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Original research

How and how much do endoscopy professionals protect themselves against infection?

N. Akyüz [a], M. Keskin [b], N. Akyolcu [a], İ. Çavdar [a], A. Özbaş [a], T. Ayoğlu [a], E. Balık [b], T. Bulut [b, *]

[a] Istanbul University, Florence Nightingale Faculty of Nursing, Surgical Nursing Department, Istanbul, Turkey
[b] Istanbul University, Istanbul Faculty of Medicine, General Surgery Department, Turkey

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ABSTRACT

Purpose: It is aimed to identify, the educations given to professionals working in endoscopy units against infectious risks during the endoscopic procedures and awareness of professionals for protection from these infections.

Material and method: After obtaining the required ethic committee permissions, 50 physicians and 34 nurses, working in the endoscopy units of three university and one training and research hospital, were included in this study. A survey with 37 questions, prepared in accordance with the literature was applied to the participating endoscopist (E) and endoscopy nurses (EN). SPSS (Statistical Package for Social Sciences) for Windows 16.0 program was used for statistical evaluation of the obtained data.

Findings: Forty-four (52%) of the subjects were female and 40 (48%) were male, and their average age was 39 (±6.82) years. When trainings on endoscopy of E and EN were evaluated, it was found that 44% ($n = 37$) of them precise an endoscopy course on endoscopy training, %56 ($n = 47$) received no training and they learned through master/apprentice system. Furthermore, it was found that 65% ($n = 55$) of the E and EN received no training on universal precautions procedures, infection and risks endoscopic procedures and only 35% ($n = 29$) received a specific course or on-the-job training. Nevertheless, rates of wearing protective gowns and gloves were high both for E and EN; but rate of other precautions such as wearing mask, using special gloves and face shields were found to be low. It was found that the rate of "receiving an education on endoscopy" for E was significantly higher than that of EN (**$p < 0001$**). The rate of reporting emergency situations such as contact with blood/body fluids or percutaneous injuries and the rate of taking universal precautions of EN who received an education, was statistically higher than that of EN who did not (**$p < 0.001$** and **$p < 0008$**).

Results: As a result of our investigation, it was determined that the endoscopists and endoscopy nurses did not effectively apply the universal precautions against infectious risks faced during endoscopic procedures and did not receive the basic trainings. The professionals who received training were more responsive for this issue. According to our results, organizing continuous training programs through endoscopy professionals is necessary to provide the universal precautions of avoiding exposure to blood and body fluids.

1. Introduction

Contemporary, endoscopic applications for gastrointestinal system are frequently applied both for diagnosis and treatment. Endoscopist (E) and endoscopy nurses (EN) are exposed to patient body fluids either during endoscopy procedures or after the procedure when the tools are being prepared (disinfection-reprocessing) [1,2]. Therefore, they are under the infection risk of hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV), *Mycobacterium tuberculosis* (*M. tuberculosis*), *Helicobacter pylori*, herpes simplex and other enteric pathogens [3–5]. Hence, it is recommended in many regulations that all endoscopy professionals shall be trained on protection from the infections that can be contracted from blood and other potential infectious materials, and they shall use personal equipment [6–8]. Our study was planned in order to determine the trainings given to physicians and nurses working in

* Corresponding author.
E-mail addresses: nakyuz1@hotmail.com (N. Akyüz), mkeskin@istanbul.edu.tr (M. Keskin), nakyolcu@yahoo.com (N. Akyolcu), ikbal@istanbul.edu.tr (İ. Çavdar), ayfer@istanbul.edu.tr (A. Özbaş), tuluha@gmail.com (T. Ayoğlu), ebalik@istanbul.edu.tr (E. Balık), tbulut@istanbul.edu.tr (T. Bulut).

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endoscopy units, and also to determine the applications and responsiveness about this issue, and to provide guidance for the required precautions that shall be taken.

2. Material and method

This study was carried out in the endoscopy units of Istanbul University Istanbul Medical Faculty Hospital, Istanbul University Cerrahpaşa Medical Faculty, Istanbul Training and Research Hospital and Bezm-i Alem Valide Sultan Foundation Hospital. Necessary documents were prepared and permissions were obtained from the ethic committees of these centers. Before start up, purpose and benefits of the study were explained to E and EN. Fifty physicians and 34 nurses, who were voluntary, were participated the study. Data was collected from a survey, including 37 questions which were prepared in accordance with the literature. SPSS (Statistical Package for Social Sciences) for Windows 16.0 program was used for statistical evaluation of the collected data. In addition to statistical methods (number, percentage, average and standard deviation), Chi-square and Fisher's Exact Chi-Square tests were used in comparison of qualitative data. Results were evaluated in 95% confidence interval, significance was taken as $\mathbf{p < 0.05}$.

3. Results

Average age of E and EN was 39 (±68). 44 were female (%52) and 40 were (%48) male. Median time of the experience in the endoscopy units was 6 years (1–22). More than 60% of the subjects were under 40 year-old ($n = 51$). In addition to this, the working duration of 50% of the subjects in the endoscopy unit w below 5 years, and 20% of them had been working in the endoscopy unit more than 10 years (Table 1).

When the number of daily procedures for the participating E and EN were considered, it was determined that nearly 30% of them were involved in 10–20, %25 in 20–30, and 20% of them in more than 30 procedures and only 20% of them less than 10 procedures per day.

When training on endoscopy of E and EN was evaluated, it was identified that 44% of them ($n = 37$) received a course training on endoscopy, and 56% ($n = 47$) received no special education and learned endoscopic procedures by masterapprentice relationship. It was also identified that 65% ($n = 55$) of them received no education on universal precautions and infectious risks faced during endoscopic procedures, in the other hand 35% of them ($n = 29$) received a course or on-the-job training.

The rate of "always wearing a gown" was 90% for E and 75% for EN; the rate of "wearing a glove" was 98% for E and 100% for EN. Ten percent of E w always, 32% w sometimes wearing a mask. These rates were 32% and 41% for EN. Fifteen percent of EN w always wearing goggles and 20% sometimes, same rates were 4% and 26% for the physicians respectively. When gown changing was elaborated, 54% of E and 62% of EN reported that they did not change gowns until they got dirty. Most of E and EN (85% and 71%) reported that they were using a needle to remove the biopsy sample from forceps. The rates of working when they were suffering an exudative skin lesion or dermatitis were 38% and 70% for E and EN respectively. The rates of vaccination against HBV for E and EN were 80% and 82%.

Table 1
Socio-demographic characteristics.

Average age ± standard deviation	39 ± 6.82 years	
	Number ($n = 84$)	Percentage (%)
≤30	12	14
31–35	11	13
36–40	28	33
41–45	15	18
46–50	14	17
>50	4	5
Gender		
Female	44	52
Male	40	48
Median working duration(year)	6 (1–22)	
1–5	40	48
6–10	27	32
11–15	13	15
>15	4	5

Eighty-eight percent of E and 61% of EN reported that they take universal precautions during the endoscopic procedures. Details of the precautions taken for protecting from infections during endoscopic procedures by the endoscopist and endoscopy nurses were given in Table 2.

Thirty-five (69%) of E and 9 (26%) of EN reported that they had received a special education program on endoscopy. The rate of "receiving training on endoscopy" of E was significantly higher than that of EN ($\mathbf{p < 0.001}$). No difference was found between the E and EN in terms of receiving education on universal precautions, risk of infections and protection methods during endoscopic procedures (33% vs. 36%, $p = 0.752$).

The vast majority of E (91%), who were trained on "universal precautions and the risks facing professionals in endoscopy and protection methods" promptly, report the situations of contacting with blood/body fluid of patients or percutaneous injuries. Seventy-nine percent of E, who did not receive any training on this issue stated that they did not report. The rate of reporting a contact with blood/body fluid of patients or percutaneous injuries of EN who received training was significantly higher than that of EN who did not receive any training ($\mathbf{p < 0.001}$, Fig. 1).

91% of EN who were trained in "universal precautions and risks facing professionals in endoscopy and protection methods" were taking precautions, it was 9% of EN who did not receive any training. The difference was statistically significant ($\mathbf{p < 0.008}$, Fig. 2).

When the precautions were evaluated, 55% of EN reported that they were using mask during procedures, however this rate dropped to 15% for E ($\mathbf{p = 0.048}$). The rate of working while they had an exudative skin lesion or dermatitis was 40% for E ($n = 19$) and 70% for EN ($n = 24$) ($\mathbf{p = 0.025}$). 88% of E and 61% of EN reported to take precautions ($\mathbf{p = 0.016}$) (Table 3).

4. Discussion

Contemporary, endoscopic applications are frequently applied, both for diagnosis and treatment purposes, in gastrointestinal system, bile ducts or pancreatic diseases. In the United States more than 20 million of gastrointestinal endoscopy procedures per year are applied [9]. Endoscopy professionals are at risk of chemicals, body fluids contamination of patients, exposure of radiation and muscle skeleton injuries [1,2,10].

The rate of contracting an infection, during a gastrointestinal endoscopic procedure is reported to be 1/1.8 million operations [11]. Reported infections are Hepatitis B virus (HBV), Human Immunodeficiency Virus (HIV), *Mycobacterium tuberculosis* (*M. tuberculosis*), *H pylori*, Herpes simplex and enteric pathogens [3–5]. A study from USA reported that 1.6% of population were infected with HCV and half of them did not know this situation [11,12]. Hence, it is emphasized that all patients have to be considered as infected and disinfection of endoscopic tools is mandatory for reuse [6]. Such as patients, E and EN are under a risk of infections, both during the procedure and after that when the tools are being prepared for the new one (disinfection-reprocessing) [2,4,10,13,14]. For

Table 2
Distribution of the endoscopist and endoscopy nurses in terms of the precautions that they take for protecting from infections during endoscopy procedures.

	Endoscopy nurse (EN)		Endoscopist (E)	
	n (34)	%	*n* (50)	%
I wear gown				
Yes	24	75	44	90
Sometimes	8	25	5	10
No	2	0	1	0
I wear gloves				
Yes	34	100	49	98
Sometimes	0	0	1	2
No	0	0	0	0
I wear mask				
Yes	11	32	5	10
Sometimes	14	41	16	32
No	9	26	29	58
I use face shield				
Yes	2	5	1	2
Sometimes	5	15	11	22
No	27	80	38	76
I use special goggle				
Yes	5	15	2	4
Sometimes	7	20	13	26
No	22	65	35	70
How often do you change your gown?				
After every procedure	3	9	10	20
When it gets dirty	21	62	27	54
At the end of the day	4	11	13	26
Other	6	18	0	0
Do you wear your shirt outside the procedure room?				
Yes	2	6	10	20
No	32	94	40	80
How often do you change your gloves?				
After every procedure	28	82	48	96
When it gets dirty	1	3	0	0
Other	5	15	2	4
What do you do with the used needles?				
I try to put them into their cases with two hands	4	12	6	12
I put them into their cases with one hand.	1	3	2	4
I throw them to needle container	29	85	41	82
Other	0	0	1	2
How do you remove the piece from forceps after biopsy?				
With needle	29	85	32	64
With pick	0	0	5	10
Other	5	15	13	26
Do you work when you are suffering from exudative skin lesion/dermatitis				
Yes	24	70	19	38
No	10	30	31	62
Do you immediately report when you contact with blood/body fluid of the patients or percutaneous injuries				
Yes	14	41	22	44
No	20	59	28	56
Do you have vaccination against Hepatit B?				
Yes	28	82	40	80
No	6	18	10	20
Do you take universal precautions during endoscopic procedures?				
Yes	17	50	43	86
No	17	50	7	14

this reason, endoscopy professionals should be trained on chemical and biological harms. They also have to be educated about the chemical agents used as disinfectants. Endoscopy department staff should use gloves, masks, personal protective equipment such as face and eye protecting materials against chemical substances, blood and potentially infectious materials [6–8].

Mohandas and Gopalakrishnan [15] stated a high possibility of splattering liquids from patients' bodies during endoscopic procedures. In this study, 948 operations were evaluated and the rate of splattering liquids from patients' bodies to any part of the endoscopists' body was found as 13.2% and the rate of splattering liquids from patient to endoscopists' face, front arms and feet was found as 4.1%. In addition to this, it was stated that this risk did not decrease by using a video endoscopic system, hence importance of taking precautions by all endoscopists and endoscopy assistants w emphasized [15].

In a study published in Turkey, a Hepatitis C case contracted by conjunctiva following a blood splatter was reported and training of professionals and application of protective precautions (personal protective equipments and tools, particularly mask and face/eye protecting goggles) were underpinned [16]. According to the American Society for Gastrointestinal Endoscopy guideline, endoscopist and assisting staff should also use personal protective equipments and tools (such as gloves, masks, protective goggles, moisture resistant gown) during cleaning and disinfection of endoscopes to reduce the risks that could arise by splattering of infectious blood, other body fluids and respiratory secretions of [6,14]. In our study, 81% of the professionals reported that they were wearing gown, it was 99% for wearing gloves. They reported to wear mask, face shield and special goggles as 19%, 4% and 2% respectively. Angtuaco et al. found in their study that, 32% of gastroenterologists (GE) and 50% of gastroenterology endoscopy nurses (GIEN) wash their hands before and after each procedure, and 5% of GE and 30% of GIEN wear gloves during contact with the patients. Fourteen percent of GE and 21% of GIEN wear face shield, 29% of GE and 46% of GIEN wear gown during the procedures [3]. In the study done by Taze, the rate of wearing gown was found as 332%. It was 951% for wearing gloves, 327% for mask was and 3.7% for goggles [17]. These results are parallel with our findings. While an attention was paid for wearing gown and gloves, it was not the same for the use of mask, face shield and goggles. When a comparison between nurses and physicians was made, it was determined that 90% of E and 75% of EN wore shirt; 98% of E and 100% of EN wore gloves; only15% of E and 55% of EN always wore a mask ($p = 0.048$); 24% of E and 20% of EN used face shield; 4% of E and 15% of EN always used special goggles. For the endoscopic procedures, the rate of wearing a mask of EN (73%) was significantly higher than that of E (36%). This low rate gave us an expression that it could be due to ignoring the possibility of splatter by physicians.

Angtuaco et al. [3] reported that rate of GE and GIEN putting the used needles into their covers by using both hands correspondingly, 10% and 17% respectively, hence it was understood that GE paid more attention than GIEN in this respect [3]. The rates of appropriate hand washing, use of handface protectors and gown were found to be low for both groups. In our study the rates of putting the used needles into their covers by using both hands were found as 12% both for E and EN. These results were compatible with

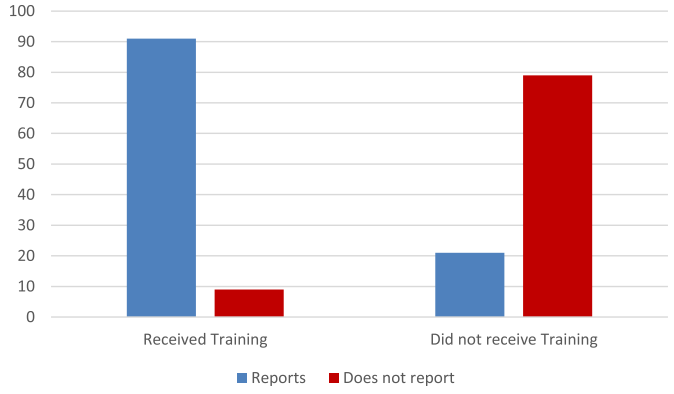

Fig. 1. Rate of reporting a contact with blood/body fluid of patients or percutaneous injuries.

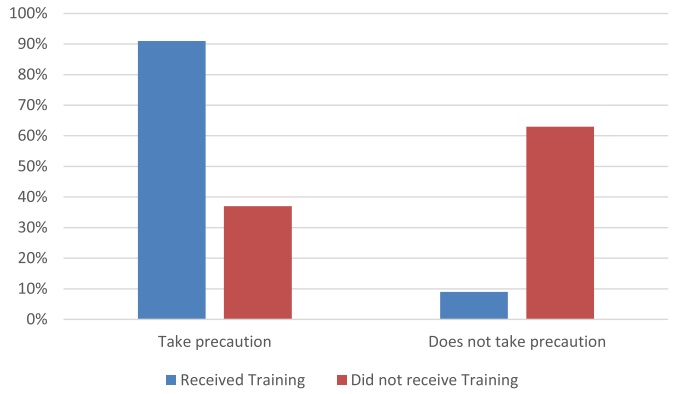

Fig. 2. Situation of taking precautions in endoscopy unit.

Table 3
Distribution of the endoscopist and endoscopy nurses in terms of receiving precautions for protecting from infections during procedures.

Statements	Endoscopist (E)		Endoscopy nurse (EN)		*P*
I wear mask	*n*	%	*n*	%	
Yes	5	15	11	55	**0.048***
No	29	85	9	45	
Do you wok when you are suffering from exudative skin lesion or dermatitis					
Yes	19	40	24	70	**0.025****
No	31	60	10	30	
Do you apply universal precautions in endoscopy unit?					
Yes	42	88	17	61	**0.016****
No	6	12	11	39	

*Fisher's Exact Test; **p < 005**, **Chi-Square testi; **p < 005**.
Note: Column and row percentages are used in comparisons and graphs respectively "Sometimes" option was excluded for "I wear mask" statement.

that of Angtuaco et al. [3]. The rates of throwing used needles into needle containers were found as 82% and 85% for physicians and nurses respectively. It was pleasing to determine that this issue was paid attention. In addition to this, 80% of E and 82% of EN were vaccinated against Hepatitis B. The rate of vaccination of nurses was found as 724% in a study conducted by Taze [17].

Forty-four percent of E and 41% of EN replied as "yes" to the question "Do you immediately report when you contact with blood/body fluid of patients or percutaneous injuries. However, it was identified that 91% of these EN received a training program about universal precautions against infectious contamination during endoscopy; whereas 79% of the nurses who were not reporting these accidents had no previous education about this issue. In the light of obtained information, the rate of immediately reporting situations of contacting with blood/body fluid of the patients or percutaneous injuries of EN who received training was significantly higher than that of EN who did not receive any training. Importance of education was understood for this issue as per all issues.

It was also seen that the rate of working during "exudative skin lesions/dermatitis" of nurses (70%) was significantly higher than that of physicians (40%) (**0.025**). The reason for this difference might be the difficulty of replacing an experienced nurse when they suspend working.

It was seen that most of the professionals replied "with the needle" to the question "How do you remove the piece from forceps after biopsy?" However, it is recommended in the literature that a tooth pick shall be used in order to prevent injuries [18,19]. This issue can be related to insufficient care of professionals or lack of information.

Consequently, although E and EN stated that they were applying, it was identified that they did not apply universal precautions for protecting from infections during endoscopic procedures effectively. In addition to this, E and particularly EN did not receive sufficient training on endoscopic applications, universal precautions or risks facing professionals in endoscopy and protection methods. All patients shall be considered as infectious under the scope of universal precautions. It was seen that professionals who received specific training on this matter were more responsive. Continuous training programs shall be organized for providing efficient application of universal measures in order to protect from the diseases contracted from blood and body fluids for health care professionals under risk.

Ethical approval

Ethical Approval was given by Istanbul University Ethics Comitee. No: 75 Date: 15.01.2008, Signed by Vice Rector, İrfan Papila.

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Author contribution

Study design: Nuray Akyüz, Turker Bulut, Neriman Akyolcu, Metin Keskin.
Data collections: Ikbal Cavdar, Ayfer Ozbas, Tuluha Ayoglu.
Data analysis: Nuray Akyüz, Turker Bulut, Neriman Akyolcu, Emre Balik, Metin Keskin.
Writing: Nuray Akyüz, Turker Bulut, Metin Keskin.

Conflicts of interest

We have no conflicts of interest on the subject and during the process of the paper.

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