Clinical and Experimental Emergency Medicine

Clin Exp Emerg Med 2023;10(3):287-295
https://doi.org/10.15441/ceem.22.389

Original Article

eISSN: 2383-4625

Influence of work and family environment on burnout among emergency medical technicians

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Received: 23 October 2022
Revised: 9 January 2023
Accepted: 31 January 2023

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Objective Burnout among emergency medical technicians is a serious problem affecting delivery of quality emergency medical services. Although the repetitive nature of the job and lower education level requirements for technicians have been reported as risk factors, little is known about the influence of burden of responsibility, degree of supervisor support, and home environment on burnout among emergency medical technicians. This study aimed to test the hypothesis that burden of responsibility, degree of supervisor support, and home environment increase burnout probability.

Methods A web-based survey was conducted among emergency medical technicians in Hokkaido, Japan from July 26, 2021 to September 13, 2021. A total of 21 facilities were randomly selected from 42 fire stations. Prevalence of burnout was measured using the Maslach Burnout-Human Services Survey Inventory (MBI-HSS). Burden of responsibility was measured using a visual analog scale. Occupational background was also measured. Supervisor support was measured using the Brief Job Stress Questionnaire (BJSQ). Family-work negative spillover was measured using the Japanese version of Survey Work–Home Interaction–NijmeGen (SWING). The cutoff value for burnout syndrome was defined as emotional exhaustion ≥ 27 and/or depersonalization ≥ 10.

Results A total of 700 survey respondents were included, and 27 surveys with missing data were excluded. The suspected burnout frequency was 25.6%. Covariates were adjusted using multilevel logistic regression model analysis. Low supervisor support (odds ratio, 1.421; 95% confidence interval, 1.136–1.406; $P<0.001$) and high family-work negative spillover (odds ratio, 1.264; 95% confidence interval, 1.285–1.571; $P<0.001$) were independent factors associated with higher probability of burnout.

Conclusion This study indicated that focusing on improvement of supervisor support for emergency medical technicians and creating supportive home environments may assist in reducing burnout frequency.

Keywords Psychological burnout; Emergency medical technicians; Home environment

How to cite this article:
Haruna J, Uemura S, Taguchi Y, Muranaka S, Niiyama S, Inamura H, Sawamoto K, Mizuno H, Narimatsu E. Influence of work and family environment on burnout among emergency medical technicians. Clin Exp Emerg Med 2023;10(3):287-295. https://doi.org/10.15441/ceem.22.389

Capsule Summary

What is already known

Burnout is a serious problem among emergency medical technicians that may effect delivery of high quality care. However, the factors contributing to burnout have not been clearly defined.

What is new in the current study

This study suggests that it is important to focus on supervisor support for emergency medical technicians along with the home environment to reduce the frequency of burnout.

INTRODUCTION

Emergency medical services (EMS) play a critical role in providing care to patients in prehospital settings worldwide. The EMS field evolved in the 1960s due to the occurrence of traffic traumas and has been expanding in influence [1]. The educational system for emergency medical technicians (EMTs) and practice environment in which EMTs work vary from country to country. In the United States, there are four levels of EMS professionals certified by the National Registry of Emergency Medical Technicians: emergency medical responder, EMT, advanced EMT, and paramedic [2]. In addition, the legal authority and regulatory responsibilities of EMTs is at a state level, not federal. Thus, the structure, delivery, and funding of EMS vary from state to state, as does the scope of work. Therefore, the educational requirements of each EMS provider also vary. EMS has a wide variety of forms, including attachment to fire department systems, medical center systems, nonprofit organizations, private companies, and government agencies [3]. There are two levels of EMT professionals in Japan: EMTs and paramedics [4]. EMTs are affiliated with each municipality and responsible for driving ambulances, providing first aid to patients in these ambulances, and transporting patients to emergency facilities. Japan's emergency medical care system is classified into the following: primary emergency facilities, mainly providing outpatient services; secondary emergency facilities, predominantly treating severely ill patients who require hospitalization; and emergency medical centers, treating severely ill patients who require advanced treatment [4]. Patients who cannot visit the hospital independently are transported to an emergency hospital by ambulance, which is requested by either patients or their family members. In 2017, there were 6,342,147 ambulance dispatches in Japan, a consistent increase since 2004 [5]. Currently, the scope of prehospital emergency care in any country is no longer limited to traffic traumas [4]. The role of EMTs has also diversified due to changes in the nature of diseases, such as cardiac disease and acute exacerbations of chronic diseases, and populations [6]. Therefore, medical care in prehospital settings is a common entry point into the continuum of care. In addition, presence of EMTs is essential to providing the necessary medical care in the prehospital setting.

However, fatigue and stress among healthcare professionals involved in EMS have become problematic. In particular, burnout is one of the most widely discussed mental health problems in society. The concept of burnout was first described by Freudenberger [7]. He described burnout in the workplace as "exhaustion due to excessive demands on energy, stamina, and resources." The processual characteristics of burnout indicate the cumulative negative consequences of long-term work stress and fatigue [8]. Burnout has been reported to produce physical symptoms such as fatigue, malaise, frequent headaches and gastrointestinal problems, insomnia, and shortness of breath, as well as psychological conditions such as frustration, anger, and depression [9]. Burnout in healthcare professionals has been associated with depression, suicidal ideation, early retirement, and medication errors [10,11]. Burnout occurs at a high rate. The prevalence of burnout among physicians and nurses involved in emergency medicine is estimated to be 30% to 44% [12–14]. Risk factors for burnout among healthcare professionals involved in emergency medicine have been reported to include age, gender, education, years of experience, degree of supervisor support, family-to-work negative spillover (FWNS), and caring for critically ill patients [15,16].

EMTs are involved in providing first aid to patients with sudden illnesses, and EMTs are responsible for transporting patients quickly to the hospital. The occupational environment in which EMTs work is characterized by regular exposure to traumatic and emotionally taxing situations [2], a dynamic and uncontrolled environment with frequent changes, increased rates of occupational violence [17], physical fatigue [18], irregular work patterns [19], long overtime hours [20], and higher workload [21]. Burnout has been reported to range between 16% and 56% [22] among EMTs, indicating a burnout rate similar to that among emergency physicians and intensivists [14]. The risk factors for burnout among

EMTs have been reported to include years of doing the same job, work location [23], and work overload [24]. FWNS is reflected through several risk factors that include impact of a poor family environment on work [25], work environment [26], and degree of supervisor support [27]. These are independent risk factors for burnout. Moreover, EMTs tended to experience increased stress and responsibility due to encountering stressful situations, such as providing care for patients with trauma or cardiopulmonary arrest [28]. Rescuing a patient with a life-threatening condition can present a huge burden of responsibility. Situations involving serious responsibilities in prehospital medicine may be associated with burnout in EMTs. However, this has not yet been researched. Therefore, we hypothesized that burnout among EMTs would be associated with FWNS, low supervisor support, and a high burden of responsibility.

METHODS

Ethics statement

This study was approved by a suitably constituted Ethics Committee of Sapporo Medical University (No. 2-1-76) and conformed to the provisions of the Declaration of Helsinki. Informed consent was obtained from all the respondents prior to the survey.

Study design and settings

An institution-based, cross-sectional study was conducted among 3,215 EMTs in Hokkaido, Japan using ArcGIS Survey 123 (Esri, https://survey123.arcgis.com/) from July 26, 2021 to September 13, 2021. ArcGIS Survey 123 is a platform that maintains a high level of security.

Simple random sampling was used to select 42 fire stations in Hokkaido, Japan after obtaining permission from the chief of each fire station. The number of EMTs in each fire department was identified. We emailed heads of selected fire stations requesting a response from the EMTs.

Hokkaido's EMS system is operated by local fire departments and can be activated by a 119 call from anywhere in Hokkaido [29]. In 2021, a total of 42 fire departments and 427 ambulances were deployed in Hokkaido [30]. Usually, each ambulance has a crew of three emergency providers, including at least one emergency life-saving technician and a highly trained prehospital emergency care provider. On-site EMS personnel select hospitals for patient transport, including tertiary care hospitals, with the capacity to manage patients with life-threatening conditions. Local medical management councils, composed of emergency physicians and specialists from each region of Japan, play an important role in ensuring the quality of care provided by EMS staff in prehospital settings and in conducting follow-up evaluations of EMS procedures [31].

Measurement

The survey comprised six components. The first part of the questionnaire, on individual and organizational characteristics, included age, gender, marital status, bachelor's degree as education status, managerial position, full-time employment status, paramedic certification, population of the employment area, years of doing the same job, and type of fire department. The second part concerned the working environment, such as the number of annual mobilizations, night shifts, hours worked per week, overtime hours, and number of paid vacations taken per year. Another included variable was the frequency of involvement of the EMT personnel in the transport of COVID-19 patients, as the COVID-19 pandemic may increase burnout among EMTs. The third component consisted of the 22-item Maslach Burnout-Human Services Survey (MBI-HSS) [32], which was used to assess burnout among EMTs. The fourth component consisted of a nine-item subscale of the Brief Job Stress Questionnaire (BJSQ) to assess the level of support from superiors [33]. The BJSQ has been authorized by the Ministry of Health, Labour and Welfare of Japan and is considered a standard questionnaire for evaluating occupational stress [34]. The fifth component consisted of four items from the Japanese version of Survey Work–Home Interaction – NijmeGen (SWING-J) to assess the FWNS of EMTs [35]. The sixth component consisted of three questions to assess the burden of responsibility of the paramedic's work.

The MBI-HSS is widely used to assess burnout and consists of three dimensions: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment. This Japanese-translated instrument has been validated [36]. The alpha for each factor in the reliability of the Japanese version of the MBI-HSS was 0.92, 0.91, and 0.88, respectively. Each question was rated on a 7-point Likert scale (0 [never] to 6 [frequent]). The cutoff value for burnout syndrome was defined as EE ≥ 27 and/or DP ≥ 10. The cutoff scores used in this study were based on a 2016 systematic review, which is identified as the most widely used criteria to define burnout [37].

The BJSQ was developed to measure occupational stress but could also gauge the degree of supervisor support [33]. For each of the BJSQ subscales, respondents rated their level of agreement on a standard 4-point Likert scale (1 [strongly disagree] to 4 [strongly agree]). A higher score on the subscale of supervisor support indicates a greater need for supervisor support for EMTs.

SWING-J was developed as a scale to assess work-home interactions. Geurts et al. [38] defined FWNS as negative load reactions transferred from domestic space to the workplace. For each

item on the SWING-J subscale, respondents rated their level of agreement on a standard 4-point Likert scale (0 [most of the time] to 3 [never]). The SWING-J has been shown to have good validity and reliability [17]. The higher the FWNS subscale score, the higher the negative family-to-work influence.

First, to determine the contents of the questions regarding the burden of responsibility on EMTs, first, the available information from previous studies was examined [24,39,40]. Second, paramedic perceptions concerning their burden of responsibility in their work were extracted. Third, based on these contents, 10 EMTs were interviewed to analyze the tasks for which the EMTs assumed responsibility. Based on these results, three items were adopted in this study: (1) burden of responsibility in determining the medical condition of the patient; (2) burden of responsibility in selecting a hospital to transport the patient; and (3) burden of responsibility in communicating with physicians. Each question was measured using the visual analog scale (VAS) with "strongly agree" as 100 and "disagree" as 0.

Bias

Simple random sampling was used to select the participants of the study from the fire station of each region. This was done to address the potential selection and response biases. Therefore, selection bias did not have a significant impact on the results of this study. In addition, there were some confounding factors, such as years of doing the same job, marital status, shift, and position, which could have influenced burnout [22]. Therefore, multivariate statistics were used to make adjustments for these factors.

Sample size

The prevalence of burnout was estimated at 20% [22], and 12 covariates were identified that required adjustment in logistic regression. As a result, the number of participants needed for the analysis was estimated to be 650 [41], and considering a response rate of 20%, a sample size of 3,250 was considered necessary.

Statistics

Normally distributed data are represented as mean ± standard deviation. Non-normally distributed data are presented as median (interquartile range [IQR]). First, descriptive statistics were calculated. Second, the respondents' demographic characteristics, burden of responsibility, working environment, social support, and work-life balance were compared with those of EMTs with or without burnout using Fisher exact test for categorical variables or the t-test for continuous variables. Third, to clarify the relationship between burnout and FWNS, supervisor support, and severity of responsibility, a multilevel logistic regression analysis was performed using SWING-J and BJSQ scores as continuous variables. The VAS scores of the three items of severity of responsibility that were significantly different in the univariate analysis were continuous variables in this logistic regression analysis. Therefore, covariates were introduced at the fire department level to account for the possible heterogeneity in fire department management practices. Items from the three burdens of responsibility that showed significant differences using the univariate analysis were analyzed using multilevel logistic regression analysis. The covariates were predefined based on previous studies and clinical perspectives. The covariates were predefined based on previous studies and clinical perspectives [23,39]. The covariates were years of doing the same job, education, experience in transporting patients with COVID-19, marital status, full-time employment of EMTs and paramedics, shift, and position.

The results of multilevel logistic regression model analysis are shown with odds ratios (ORs), 95% confidence intervals (CIs), and P-values. A P-value of <0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS ver. 27 (IBM Corp).

RESULTS

Population

A total of 700 respondent surveys were included in the final analysis after excluding 27 surveys with missing data. The response rate was 21.8%. The survey respondents' characteristics are presented in Table 1. A total of 86.3% of respondents were involved in COVID-19 patient management.

Associations of work and personal environments and the outcomes of burnout

Table 1 shows the comparison of the characteristics, supervisor support, and FWNS between respondents with and without burnout. In the univariable analysis, EMTs with bachelor's degrees had a significantly higher probability of burnout than EMTs without bachelor's degrees (12.8% vs. 7.5%, $P=0.033$). Full-time EMTs had a significantly higher probability of burnout than other EMTs ($P<0.001$). The VAS score for the burden of responsibility in communicating with physicians was significantly higher in respondents with burnout than in those without (76.7 ± 26.7 vs. 70.9 ± 26.6, $P=0.013$). Supervisor support scores were significantly higher in respondents with burnout than in those without (8.1 ± 2.1 vs. 6.6 ± 2.1, $P<0.001$). The FWNS scores were significantly higher in respondents with burnout than in those without (1.9 ± 2.1 vs. 1.0 ± 1.4, $P<0.001$).

Table 1. Characteristics of the respondents and associations of work, personal environments, supervisor support scores, and FWNS with burnout

Variable	Overall (n = 700)	Burnout		P-value
		Yes (n = 179)	No (n = 521)	
Men	685 (97.9)	174 (97.2)	511 (98.1)	0.550
Age (yr)				0.202
20–29	213 (30.4)	48 (26.8)	165 (31.7)	
30–39	230 (32.9)	54 (30.2)	176 (33.8)	
40–49	207 (29.6)	60 (33.5)	147 (28.2)	
50–59	48 (6.9)	17 (9.5)	31 (6.0)	
> 60	2 (0.3)	0 (0)	2 (0.3)	
Marital status	174 (24.9)	134 (74.9)	392 (75.2)	0.920
Education status (bachelor's degree)	67 (9.6)	23 (12.8)	39 (7.5)	0.033
Position				
Manager	233 (33.3)	61 (34.1)	172 (33.0)	0.854
Full-time EMT	195 (27.9)	68 (38.0)	127 (24.4)	< 0.001
Paramedic	229 (32.7)	128 (71.5)	343 (65.8)	0.168
Population of the area				0.070
0–5,000	100 (14.3)	23 (12.8)	77 (14.8)	
5,001–10,000	175 (25.0)	39 (21.8)	136 (26.1)	
10,001–30,000	143 (20.4)	32 (17.9)	111 (21.3)	
30,001–50,000	32 (4.6)	10 (5.6)	22 (4.2)	
50,001–100,000	43 (6.1)	15 (8.4)	28 (5.4)	
100,001–300,000	131 (18.7)	30 (16.8)	101 (19.4)	
300,001–500,000	20 (2.9)	7 (3.9)	13 (2.5)	
> 500,001	56 (8.0)	23 (12.8)	33 (6.3)	
No. of dispatches per year				0.001
0–100	385 (55.0)	78 (43.6)	307 (58.9)	
101–500	182 (26.0)	56 (31.3)	126 (24.2)	
> 501	133 (19.0)	45 (25.1)	88 (16.9)	
Type of facility				0.253
Head office	25 (3.6)	3 (1.7)	22 (4.2)	
Fire department	564 (80.6)	145 (81.0)	419 (80.4)	
Field office	111 (15.6)	31 (17.3)	80 (15.4)	
Years of doing the same job	12.6 ± 8.0	13.1 ± 8.3	12.5 ± 8.0	0.530
Shift				0.794
Only day shift	19 (2.7)	3 (1.7)	16 (3.1)	
Double shift	155 (22.1)	41 (22.9)	114 (21.9)	
Three shifts	130 (18.6)	33 (18.4)	97 (18.6)	
24-hr shift	396 (56.6)	102 (57.0)	294 (56.4)	
No. of night shifts per month	9.8 ± 2.1	10.1 ± 1.7	9.7 ± 2.2	0.013
No. of hours worked per week	46.3 ± 15.5	48.3 ± 15.6	45.6 ± 15.4	0.051
Overtime hours per week	2.9 ± 4.1	3.3 ± 4.8	2.7 ± 3.9	0.104
No. of paid vacations per year	12.7 ± 7.0	12.9 ± 7.4	12.6 ± 6.9	0.621
Involved in management of COVID-19 patients	604 (86.3)	162 (90.5)	442 (84.8)	0.060
Degree of burden of responsibility of the EMT				
Responsibility in determining the medical condition of the patient	83.4 ± 19.1	84.4 ± 19.7	83.1 ± 18.9	0.456
Responsibility for transporting critically ill patients	89.2 ± 16.8	89.7 ± 18.6	89.1 ± 16.2	0.690
Responsibility to communicate with physicians	72.4 ± 26.7	76.7 ± 26.7	70.9 ± 26.6	0.013
BSJQ (supervisor support score)	7.0 ± 2.2	8.1 ± 2.1	6.6 ± 2.1	< 0.001
SWING-J (FWNS)	1.2 ± 1.7	1.9 ± 2.1	1.0 ± 1.4	< 0.001

Values are presented as number (%) or mean ± standard deviation.
FWNS, family-to-work negative spillover; EMT, emergency medical technician; BJSQ, Brief Job Stress Questionnaire; SWING-J, Japanese version of Survey Work–Home Interaction–NijmeGen.

Table 2. Risk factors for the frequency of burnout among EMTs in a multivariate analysis

Risk factor	Odds ratio	95% Confidence interval	P-value
Men	1.043	0.288–3.785	0.948
Years of doing the same job	1.005	0.975–1.036	0.744
Paramedic	0.908	0.596–1.383	0.653
Position	1.134	0.693–1.853	0.617
24-hr shift	1.129	0.769–1.659	0.535
Involved in COVID-19 patient management	1.461	0.781–2.733	0.235
Education status (bachelor's degrees)	0.593	0.309–1.138	0.116
Burden of responsibility to communicate with physicians	1.007	0.999–1.015	0.085
Marital status	1.591	0.986–2.565	0.057
Full-time emergency medical technician	2.043	1.234–3.383	0.005
Family-to-work negative spillover	1.264	1.136–1.406	<0.001
Low supervisor support	1.421	1.285–1.571	<0.001

Risk factors for the frequency of burnout among EMTs

The results of a multilevel logistic regression model analysis adjusted for predefined covariates to examine the hypotheses are presented in Table 2. Support from supervisors was an independent factor associated with burnout (OR, 1.426; 95% CI, 1.289–1.577; P<0.001). The FWNS was also an independent factor associated with the frequency of high-severity burnout (OR, 1.268; 95% CI, 1.138–1.413; P<0.001). There was no statistically significant association between burnout and the burden of responsibility associated with communication with physicians (OR, 1.007; 95% CI, 0.999–1.015; P=0.085).

DISCUSSION

The results showed that, contrary to the hypothesis, burnout among EMTs was not associated with the burden of responsibility associated with communication with physicians involved in transporting patients who required emergency care. The independent risk factors for burnout among EMTs were associated with less support from supervisors and FWNS. Therefore, measures that improve support from supervisors and enhance work-life balance are required.

There was no association between burnout among EMTs and the burden of responsibility associated with communication with physicians. There are several possible explanations for this lack of an association. In Japan, the prehospital care system has strengthened to expand the scope of medical practice for EMTs, and the enhanced collaboration between physicians and EMTs may not have been associated with burnout [42]. Communication between prehospital and hospital healthcare professionals is essential for high-quality patient care [43]. The information EMTs obtain from patients includes current medical history, history of illness, family information, and advanced care planning. These are valuable sources of information to improve in-hospital care. Many studies have been conducted on enhancing the communication skills of EMTs, and their strategies have been examined [44]. In Japan, the strategic implementation of communication training in education for EMTs and in clinical settings may have had a negative association with burnout [42]. Moreover, there is evidence of a normalized perception that EMTs should have responsibility for transporting emergency patients as their training includes working in such emergency situations in prehospital settings. Task shifting is performed in prehospital care for out-of-hospital cardiac arrest, and EMTs are being trained to master more responsible procedures, which may also be related to the results of this study [41].

FWNS causes a high prevalence of burnout among EMTs as an independent risk factor. Among non-EMT healthcare professionals, reducing FWNS is deemed to improve mental and physical well-being [38]. However, we believe that the same is not reported among EMTs. A favorable home environment may increase job satisfaction and correlate with lower turnover intentions [45]. Supervisor support is important to improve FWNS [46], and the study includes this as an independently associated factor. A positive relationship with a supervisor can reduce stress in the work environment and create a more positive self-perception [47]. Staff who have a good relationship with their supervisors are more likely to be trusted by the supervisors and, thus, have a higher level of autonomy [48]. Based on the BJSQ, EMTs are unable to discuss their work and personal matters with their supervisors due to a lack of trust in their supervisors. Therefore, to reduce the prevalence of burnout among EMTs, enhancement of the supervisor-staff relationship is necessary. A teamwork system for healthcare professionals called TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety) helps to improve healthcare quality, safety, and efficiency. We recommend the interventions such as team training tools to promote patient safety [49]. Supervisors should address the family needs of their subordinates, provide work flexibility, and empathize with staff [50].

There were several limitations to the current study. First, this study was based on EMTs from a single province in Japan in a limited number of surveys. However, the EMS system and EMT work practices across Japan are the same, presumably with a similar level of burnout. Therefore, we expect this limitation to have a minimal impact on the results. Ideally, however, replication of this study in other parts of Japan for comparisons and generalizations is necessary. Second, the background of EMTs who did not respond to this survey could not be evaluated. Moreover, the differences between the two groups could not be analyzed. The

web-based questionnaire in this study had a 20% response rate, and some EMTs who refused to participate in the study may have included those who experienced burnout. However, in a previous study on burnout among EMTs, the response rate was similar to that in this study. That study had a similar prevalence of burnout. Therefore, this limitation might not have had a significant impact on this study's findings.

In conclusion, this study found that supervisor support and FWNS were independently associated with a high frequency of burnout among EMTs. To reduce burnout, enhancing the support from supervisors and facilitating a balance between work and family are important.

ETHICS STATEMENT

This study was approved by a suitably constituted Ethics Committee of Sapporo Medical University (No. 2-1-76) and conformed to the provisions of the Declaration of Helsinki. Informed consent was obtained from all the respondents prior to the survey.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

FUNDING

None.

ACKNOWLEDGMENTS

The authors thank the patients who participated in this study.

AUTHOR CONTRIBUTIONS

Conceptualization: JH, SU, YT, SM, SN, HI; Data curation: JH, SU, YT; Formal analysis: all authors; Visualization: JH, SU; Writing–original draft: JH, SU; Writing–review & editing: all authors. All authors read and approved the final manuscript.

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