

# Occupational Stress among Japanese Emergency Medical Technicians: Hyogo Prefecture

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#### Abbreviations:

CISM = critical incident stress management  
EMS = emergency medical services  
EMT = emergency medical technician  
PTSD = post-traumatic stress disorder

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#### Abstract

**Introduction:** As prehospital care became emphasized in emergency medical services in Japan, qualification as a “paramedic” was established in 1991 as a requirement for national qualification as an emergency medical technician (EMT). With recent increases in emergency transportation, the responsibilities of paramedics have become more complex and demand a higher level of competency; however, no method of evaluating occupational stress among Japanese EMTs currently exists.

**Methods:** A questionnaire survey of the working conditions and health of 2,017 EMTs in Hyogo prefecture was conducted. To analyze stress levels among these EMTs, the survey was divided into two categories: (1) physical stress; and (2) mental stress.

**Results:** The number of responses was 1,551 (76.9%) and the average age of the respondents was 35.4 years. The lower back, neck, and shoulders were most frequently subjected to physical stress, which was related to the daily operations as an EMT. Mental stress was reported more frequently by those who were older or qualified paramedics.

**Discussion:** The high frequency of lower back pain suggests the need for improvement in the work environment and periodic education.

**Conclusions:** Although job satisfaction among paramedics was high, they were exposed to greater mental stress. Therefore, systematic management of stress must be developed and established.

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#### Introduction

Emergency medical technicians (EMTs) today play an important role in the provision of emergency medical services (EMS) in Japan. Not only do they transport patients to a hospital, but to the most appropriate hospital best suited to improve the patients’ medical conditions. For this latter purpose, immediate assessment of the patients, which can affect the prognosis, is essential.

The term emergency medical technician (EMT) means personnel who are working at emergency medical services, which are established in each public fire bureau in Japan. An EMT has had standard education and training, and can perform a certain emergency medical practice. The term paramedic means a qualified EMT in Japan who has received professional education and training, and can do more advanced emergency medical practice.

In order to develop and improve prehospital care, a paramedic-level system was launched in Japan in April 1991, the range of medical practices by EMTs qualified as paramedics was extended, and EMTs were recognized as a significant component of medical personnel supporting EMS.<sup>1</sup> As higher

	Problem with body part	Need medical treatment	Request leave	Experience pain >30 days/ year
Lower back	25.8	9.8	26.0	19.8
Neck	9.9	2.8	8.3	9.2
Shoulders	9.9	2.4	8.1	12.4

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**Table 1**—Percentage of emergency medical technicians reporting an effect of physical stress on activities in daily life

levels of technique and knowledge are required, the responsibilities of EMTs are becoming more advanced and more complicated every year. In addition, because of the increase in emergency dispatches and the frequency of various emergencies, physical and mental stress for EMTs has been increasing.<sup>2</sup>

The work of EMTs is extremely stressful.<sup>3-7</sup> Studies suggest that EMTs face more stressful work conditions than do many other occupations,<sup>8,9</sup> and many factors that contributed to such stress have been identified.<sup>10-12</sup> Occupational stress among EMTs in other countries has been examined and reported, but few detailed surveys have been conducted on occupational stress and the work environment among EMTs in Japan. Therefore, a questionnaire survey on the working conditions and health of EMTs was conducted that examined several factors in order to evaluate and analyze both physical and mental stressors and levels of stress.

## Methods

The Department of Disaster and Emergency Medicine, Kobe University Graduate School of Medicine, Japan and the Center for Musculoskeletal Research, University of Gävle, Sweden collaboratively produced a questionnaire survey on the working conditions and health among EMTs. This instrument was administered to 2,017 randomly selected EMTs in Hyogo Prefecture in Western Japan. There were 46 sections and 217 questions in total. Questions included age, gender, experience, work style, physical stress levels, mental stress levels, work satisfaction, spare time activities, family background, and future prospects. The questionnaire was anonymous and collected at the fire departments where the surveyed EMTs were stationed. Statistical analyses and Wilcoxon rank-sum test and multiplex logistic regression were conducted using SPSS software. Differences with  $p$ -values <0.05 were considered to indicate statistically significant differences.

In order to investigate which occupational conditions are most likely to cause mental stress, a factor analysis was performed by scoring mental stress. Utilizing a 4-point Likert-type rating scale, the results of 29 questions listed in the Appendix were rated on a scale of four to one (four points for “almost never”, three for “rarely”, two for “sometimes”, and one for “often” in terms of the environment; four points for “often”, three for “sometimes”, two for “rarely”, and one for “almost never” in terms of worksite and symptoms). The higher score corresponds to a higher stress level.

1. Most frequent work posture of EMTs	% EMTs
Sitting while bending forward without support from the arms	34.7
Standing while bending forward	33.9
Sitting in a twisted position	22.4
A kneeling position	19.5
Standing with the hands some distance in distance in front of the body	19.2
2. Causes of physical stress that EMTs themselves identified	
Heavy lifting with stretchers	65.2
Heavy lifting without stretchers	64.4
Loading ambulance	39.3
Unloading ambulance	18.6
Others	9.9

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**Table 2**—Relationship of physical stress to work posture (EMT = emergency medical technician; multiple answers)

Next, the factors of mental stress were investigated with six questions related to: (1) age; (2) length of service as EMT; (3) qualification of paramedic; (4) working conditions; (5) population density at work place; and (6) number of dispatches per ambulance. Multiplex logistic regression analysis was conducted with the total score for mental stress as the outcome variable and the six factors above as the potential predictor variable.

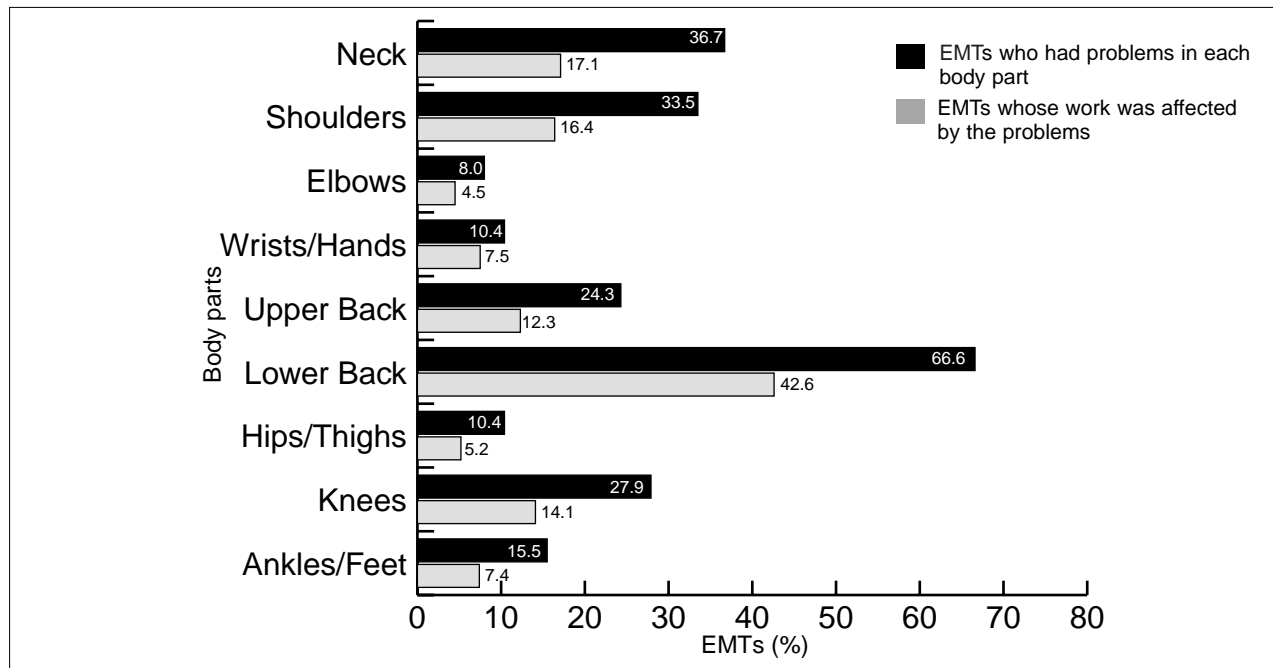
## Results

There were 1,551 (76.9%) survey responses; 1,541 from males (99.4%) and 10 from females (0.6%); 559 were from qualified paramedics (36.0%) and 992 (64.0%) from others. The average age was 34.6 ±8.2 years, the average length of service as fire brigade personnel was 175 ±100.6 months, and that of service as EMT was 123 ±84.9 months. Full-time EMTs accounted for 503 (32.4%) of the respondents; 1,047 (67.5%) were engaged in both fire and ambulance services; and others accounted for 0.1%. The results of the questions related to physical and mental stress for EMTs were examined and analyzed.

### Physical Stress

Stress effects on nine parts of the body were analyzed: neck, shoulders, elbows, wrists and hands, upper back, lower back, hips, ankles, and feet (Figure 1). First, EMTs were asked if they had experienced problems in those body parts during the previous 12 months and if the problems affected their work. Two-thirds of the responders noted problems in the lower back, one-third in the neck and the shoulders. The physical problems that responders reported affected their work most were in the lower back.

Most of the EMTs experienced stress when assuming a working posture involving bending forward or raising their arms. Specifically, responders identified the causes of phys-



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**Figure 1**—Proportion of EMTs who had problems in each body part during the twelve months and whose work was affected by the problems. Many of them noted problems in the lower back, and the problems affected their work most were also in the lower back. (EMT = emergency medical technician)

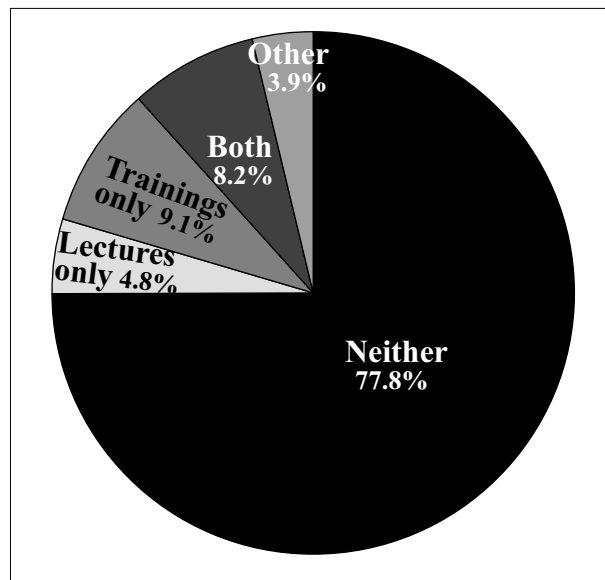
ical stress as the following operations: lifting with stretchers or other equipment and loading patients into the ambulance. Unlike hospital employees who work exclusively inside the hospital, EMTs often must work outside, on the ground or on the floor at the emergency site, which requires them to bend forward. When lifting patients, they must move the equipment up and down or horizontally. Such operations cause stress to the lower back and the shoulders, as they become pivots for the movement.

The effect of stress in the lower back, neck and shoulders on activities in daily life was examined (Table 1). Problems in the lower back were noted, which adversely affected health and daily life of EMTs. The corresponding percentages for the neck and the shoulders were less than for the lower back, but still were substantial.

The survey questions according to work posture were analyzed to examine the relationship between physical stress and work posture. The results are in Table 2. According to responders, their most frequent work posture was bending forward, and the primary cause of physical stress that responders identified was “lifting heavy things”. Proportions of the methods used for educating Japanese EMTs on how to reduce physical stress are in Figure 2. Survey responses also indicated that very few EMTs had received theoretical instruction or practical training in the last year.

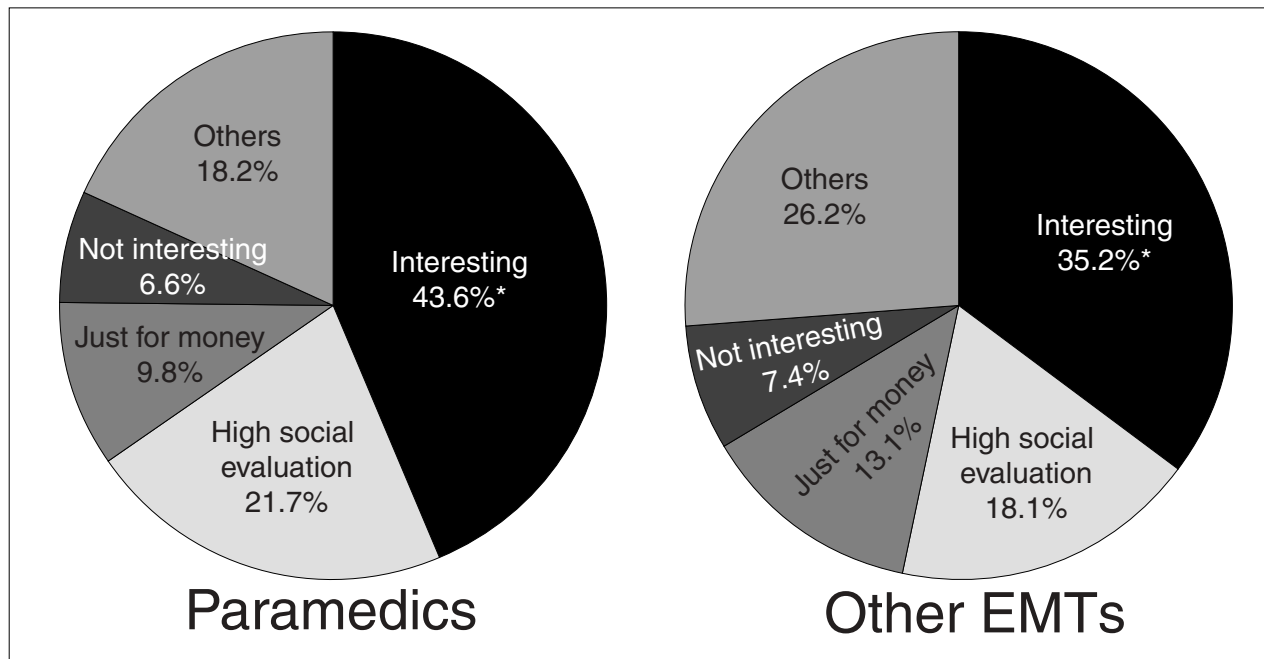
#### *Mental Stress*

Three aspects of mental stress were studied: (1) environment: psychological state in the work environment; (2) worksite:



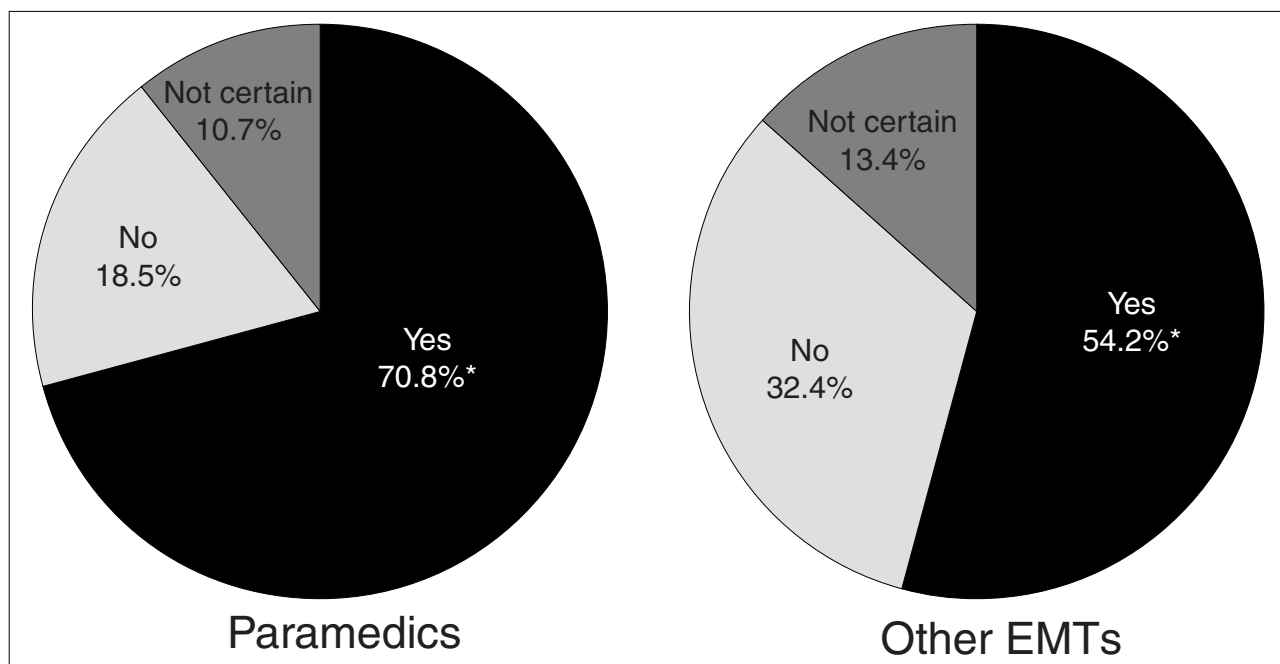
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**Figure 2**—Proportion of EMTs who have received the theoretical instruction and/or practical training on the best methods of lifting and carrying during the last year. Only a few EMTs had received theoretical instruction or practical training for reducing physical stress. (EMT = emergency medical technician)



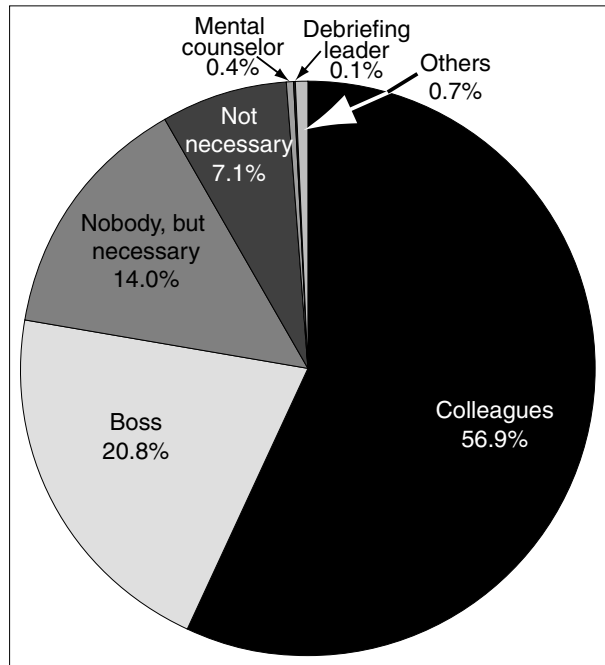
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**Figure 3**—Comparison between paramedics and other EMTs regarding the statements made by EMTs describing what they think about their work. Compared with general EMTs, a high proportion of paramedics found their job interesting. (\* $p < 0.05$ ; EMT = emergency medical technician)



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**Figure 4**—Comparison of the answers to the following question between paramedics and other EMTs, “Do you think you will be working in the ambulance service in ten years?” Compared with general EMTs, a high proportion of paramedics were planning to continue the same work. ( $p < 0.05$ ; EMT = emergency medical technician)



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**Figure 5**—Adviser of EMTs on debriefing for mental stress. Most EMTs had talked with their boss, not with the specialist, about their mental health. Very few EMTs needed no debriefing. (EMT = emergency medical technician)

psychological state at the emergency site; and (3) symptoms: psychological and physical symptoms of stress from daily life. The questions used are in the Appendix. Reported factors affecting environment were (in order of frequency): “instability”, “lack of a feeling of solidarity”, and “no support for solving the troubles”. For worksite: major factors were “high concentration”, “quick action”, and learning new things. For symptoms: “sleep deprivation when on duty”, “burnout at home”, and “having trouble getting to sleep because of anxiety” were the principal factors cited.

Significant differences were seen between the results for two questions, age and qualification of paramedic. The results indicate that the older workers and paramedics tend to experience more mental stress than do the general EMTs ( $p < 0.05$ ) (Table 3). As for environment, those who were older and working in a place with frequent ambulance dispatches experienced more mental stress. As for the worksite, age, qualification as paramedic, working conditions, and the number of dispatches per ambulance were identified as related to the level of mental stress. Finally, as for symptoms, age, and qualification as a paramedic were significant factors. On the other hand, the rate of paramedics who felt satisfied with their work was significantly higher than it was for other EMTs ( $p < 0.05$ ) (Figure 3). More paramedics were planning to stay in the same work than were other EMTs ( $p < 0.05$ ) (Figure 4). These results demonstrate that those who are qualified paramedics feel more satisfied with their job than do other EMTs.

	Regression coefficient	t-value	p-value
Age	0.140	2.857	0.004
Length of service as EMT	0.007952	1.606	0.109
Qualification of Paramedic	1.103	4.782	0.000
Working conditions	-0.705	-0.898	0.369
Population density at work place	0.0001465	0.930	0.352
Number of dispatches per ambulance	-0.0003071	-0.438	0.661

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**Table 3**—Predictive variables for mental stress using multiplex logistic regression (EMT = emergency medical technician)

As for mental stress debriefing, most responders stated they needed debriefing on mental stress or had felt the need for such debriefing at one time. Most of them answered that they would talk with their colleagues or with their boss about their mental stress (Figure 5).

## Discussion

According to the health survey on labor conditions by the Japanese Ministry of Health, Welfare and Labor, published in 2002, 17.9% of Japanese workers noticed fatigue in the lower back, which is quite low compared with the rate for EMTs (According to the 1997 report, the percentage was 17.8% for men between the ages of 30 and 39, which was closer to that for the subject of this survey).<sup>13</sup> Even for public safety workers who tend to have lower back problems, the rate was only 38.9% (according to the report in 1997). Furthermore, according to the 2002 report on chronic diseases, 1.5% of all workers mentioned “repetitive strain injury”, and 25.9% “lower back pain”, which indicates that the results of the Japanese EMT survey are remarkable. This finding shows the need for increased education about and promotion of ways of lifting patients with less physical strain, as current levels are insufficient.

In Hyogo Prefecture, this type of training is provided only in the initial lessons of the standard training course for EMTs; further training in this area is voluntary. Since frequent problems in the lower back, neck, and shoulders interfere with smooth EMT operations and can interrupt rescue activities; regular lessons addressing these issues should be introduced. Also, it is necessary to improve the ambulance environment, especially for lifting equipment, such as stretchers. To achieve this, ergonomic approaches like body mechanics are being tried. A similar effort in Sweden has been using ergonomic approaches to examine and assess the physical stress associated with lifting stretchers.

As for mental stress, the results for the six questions indicate that older workers and qualified paramedics suffer more from mental stress than do other EMTs. According to a report by Cydulka *et al*, there was no relationship between age and occupational stress.<sup>12</sup> In Japan, para-

medics account for only half of all EMTs; therefore, they often are placed in a responsible position such as team leader, and are recognized as important medical personnel for prehospital care, who must be familiar with medical techniques and be able to make appropriate and immediate decisions in emergency situations. This puts them under more severe mental strain, and explains at least in part, the difference in the results for them and the general EMTs. In fact, the number of advanced life support measures performed by paramedics increased 7.4 times between 1993 and 1998, and increased about eight times during the same period for expanded emergency measures.<sup>14</sup> On the other hand, compared with general EMTs, a higher proportion of paramedics found their job interesting and worthwhile. Such results show paramedics have more mental stress but gain more job satisfaction. While James (1988) reported that EMT was stressful but rewarding, Elling (1980) reported that 95% of EMTs found the job interesting, but 88.7% suffered burnout after leaving the job.<sup>3,7</sup>

In Japan, it is estimated that the services provided by paramedics will become more complicated with the increase in the number, education, and skills of the paramedics. Since mental stress is related to the burnout syndrome or depression, establishing some kind of management system for mental stress is urgently needed.<sup>15,16</sup> The current study noted that few EMTs did not need debriefing; in other words, most of them needed someone for and some form of counseling. However, as satisfaction with the current debriefing situation was not examined, it was not clear whether they truly could be debriefed by talking with their colleagues or boss, as there was no other counseling form available to them. Adding to the increasingly complex daily work of EMTs are the various disasters that have occurred in Hyogo Prefecture such as the mass gathering disaster at the Akashi fireworks display in 2001 and the great Hanshin-Awaji earthquake in 1995. This has led to the recognition that management for post-traumatic stress disorder (PTSD) is needed not only for victims but also for rescue workers.

Therefore, if PTSD management by EMTs will be required at the time of major disasters, it is necessary to organize a stress management system during normal times. For instance, Critical Incidents Stress Management (CISM) has been adopted in the United States. This is a stress management program for critical incidents advocated by Mitchell and others, which suggests the type of intervention by psychiatrists and counselors depends on the kinds of critical incidents, clients, needs of organizations, and other conditions, in order to prevent PTSD or resolve

it as soon as possible.<sup>17</sup> The validity of CISM in preventing or mitigating PTSD still is controversial, and the existence of such a thing as CISM has not been recognized in Japan yet.<sup>18-21</sup> Only the Tokyo Fire Department has established the use of the "CISM system" for stress management at the time of disaster,<sup>22</sup> but it is not being applied throughout the country. With the recent increase in the number of emergency dispatches, establishing an effective system for stress management should help prevent the development of the burnout syndrome also during normal times. At the Kobe Municipal Fire Bureau in Hyogo Prefecture, for example, a counseling system by lawyers for legal matters is in place, but there is no system by psychiatrists or other specialists for mental care; in such a case that EMTs need counseling for their mental problems, they go to a counseling office at the Kobe City Hall, which is open to all Kobe city employees. These counselors introduce clients to specialized medical institutions if necessary. Moreover, the number of emergency dispatches was not related to mental stress as such, but was recognized as a stress factor for "Environment" and "Worksite." According to official requirements for the allocation of ambulances established by the Japanese Council of Fire and Disaster Management in 1999, in response to the rapid increase in emergency dispatches, one ambulance should be allocated per 30,000 people for cities with a population of less than 150,000. For cities with a population of >150,000, one ambulance is needed per 60,000 people. However, it is not always appropriate to determine the number of ambulances depending on the size of the population. In view of the influx of people in large cities during the day, and in response to local requests for large areas, under the present situation fire departments are trying to add more teams or use managerial workers for both fire and ambulance work, in order to respond to requests within their jurisdiction.<sup>13</sup> For mental stress management, it is necessary to make the requirements for the allocation of ambulances more flexible by regularly checking the number of dispatches per ambulance.

Finally, the influence of family situation on occupational stress, especially on mental stress, has not been examined in this survey. Boudreaux mentions that occupational stress and stress at home affect each other.<sup>11</sup>

### Conclusions

Thus, it is of major importance to re-evaluate on the occupational stress of EMTs in Japan, and investigate ways of reducing stress in the workplace and at home.

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## Appendix—Items for the evaluation of mental stress

**a. Psychological state in the work environment**

1. My workplace has a calm, comfortable atmosphere.
2. Everyone works well together.
3. My colleagues support me.
4. People understand that I may have a bad day.
5. I have a good relationship with my superiors.
6. I get along well with my colleagues.

**b. Psychological state at the site**

1. Does your work require you to work very quickly?
2. Does your work require you to work very intensely?
3. Does your work require too great an effort?
4. Do you have enough time to perform your duties?
5. Do you often encounter conflicting demands in your work?
6. Do you learn new things at work?
7. Does your work require dexterity?
8. Does your work require ingenuity?
9. Does your work require constant repetition?

**c. Psychological and physical symptoms of stress from daily life**

1. Do you suffer from headaches?
2. Do you sleep badly or have difficulty getting to sleep at night?
3. Do you sleep badly when on duty/on call?
4. Do you have difficulty getting to sleep after a call (when on duty)?
5. Do you suffer from heart palpitations?
6. Do you have an upset stomach?
7. Do you feel mentally exhausted when you come home from work?
8. Do you have difficulty switching off from work when you are at work?
9. Does work make you so tired that it is hard for you to respond to your family, talk to friends, or practice a hobby, for example?
10. Does conflict arise between your work schedule and your family situation?
11. Does your family object to your thinking about work so much when you are at home?
12. Are you easily irritated at home because your work is so demanding?
13. Does your work take up some of the time you want to spend with your family?
14. Does your work make it hard for you to be the kind of partner and/or parent you would like to be?