis and resistant *Mycobacterium tuberculosis* infections, which may be potentially fatal in daily practice and transmitted through airway, are encountered frequently.

Again, pathogens transmitted through blood and body fluids are potential occupational hazards for healthcare providers. It is almost impossible to estimate for especially most of the patients apply to the emergency service whether they have human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) infections or not.

In this study, we aimed to establish whether the emergency medicine residents physicians that meet the patients first and undertake their interventions firstly use personal protection methods and equipments in order to protect themselves from infectious diseases, or not.

Material and Methods

We established the target group as Emergency Medicine residents in our research. For this purpose, consent was taken for the



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study from the ethical committee of the hospital. Emergency Medicine residents attended to 6th Emergency Medicine Resident's Symposium held at 2-5 June 2011 were included in our study, which we planned as a cross-sectional questionnaire study. Survey questions were addressed to people volunteered to participate in the study and they were asked to answer in condition that their identity information were kept confidential.

Survey questions were put together by screening other previous studies in the literature on the subject. Demographic characteristics, residency duration, total duration as a physician and the institution they work at (university/ training and research hospital) were asked in the first section of the questionnaire. The second section was comprised of thirteen questions evaluating their habits of using the personal protection equipments in their daily practices having the purpose of protection from infectious diseases (gloves, glasses, surgical mask, N95 mask, special clothing), and whether these equipments are available in the emergency services they work at or not. Furthermore, questions evaluating the habits of the physicians about washing hands and using hand disinfection were present in the questionnaire.

Statistical Analysis

Number Cruncher Statistical System (NCSS) 2007&PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) program was used for the statistical analysis. Besides definitive statistical methods (mean, standard deviation, median, frequency, rate), Kruskal Wallis test and Mann-Whitney U test were used while evaluating the study data. Spearman's correlation analysis was used in the evaluation of relationships between the parameters. Also Chi-Square test, Yates Continuity Correction and Fisher's Extract test were used in the comparison of the qualitative data. Significance was evaluated in the level of $p < 0.05$, $p < 0.01$.

Results

Sixty seven emergency medicine residents with age range of 24-42 were participated in our study by answering the questions. Within the participants 16.4% (n=11) indicated that they work in university hospitals and 83.6% (n=56) indicated that they work in training and research hospitals. Mean age was found 29.87 ± 4.45 . 61.2% (n=41) of the participants were men and 38.8% (n=26) were women. The duration that resident physicians have spent in their work varies between 0.30 and 18 years (mean 5.40 ± 4.19 years). The duration that individuals have spent in emergency medical residency varies between 0.20 and 5 years (mean 2 ± 1.35 years).

For the question that weather they have personal protection equipment in the emergency service or not, 28.4% (n=19) of the participant answered as yes, and 71.6% (n=48) answered as no. For the question that weather N95 mask is available in the intervention area or not, 49.3% (n=33) of the questionnaire responders answered as yes, and 50.7% (n=34) answered as no. Those who have isolation room in the emergency services they work are 31.3% (n=21), and those who have not are 68.7% (n=46). No significant relationship was detected between the availability of protection equipment, N95 mask for infections transmitted through airway in the emergency service and presence of a patient isolation room in the emergency service, and the institution worked at ($p > 0.05$).

When the participants were asked whether they had protection from the infectious diseases training or not during their resi-

dency training, 26.9% (n=18) of them gave the answer of yes, and 73.1 (n=49) of the participants answered as no. For the participants that received training for protection from infectious diseases, the time spent in the emergency service was determined to be more at a statistically significant level ($p < 0.05$). No significant difference was found when the frequencies were compared according to the institution worked at ($p = 4.437$).

The method most frequently adopted as protection from infections by the emergency medicine residents was considered as washing hands after patient examination with or without gloves. After this washing hands before the examination and using mask are preferred respectively (Table 1). 31.3 (n=21) of the answers were yes, and 68.7 (n=46) of the answers were no for the question posed to the participants as "Does it restrain you to use glasses, mask, special clothing for the patients with the risk of contamination with blood and body fluids?"

When the presence of the personal protection equipment in the emergency service and the frequencies at which those equipments were used were compared, statistically significant values were found for all of them except for the surgical mask (Table 2).

When the having training for protection from infectious diseases during residency education period and the frequency of the use of personal protection methods were compared, surgical mask usage was found to be high at a statistically significant level ($p < 0.01$). No significant differences were found when the usage of the other methods and the case of having or not having the training were compared.

Times spent in the emergency medicine and the times spent in the occupation were compared with the frequency of the use of personal protection methods. Among all the personal protection methods of participants, only the situation of using N95 mask increases as the times spent in the emergency medicine increase ($p = 0.048$) (Table 3). No statistically significant relationship was found between the total times spent in the occupation and the frequency of the usage of these methods.

Discussion

Healthcare providers work with constant risk against infections transmitting both through airway and through blood and body fluids in their daily practices. Transmission generally occurs through sharp object injuries (from skin or mucosa) or mucocutaneous contact (transmission of the pathogens through eyes, nose or mouth) (4). Invasive procedures such as putting on a peripheric or central intravenous catheter in especially trauma resuscitations, opening intraosseous access, foley catheter, nasogastric catheter, thorax tube applications and entubation are performed frequently. Unpredictable potential illness situations of these cases and the fact that these interventional processes are applied frequently are the factors increasing the risk of infection exposure of emergency service healthcare providers. In a study of Caplan et al. (5), potential infectious pathogen was determined in one fourth of the trauma cases.

Infection control guideline was prepared by Centers for Disease Control and Prevention (CDC) for healthcare professionals in order to provide their own safety in their work places about how and in what conditions they need to use the personal protection equipment. It is indicated in the guideline that the employee safety program has four main components. Protective equipment should present in the institutions according to the employee number and preferentially as disposable. Periodic trainings directed to employees should be held, physical

Table 1. Frequency of the use of personal protection methods

	Never n (%)	Sometimes n (%)	Frequently n (%)	Always n (%)	Mean \pm SD
Washing hands before patient examination	3 (4.5)	26 (38.8)	32 (47.8)	6 (9)	1.61 \pm 0.717
Washing hands after patient examination	0 (0)	20 (29.9)	30 (44.8)	17 (25.4)	1.96 \pm 0.747
Washing hands after patient examination with gloves	1 (1.5)	24 (35.8)	15 (22.4)	27 (40.3)	2.01 \pm 0.913
Using glasses during patient examination	30 (44.8)	26 (38.8)	6 (9)	5 (7.5)	0.79 \pm 0.897
Using special clothing during patient examination	35 (52.2)	23 (34.3)	5 (7.5)	4 (6.0)	0.67 \pm 0.860
Using surgical mask during patient examination	21 (31.3)	29 (43.3)	9 (13.4)	8 (11.9)	1.06 \pm 0.967
Using N95 mask when there is risk of an infectious disease transmitting through airways	28 (41.8)	22 (32.8)	9 (13.4)	8 (11.9)	0.96 \pm 1.021

Table 2. Evaluations according to the availability of personal protection equipments in the emergency service

	Availability of personal protection equipments in emergency services		p
	No (n=19)	Yes (n=48)	
	Mean \pm SD (Median)	Mean \pm SD (Median)	
Using glasses during patient examination	0.53 \pm 1.02 (0)	0.90 \pm 0.83 (1)	0.021*
Using special clothing during patient examination	0.37 \pm 0.83 (0)	0.79 \pm 0.85 (1)	0.017*
Using surgical mask during patient examination	0.37 \pm 0.83 (0)	0.79 \pm 0.85 (1)	0.017*
Using N95 mask when there is a risk of disease transmitted through airway	0.58 \pm 0.96 (0)	1.10 \pm 1.02 (1)	0.029*

Mann-Whitney U test, *p<0.05

Table 3. Relationship between time spent in the emergency medicine and usage level of protection methods

	Time spent in the emergency medicine (years)	
	r	p
Washing hands before patient examination	-0.068	0.585
Washing hands after patient examination	-0.196	0.111
Washing hands after patient examination with gloves	0.092	0.459
Using glasses during patient examination	0.136	0.274
Using special clothing during patient examination	0.091	0.462
Using surgical mask during patient examination	0.077	0.536
Using N95 mask when there is risk of an infectious disease transmitting through airways	0.243	0.048*

r: Spearman's correlation coefficient, *p<0.05

conditions of the hospitals should be arranged as to reduce infection spread (for example: isolation rooms with negative pressure) and the implementations of the healthcare providers should be controlled in daily practice (for example: disposal of the sharp objects). Moreover, the importance of washing hands is emphasized in the guideline (6).

However, as seen in the previous studies about the subject, the compliance rates of healthcare professionals to universal precautions are not at the desired level. In the study of Hosoglu et al. (4) that includes 19 provinces and 30 hospitals, information of healthcare providers about blood-borne diseases and approaches about the precautions were studied. It was concluded that the results were inadequate compared to developed countries. No special data present in the study of Hosoglu about emergency service employees. As we know, our study is the first one in Turkey that involves the physicians that realize the first intervention in critical situations.

The result of our study indicating that the availability rate of the protective equipment in the emergency services is only 28.4% is noticeable. This situation might be thought as a factor affecting the use. As a matter of fact, when the availability and frequency of use of those equipments were compared, significant differences were found among data except for surgical mask. Protective equipment should be stand ready at the places where the employees reach easily at all emergency services.

Our study demonstrated that only the use of surgical mask was related to training on prevention of infectious diseases during residency training among other frequencies of personal protection methods. This situation might be thought to originate from previous trainings of these physicians at medical schools. However, as it is considered that the appropriate use of the protection methods do not generally present, it is possible to say the trainings were not

adequate. Again, it is seen that the times spent in the occupation or in emergency service do not have a direct relationship with the use of these methods. Only the use of N95 masks seem to increase with time spent in the emergency services. One of the data of our study is that the on-the-job trainings were realized towards the end of the residency periods. We think that this situation might affect the rate of protection measures taken. If the trainings were realized within the first year of residency, we think that the rates in which the residents implement these methods would increase.

The risk in the infections transmitted through the airway increases during the use of tools such as nebulizer, face mask, balloon mask and NIMW (non-invasive mechanical ventilation) that are used frequently in emergency services and procedures frequently applied in daily practice such as aspiration, intubation and cardiopulmoner resuscitation (7). As a matter of fact, in these type of processes where the normal surgical mask is not protective, use of N95 masks are recommended (8, 9). It is a positive situation that the use of N95 masks increase with the time spent in the emergency medicine in our study.

31.3% of the physicians participated in our questionnaire were detected to have the opinion that the protective equipments restrict them to fulfill their duties. Healthcare providers might be avoiding using protective equipments because they think they do not feel vascular accesses with gloves, special clothing restricts their moves and using glasses cause restricted view. However, Udayasiri et al. (10) demonstrated that emergency service physician and nurses were successful in cardiopulmoner resuscitation they performed by wearing air cleansing mask and special clothing, gloves and glasses resistant to chemical substances and those equipments did not pose an obstacle to the work done. We believe that the trainings were given within the first year of residency as we indicated before and monitoring of the use of these equipments by the healthcare providers will contribute to the change of this kind of wrong behaviors.

Another important data we concluded from our study is that the hand washing rates of emergency medicine residents is quite low due to possible work load. However, it is emphasized that washing hands is the substantial step in preventing the transmission of infectious diseases in the guideline that CDC prepared for healthcare providers (6, 11). We think that the resident physicians personally should be more careful on this subject, hand washing areas in the emergency services should be increased to ease hand washing and to make it easily remembered, and hand disinfectants should be easily reached.

One of the important results of our study is that no difference was found between resident physicians working at training and research hospitals and university hospitals with regards to availability of the equipments, use of the equipments, and whether they had training on protection from infectious diseases or not.

Without doubt, environmental conditions should be provided regarding to prevent infectious diseases in the work places of healthcare providers. Separated isolation rooms with negative pressure should be available for the care of infected diseases during the configuration of emergency services (12). According to our study, 21 (31.3%) of the physicians had isolation rooms in the emergency services they work at. We think that this rate should be increased as soon as possible in all emergency services. Evaluation of our emergency services regarding their structure and equipment in case of

biological and chemical mass injuries should be the subject of another study.

Study Limitations

The participants we could reach in this study are just the residents attended to 6th Emergency Medicine Resident's Symposium. It is a constraint of our study that no generalizations can be made about centers which did not attend to the symposium.

Conclusion

It is determined that the emergency medicine residents that meet the patients in emergency services and undertake their primary interventions do not use personal protection methods and equipments to protect themselves. At the same time, we think that institutions also should be more careful for providing these equipments, providing appropriate physical conditions at emergency services and scheduling necessary trainings.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ümraniye Training and Research Hospital Clinical Research Ethics Committee.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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