

Evaluation of Risk Perception and Management in Emergency Medical Services Providers Working in Pre-hospital Areas in Kayseri, Turkey

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ABSTRACT Emergency Medical Services (EMS) Providers' perceptions and management of occupational risk factors are the main determinants for risk control in Emergency Medical Services. The aim of this study was to investigate the perception of occupational risk factors and their management by EMS providers. This cross-sectional study based on self-reporting was conducted with 160 providers working in Kayseri. The data was analyzed using descriptive statistics. The mean age in the study was 25.4±3.7. The majority of providers (73.9%) were emergency medical technicians (EMTs) and paramedics. Having to worry about working with forensic cases (82%), expos to burnout (75.8%), and violence (72%) were the major risk factors and threats for personal-safety. Using personal protective equipment (PPE) during invasive procedures (intubation 16.7%, aspiration 14%, and delivery 34.7%) and sensitivity of pre-employment protective immunizations against certain antigens is very low. Permanent disability based on overexertion during load lifting (65.3%), traumatization during pregnancy (54.5%), and death (52.0%) were the main potential complications for providers. Fear of personal safety and workplace violence were the most acute stressors for EMS providers. The level of risk perception, compliance with universal protective measures and sensitivity of protective immunization against certain antigens is considerable lower.

INTRODUCTION

Pre-hospital emergency health services inherently have serious and combined risks in terms of occupational health and safety. Therefore, EMS providers are exposed to physical, mechanical, biological, chemical, and psychosocial risks as well as ambulance accidents, disasters, and workplace violence, directed by patients or their relatives in the field, on a daily basis (Abdullah et al. 2009; Bigham et al. 2014).

Pre-hospital emergency health services have evolved over the last 25 years to become a fundamental part of the Turkish health care system, which began services in Turkey in 1993. In general, physicians, emergency medical technicians (EMTs), and paramedics work in this sector. EMTs and paramedics provide access to emergency health care 24 hours a day, seven days per week in most locations throughout Turkey. They perform two main functions that take priority in pre-hospital care. The first is to provide medical care such as cardiac resuscitation, intubation and aspiration, defibrillation/cardiover-

sion, wound care/bleeding control, assisting in a normal delivery on the scene or in ambulance, interventions, and drug/fluid applications. The second function is that EMTs and paramedics provide transport via driving patients to their definitive treatment (Health Minister 2009).

EMS providers give unknown individuals medical care regarding their life and death in environments that can be uncontrolled and occasionally dangerous. They suffer from exposure of high frequency injury from needle sticks and blood-borne infections due to taking action in the field or in an ambulance (Suyama et al. 2009; Thomas et al. 2017), musculoskeletal injuries due to carrying heavy equipment, lifting, and moving patients (Pollack et al. 2007; Hansen et al. 2012), workplace violence directed by aggressive patients and bystanders (Furin et al. 2015), severe traumatic events (Crill et al. 2005; Somville et al. 2016), and death due to ambulance accidents (Ilhan 2006; CDC 2008; Maguire et al. 2014). Furin et al. (2015) reported that eighty-eight percent of EMS providers were

verbally assaulted and eighty percent of them were physically assaulted while at work. Sucu et al. (2007) found that ninety-five percent of EMS providers sustain verbal violence and sixty-two percent physical violence. Previous studies (Johnson et al. 2003; Aasa et al. 2005) have shown that psychological outcomes are four to ten times higher among ambulance personnel than in other professional groups. Furthermore, in these studies it has been reported that in EMS workers, burnout, depression, and anxiety have an elevated prevalence of symptoms. Some studies (Korkmaz et al. 2014; Weaver et al. 2015) have documented that the most frequent profession-specific events in this group are back pain, needle stick injuries and blood-borne infections, sleep disturbances, and gynecological illness. Also, ambulance accidents involving personal injuries or death are other situations that aggravate occupational risk exposures (van der Ploeg 2003; Ilhan 2006; Wagstaff and Sigstad 2011). Disasters such as fire and explosion due to car accidents, earthquakes, flood disasters, terrorism, and extended work-hours impact EMS and paramedics more than other workers (Sucu et al. 2007; Weaver et al. 2015).

Injuries/disease and psychosocial traumas based on the exposures of occupational risks affect staff's cycle speed, absence, work performance, job satisfaction, and service quality negatively, and it might cause disability/sequela, life-long chronic diseases, and acute deaths in addition to financial losses (Hazell 2010; Maguire et al. 2014; Reuter and Camba 2016). Maguire et al. (2014) reveals that Australian paramedics suffer from serious injuries more seven-times and died about six-times higher than the Australian national average. All these losses have a negative effect on patient and employee safety.

The World Health Organization (Whitaker and Baranski 2001) defines a secure environment as the environment in which individuals can perform their life activities in a healthy manner and have a sense of security. Awakening and awareness levels are important in the processes of risk analysis/assessment, risk control and management in order to protect and improve employees' health. Current studies (Meydanlioglu 2013; Vasvarir 2015) report that risk management should be invested in to prevent individual/institutional losses based on occupational exposures and supervision should be increased to provide continuity for risk management.

Some studies (Weaver et al. 2011; Meydanlioglu 2013; Vasvarir 2015) revealed that there is a connection between EMS providers perceptions of workplace safety culture and safety outcomes, but few studies display awareness and views in regards to safety and risk perceptions. This study was planned to determine levels of risk perception and management in EMS providers who were working in pre-hospital emergency care.

MATERIAL AND METHODS

This cross-sectional study based on self-statement was conducted with 160 healthcare professionals, who were working for emergency medical stations and command and control centers in Kayseri between April-May 15 in 2014. The entire population was taken as samples, but only 150 questionnaires were evaluated. Data was collected by conducting a face to face questionnaire with 37 questions that were prepared by the researchers in the light of the literature.

SPSS (Chicago, IL, USA) version 21.00 was used for data analysis. The relevance of the data to the Kolmogorov Smirnov test in regards to normal distribution was revealed; descriptive statistics were used to illustrate the levels of risk perceived according to the percent of "high risk" responses. Student t-test was used to compare two independent groups in the continuous data, ANOVA was used to compare more than two independent groups, and the Chi-square test was used in comparison of the categorical variables. $P < 0.05$ was taken as the level of statistical significance. Written permission was received from the Kayseri Provincial Directorate of Health and oral consent was received from the participants.

RESULTS

Ninety-four percent (150/160) of EMS providers completed the surveys. The average age is 25.4 ± 3.7 , most of them are male (46.4%) and married (58.2%) and between the ages of 18 and 27 years of age (82.8%). Seventy-four percent of them are EMTs and paramedics. Eighty-seven percent of providers were working for emergency medical stations and thirteen percent were working for command centers (Table 1).

The majority of the providers stated that, working with forensic cases (80.6%), having concerns about exposure to violence (77.6%), hav-

Table 1: Demographic and professional characteristics of the emergency medical services providers (n:150)

Variables	Number	%
<i>Gender</i>		
Female	69	43.6
Male	81	46.4
<i>Age Groups</i>		
	Mean ± SD: 25.4±3.7	
18-22	55	36.4
23-27	74	46.1
28-32	17	15.1
≥33	4	2.4
<i>Marital Status</i>		
Married	91	58.2
Single	55	36.4
Divorced/widowed	4	2.4
<i>Level of Education</i>		
High school	61	40.0
Vocational college	74	46.1
Bachelor and Master	15	9.1
<i>Title</i>		
Physician	16	11.5
Paramedic	38	24.2
Emergency medical technician	80	49.7
Health officer	7	4.2
Driver	9	5.5
<i>Workplace</i>		
Emergency medical stations	128	86.6
Command and control centers	22	13.3

ing occupational burnout syndrome (75.8%), having an accident risk (73.3%), having fire risks from car accidents (70.9%), and assault by patient's relatives in forensic cases with long wait times for physicians to arrive at scenes (70.3%) are the highest risks potentials for healthcare professionals. The most risky environment in terms of case management are streets (67.9%). Permanent disability due to overexertion during lifting/carrying patient/equipment (64.2%), not giving the right of way to the ambulance (61.2%), high speed ground transport (46.7%), and not investigating the risk of infectious disease (59.4%) are stated as other potential risks (Table 2). However, more than half of the providers (51.5%) had not been trained about danger/risk assessment and management related to exposures in their job.

Two-thirds of the providers stated that they take appropriate personal safety measures during intramuscular interventions (70.0%), during intravenous interventions (69.3%), and during wound care/bleeding control processes (50.6%). However, the majority of providers reported that they do not use PPE during oral/nasal aspiration (86.0%), endotracheal intubation (83.3%),

Table 2: Level of perception of work-related risk factors in emergency medical service providers (n: 150)

Risk factors	Number	%
Working with forensic cases	133	80.6
Worrying about being exposed to violence	128	77.6
Having occupational burnout syndrome	125	75.8
Risks at the scene originating from car accidents	121	73.3
Fire at the scene originating from car accidents	117	70.9
Risk of assault by patient's relatives at the scene during long waits	116	70.3
Risk of disability/sequela based on moving and lifting of patients/equipment	106	64.2
Failure of other vehicles giving the right of way to ambulances during patients' transport	106	61.2
Failure to investigate risks of infectious disease during case management	98	59.4
Trauma and the miscarriage risk on the ambulance during active duty	97	58.8
Lack of training about danger/risk assessments and management	82	51.5
High speed ground transport while processing the case	77	46.7

or with delivery assistance at the scene/in the ambulance (65.3%) (Table 3).

The majority of EMS providers stated that the Hepatitis-B vaccination needed to be inoculated ($p>0.05$) before beginning active duty, but the view of difference between professions is not significant. Physicians are more sensitive against measles ($p=0.006$), typhoid ($p=0.001$), BCG ($p=0.03$), and tetanus ($p=0.005$) vaccinations in the pre-events stage when compared to other professional groups (Table 4).

EMS providers agree that streets come first among the riskiest fields in terms of case management (68.0%), houses/workplaces come second (45.3%), and open fields come third (40.7%) (Table 5). EMTs stated that EMS stations were the least risky fields and paramedics stated that the command and control center was the least risky field.

Sixty-six percent of providers find the present work schedule with "circadian shifts" is "acceptable." When providers were asked what would happen to risks in case of extended work hours, they stated that some kind of medical errors could arise (Table 6). There is some difference in pro-

Table 3: The distribution of percentage of use of appropriate personal protective equipment during interventional applications in emergency medical service providers (n: 150)

Interventional applications	Using personal protective equipment				Statistical evaluation	
	Yes		No		χ^2	P
	Number	%	Number	%		
Wound care/bleeding control	76	50.6	74	49.4	204.95	<0.001
Assisting in a normal delivery	52	34.7	98	65.3		
Endotracheal intubation	25	16.7	125	83.3		
Oral/ nasal aspiration	21	14.0	129	86.0		
Intravenous injection	104	69.3	46	30.7		
Intramuscular injection	105	70.0	45	30.0		
Hygiene after invasive procedures	119	79.3	31	20.7		

Table 4: The distribution of positive statements about the necessity of pre-employment protective immunization according to professional groups

Vaccination name	Professional groups										P
	Physicians		Paramedics		EMTs		Health officer		Driver		
	Number	%	Number	%	Number	%	Number	%	Number	%	
Hepatitis- B	17	94.4	32	80.0	60	80.0	5	100.0	6	66.7	0.783
Hepatitis- A	13	72.2	28	70.0	41	54.7	1	20.0	4	44.4	0.780
Influenza	13	72.2	18	45.0	33	44.0	3	60.0	3	33.3	0.104
Measles	12	67.0	26	65.0	38	48.0	0	0.0	2	22.2	0.006
BCG	14	77.8	15	37.5	46	61.3	5	100.0	5	55.6	0.030
Tetanus	16	88.9	30	75.0	54	72.0	4	80.0	3	33.3	0.005
Typhoid	15	83.3	19	47.5	33	44.0	0	0.0	2	22.2	0.001

Table 5: The definition of the risky fields in terms of case-management according to emergency medical services providers

Risky fields	Yes		No		Total	
	Number	%	Number	%	Number	%
House / workplace	68	45.3	82	54.6	150	100.0
Streets	102	68.0	48	32.0	150	100.0
Emergency service	30	20.0	120	80.0	150	100.0
Field	61	40.7	89	59.3	150	100.0
Ambulance cabin	43	28.7	107	71.3	150	100.0
Command and control center	26	17.3	124	82.6	150	100.0
EMS stations	23	15.3	127	84.7	150	100.0

professional groups' views that medical errors might occur during an extended shift. Physicians stated that errors such as 'not using proper techniques while carrying patients by stretcher' ($p < 0.05$), paramedics stated that "not using the appropriate disinfection methods special to the cases", and EMTs stated that "not investigating infectious factors while dealing with cases" could occur during extended work hours (Table 6). In this study, nearly half of the providers (43.6%) have been exposed to violence, and only

fifty-five percent of them have had training about workplace risk factors and their management. However, more than half of them (51.5%) stated that they wanted to get education on these subjects.

DISCUSSION

Emergency care services, which have a history of about 25 years in Turkey, are usually performed by physicians, emergency care technicians (EMTs), and paramedics. Since the pub-

Table 6: The distribution of medical errors that might occur during extended work-hours according to professional groups (n: 150)

Types of medical errors	Physician (n:16)		Paramedics (n:38)		EMTs (n:80)		Other* (n:16)		P
	Number	%	Number	%	Number	%	Number	%	
Lack of medical skill and technical knowledge	6	37.5	11	28.9	33	41.2	2	12.5	0.220
Not applying proper stretcher techniques	14	87.5	16	42.1	34	42.5	9	56.2	0.002
Not using the appropriate disinfection methods special to the cases	7	43.7	22	57.9	29	36.2	3	18.7	0.520
Not investigating infectious factors while dealing with cases	12	75.0	12	31.6	40	50.0	6	37.5	0.360
Not washing hands before and after intervention to the patient/casualty	7	43.7	12	31.6	26	32.5	2	12.5	0.217
Giving fast/incorrect casualty care at the scene	7	43.7	11	28.9	24	30.0	4	25.0	0.075

*Other: Health officer, drive

lic domain EMTs and paramedic appointments have been carried out since 2003, this profession group is showing a young, active, and feminine structuring in the health-care setting (Duran et al. 2012). Similarly, in this paper, the sample group also has a young mean age (25.4 ± 3.7), the majority of those are EMTs and paramedics, but male providers are higher than their female co-workers.

Paramedics and EMTs making decisions in line with life and death, in front of hostile patients and their relatives, in uncontrolled and occasionally dangerous environments, provide uninterrupted service for 24 hours, 7 days a week. They always suffer from exposure to infections originating from patients, attack/violence directed from patients and bystanders, long shift work hours, fatigue, burnout, sleep disturbances, ambulance accidents, high-speed ground transport, disasters, severe trauma, and exposure to death (Cydulka et al. 1989; Weaver et al. 2015).

This study found that more than three-fourths of the providers working in emergency health services have fears regarding their personal safety while at work, and approximately half of them have been violently assaulted. A large majority (77.6%) of providers have identified risks of assault in forensic cases as the most common stressful conditions (Table 2). In accordance with the findings of this study, in a study (Celebi 2016) conducted on EMS workers across the country, it was stated that the great

majority of providers found the scene insecure and have an intense concern of being exposed to violence. Blando et al. (2013) determined in their study, which was conducted by multi-analysis methods, that the healthcare staff's perceptions of security and violence were related to the conditions of the working environment. Deirdre et al. (2011) investigated the relationship between patient care, staff's perception of security, and stress levels; it was stated that those providing health care had a higher level of job-stress due to threatening agitated patients and environments/conditions with low security.

In this paper, nearly half of the providers (43.6%), especially paramedics and EMTs were exposed to verbal and physical violence. In studies conducted in Turkey (Olmezoglu et al. 1999; Sucu et al. 2007; Celebi 2016) on staff working for emergency healthcare services between 1999 and 2016, found the rates of verbal and physical violence from sixty-seven to ninety-five percent and from fourteen to sixty-two percent, respectively. In international literature, Molly et al. (2015) reported that verbal violence was as high as eighty-eight percent and physical violence as high as eighty percent in EMS providers. Based on these surveys, exposure to violence towards EMS providers remains unacceptably high. Thus, personal safety is a priority need for these personnel that are responsible for providing uninterrupted medical care to the public in pre-hospital areas.

In this paper lower risk perception associated with infections is another major problem. It was revealed that more than half of the EMS providers did not investigate infectious disease during case-management processes and the great majority of them, especially those working in EMS stations, did not use appropriate personal protective equipment (PPE) during endotracheal intubation, oral/nasal aspiration, or in assisting normal delivery on the scene or in the ambulance. Ignoring the use of PPE during wound care/bleeding control and routine interventions (IM, IV), in other invasive procedures, compliance with universal safety rules is considerable lower (Table 3). According to the international literature (Suyama et al. 2009; Thomas et al. 2017) EMS providers have been exposed to infectious diseases in spite of the universal protective measures in the mandatory provision of the Disease Control and Protection Committee (CDC 2008). Previous studies (Reed et al. 1993; Sayed et al. 2011; Thomas et al. 2017) revealed that the risk of exposure to infectious diseases of EMS providers has been decreased over time, but it is still a major problem of the system. EMS providers are at greater risk of acquiring blood-borne infections such as HIV, hepatitis-B, hepatitis-C, MRSA colonization, Influenza, and SARS compared to the general public. Types of exposures to infected blood and body fluids revealed in the literature vary from needle sticks and sharp instrument injuries to mucous membranes and skin contact (Suyama et al. 2009). These results can be attributed to the fact that EMS providers have low self-protection motivation as well as strategies to reduce the incidence and impact of infections have not been well implemented or studied.

In this paper risk safety culture of the EMS providers was found weak as well as their low perception to the risk of infection as in line with the literature (Hubble et al. 2011; Bucher et al. 2015). Pre-event protective immunization sensitivity against some antigens, for example measles, BCG, tetanus and typhoid is also low in this paper. Although the positive attitude to protective Hepatitis-B immunization is high in all professions, it is engrossing that mostly of the paramedics regard BCG vaccination as unnecessary and approximately one-fifth of paramedics/EMTs regard tetanus and Hepatitis-B immunization as unnecessary (Table 4). In the previous literature (Gershon 1995; Nichol and Hauge 1997) revealed

out that in EMS providers voluntary participation towards pre-event/protective immunization programs and compliance with universal safety measures were lower in accordance with this paper findings. In addition, the researchers' findings related to protective hepatitis-B vaccination conform with the literature that in those studies (Malak et al. 2010; Abiola et al. 2013) between sixty-six and ninety-three percent of providers had a positive attitude towards hepatitis-B immunization.

In this paper, flu vaccination was deemed as unnecessary by half of the providers in that they were in a potential host position in terms of communicable diseases, did not pay attention to the infections that were temporary and non-sequel such as influenza (Table 4). In a multi-centered study conducted by Hubble et al. (2011) on EMS providers the rate of those being vaccinated for influenza was found as forty-eight percent similarly to our paper findings. It is an interesting and pleasing finding that nearly half of the providers have been vaccinated for typhoid and hepatitis-A, of which recognition level in routine practice in Turkey is still low.

However, this paper reveals that the awareness of the providers regarding infection risk and self-protection reflex is low since nearly half of them do not have the habit of washing hands before and after patient contact (Table 3). Bucher et al. (2015) conform that hand hygiene practices were poor amongst pre-hospital providers. As it is known, hand hygiene has an important role for infection control in pre-hospital emergency health service. So, it is very important to provide training and disinfectant support to the emergency medical staff. To have them wear protective equipment (gloves, and to wash hands after each contact/treatment periodically), is imperative in order to break the two-way infection transmission cycle between the patient and the health worker.

In this paper, three out of four providers reported that fire originating from car accidents, explosion, secondary accidents, traumatization during forensic cases, and permanent disability due to inappropriate lifting/carrying techniques were the most severe acute stressors threatening their personal safety (Table 2). Khashaba et al. (2014) reported that the most acute stressors among EMS responders were dealing with traumatic events (88.6%), followed by dealing with serious accidents (87.8%). Some studies (Suya-

ma et al. 2009; Reichard et al. 2011; Johnson et al. 2003; Crill et al. 2005) found that work-related traumatization in EMS providers was 5.8 times higher than other professions in the healthcare field. In these studies the rates of exposure to traumatic stressors in EMS providers were varied between eighty and one-hundred percent. Musculoskeletal injuries such as overexertion during lifting/moving of patients, especially back injuries, were commonly reported to be a cause of injury among EMTs.

In this paper, a large proportion of providers under pressure of intensive violence and trauma, stated that burnout could be one of the most important risk factors related to occupational exposure (Table 2). Previous studies (Johnson et al. 2003; van der Ploeg et al. 2003; Berkhmiller et al. 2016) revealed that Burnout syndrome is a common problem in EMS providers, and is especially found higher in ambulance drivers, consistent with respondent perceptions. A recently conducted study (Berkhmiller et al. 2016) reported that eleven and a half percent of EMS providers working in pre-hospital areas had a risk of burnout syndrome.

In this paper, nearly two-third of EMS providers stated that streets were the riskiest location in case management in terms of other drivers failing to give the right of way to ambulances and high speeds exceeding legal limits (nearly half of the group) while managing patients in transport were the main mechanical risk factors (Table 5). Unlike other vehicles in traffic, ambulance drivers have been given the rights of exceeding the speed limit determined by law, demanding other drivers to clear the left lane, ignoring the rules of stopping and turning, all with the precondition of providing the security of patient/their relatives, emergency team, and equipment (TOOEMSV 2000). However, in the literature, it is reported that giving the right of way to ambulances causes ambulance drivers to disregard the rules more easily and to lead to accidents due to their thinking that they have priority in traffic (Vrachnou 2003). Accidents involving death and injury involving ambulances originate from the ambulance drivers' thinking they have the "right of way on roads", "right of way in cross-roads", and "to speed" in Turkey and the risk factors defined by our sample group conform with literature (Maguire 2011; Turkdemir et al. 2013).

It is interesting that more than half of the providers (67.5%) in this paper, find the traditional schedule, including extended work shifts (≥ 24 hours) every other shift, is "appropriate". Long working periods without rest can impair cognitive and motor performance, decrease alertness and productivity, and increase the risk of adverse events and outcomes such as fatigue, poor performance, and safety and health care errors (Keller 2009; OSHA 2014). In scientific literature (Ilhan et al. 2006; Rogers et al. 2004; Keller 2009; Weaver et al. 2015) it is shown that an employee working in a shift of 12.5 hours had the risk of making errors three times more than those working in a shift of 8.5 hours. The greatest risk was observed for 24 hour shifts. Drug errors and accidents related to needle sticks after a 12-hour work shift were found to be more than in an 8-hour work shift. Wagstaff and Sigstad (2011) reported that work periods greater than 8 hours lead to an increased risk of accidents. So, the increased risk of accidents at around 12 hours is twice the risk of 8 hours.

When EMS providers were asked about the related risks of extended work hours, most of them reported that some medical errors could occur (Table 6). There are differences between professional groups in terms of medical error types and levels; physicians stated that errors such as 'not using proper stretcher use techniques' could happen intensively significantly higher than in the other groups; paramedics stated that 'not using the right disinfection method in specific cases' and EMTs stated that 'not investigating infectious diseases' could happen intensively.

The team is aware of the risks that long work shifts will have on patient and employee safety, but defines the traditional schedule, including an extended work shift (≥ 24 hours) as "appropriate". This is a contradictory result. It is important to raise the awareness of the group regarding the potential medical risks and complications that long working hours are likely to cause and to establish a consensus on 8-hour standard shifts.

In this paper only half of the EMS providers have received education about workplace risk factors and universal protective measures in the pre-employment orientation. Studies (Gershon et al. 1995; Listyowardojo et al. 2010) revealed that EMS providers voluntary participation in

training programs about infectious diseases and universal precautions organized by institution is relatively low and depends on the lack of their self-defense awareness and safety culture.

CONCLUSION

Fear of work-related violence and personal safety during case-management were the most acute stressors for EMS providers. Nearly half of the providers have suffered from exposure to workplace violence. The level of risk perception, compliance with universal protective measures, and sensitivity regarding protective immunization is considerable lower. EMS providers are in need of risk awareness and stress management program for prevention of acute and chronic work-related stressors effecting health and work performance of personnel.

RECOMMENDATIONS

Organizing periodic training programs on danger/risk awareness and management, gaining self-protection motivation and creating a safety work environment by experts may reduce adverse consequences of confrontation with traumatic occupational hazards.

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