

Full Length Research Paper

The relationship between job characteristics of emergency medical technicians and scene time in traumatic injuries

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Scene time (time at the scene) is one of the performance indices for pre-hospital emergency system, and is defined as the time interval in which an emergency technician reaches a scene, provide the emergency medical services, and leaves the scene. The present study was performed to examine the relationship between job characteristics of emergency medical technicians and scene time in traumatic injuries. Data were collected from 45 emergency medical technicians in Mashhad, North-east of Iran. To evaluate job characteristics of the technicians, "John Wagner's job cognition questionnaire" was used. The scene time was specified using "time scene information form" and for each technician, a mean score of three scene time was calculated to get a more precise estimate of the scene time. Data were analyzed using Pearson's correlation coefficient and Mann Whitney U test. The findings reveal that there is a significant correlation between technicians' job characteristics and scene time ($r = -0.28$). Three variables, that is, skill diversity ($r = -0.44$), job importance ($r = -0.37$), and taking feedback ($r = -0.34$), showed a significant relationship with scene time. No significant relationship between demographic variables and scene time was observed. Decreasing scene time is one of the key indices of pre-hospital emergency system's performance which is achievable through increasing motivation of employees by considering their job's characteristics. The results of the present study show that the investigated technicians do not have an ideal feeling about their job's identity. This can have a negative effect on their performance, especially scene time.

Key words: Job characteristics, scene time, emergency medical technicians, traumatic injuries.

INTRODUCTION

"Time" is an important factor for severely injured traumatic patients' survival (Altintas and Bilir, 2001; Mohd et al., 2008). The available statistics reveal that "trauma-related injuries are the fourth leading cause of death in the United States and they are the primary cause of death among individuals under the age of 45" (Hamilton and Hodge, 2011). Similar condition could also hold true for many other countries around the globe, even worse than this can be seen. Some researchers believe that the shorter the time between the accident and operation start, the more increase in patients' surviving is seen (Altintas and Bilir, 2001).

'Scene time' is one of the operation indices of pre-hospital emergency system. According to global protocols, scene time is defined as the time between arrival of

emergency technician at the scene and leaving the scene. Based on international standards, this time is 10 min (Bledsoe et al., 2003). Therefore, improvement of time indices is amongst the priorities of hygiene and cure systems. Previous investigations show that fast help with standard quality can reduce accident deaths by about 30% (Hamilton and Hodge, 2011). Thus, pre-hospital emergency systems can play a significant role in reducing death, disabilities, and injuries in accidents. Time indices and human resources are of significant importance.

In organizational behavior management literature, human being is considered as the main factor of movement and evolution in organization and the society, and management of the organization should utilize this worthy

and unique resource to achieve the goals of the organization. This is possible through generating motivation in employees by knowing and attending to their real needs.

In the same literature, job design is known as one of the effective approaches to enhance employee motivation, and mechanical, biological, and perceptual approaches as well as motivational approaches which are amongst strengthening methods of job design.

In motivational approach, job design improves effectiveness and attitude interaction of employees, such as job satisfactory, internal motivation, and a set of behavioral consequences such as being absent, displacement, and operation of employees. This approach consists of four methods: job enlargement, job rotation, job enrichment, and an ad-hoc theory called job characteristics model (JCM). JCM studies the factors that make a particular job satisfying. This theory was developed by Hackman and Oldham (1980). "The job characteristics model is based on the idea that the task itself is a key to employee's motivation" (Anonymous, 2012). In other words, "work motivation arises from the characteristics of jobs" (Edgar, 1999).

According to this theory, any job can be described in terms of the following five core job dimensions: skill variety, task identity, task significance, autonomy, and feedback. This theory is seen as being more motivating and satisfying to workers who perform jobs with these characteristics, the five core job dimensions influence psychological states of workers that are more likely to lead to favorable work outcomes: high work productivity and low absenteeism and turnover. The theory further asserts that people with high growth needs are more likely to experience the psychological states with motivating jobs than people with weaker growth needs (Torraco, 2005).

Hackman and Oldham (1980) developed an index called "motivating potential score (MPS)" to determine the motivating power of the job to each employee as well (the corresponding formula is provided in the materials and method). This researcher also adapted the same model and formula to estimate the MPS of the job for the emergency medical technicians.

The main purpose of the present study was to determine the relationship between job characteristics and scene time of emergency medical technicians in traumatic injuries.

MATERIALS AND METHODS

In order to achieve the goal of this study, 45 technicians of emergency medical services in Mashhad, North-east of Iran participated in the study. Minimum sample size was estimated by a pre-test:

$$n \geq \frac{N \times Z_{\alpha/2}^2 \times \sigma^2}{(N - 1) \times \varepsilon^2 - Z_{\alpha/2}^2 \times \sigma^2}$$

$$N = 140, \varepsilon = 0.06, \sigma^2 = 0.05, n \geq 43$$

In the aforementioned formula, N is the number of population, ε is the accuracy of the estimation, σ^2 is the sample variance, and n is the number of the sample. According to the formula, sample size was estimated to be 43. Practically, 55 people were chosen for this study.

Sample description and trainings

Most of the investigated subjects (84.44%) were trained as emergency medical technicians and the rest (15.55%) as operation room or anesthesia technicians. The stated technicians underwent different training before they were fully involved with their job responsibilities. First, they got a formal training for 24 months in the college and received a technician degree. Then, they were hired by the traumatic medical emergency office which supervises various emergency units of this nature in each province in Iran (the so called Emergency Medical Services, 115). As the technician started the job, they were tested on their knowledge and more materials were provided for them to read while simultaneously they will be trained in the field for 100 h. During this period, they will rotate between the traumatic emergency units to get experience and skill. Finally, they were placed in the dispatch unit to get experience and skills of working in this unit. This part of training lasted for 20 h.

A simple random sampling procedure was used to select the samples. The selection was from the list of the technicians who provided the traumatic injuries emergency services during the second half of 2009.

In this study, John Wagner's (1980) job recognition questionnaire was used to measure the job characteristics of emergency medical system technicians. This questionnaire consist of two sections: the first section included questions on personal characteristics of respondents and the second section included questions on Wagner's job characteristics. This section had five dimensions and each dimension had three questions (total of 15 questions), which were scored according to the five point Likert scale where incorrect = 1 and completely correct = 5.

As stated earlier, the main elements of the job can be combined and indicated by a predictable index called MPS. MPS can be calculated by:

$$MPS = \frac{\text{Skill diversity} - \text{Work identity} - \text{Work importance}}{3} \times \text{Independence} \times \text{Feedback}$$

The first three dimensions (job diversity, job identity, and job importance) combine together to make a valuable and significant work. If a person has a job which has high freedom and liberty, it will give him the sense of responsibility about his/her operational results, and if in a job, a feedback about the result and the employee's work is offered to him/her, the person can understand how to do his/her job in an effective way. Considering motivation, this model argues that when the person learns (knowledge of result) to do his work on his/her own (accept the responsibility of the work and experiences that his/her work is valuable), internal reward is the outcome. The more these triple occasions are available, the more motivation and satisfaction appear, and being absent from work and leaving the work will decrease. The relation between main dimensions of work and the result are adjusted through the amount of person's need for development. Personal development can be seen in somebody's respect for himself/herself and self-efflorescence. It means that when a job has these five dimensions, people in whom trend to personal development is in high level, experience more psychological conditions in comparison with the people whose trend to personal development is in low level.

Table 1. Demographic characteristics of emergency medical technicians.

Variable		Frequency	Percentage
Marital status	Married	34	75.6
	Single	11	24.4
Education level	Emergency Medical Technician (EMT)	38	84.44
	Operation Room Technician (ORT)	5	11.11
	Anesthesia Technician (AT)	2	4.44
Work sector	Government	17	37.8
	Private	27	60
	Unknown	1	2.2
Type of employment	Tenure	2	4.4
	Contractual	12	26.7
	Convention employment*	5	11.1
	Company	26	57.8

*Is a kind of contractual employment with less job benefits

Therefore, they will respond to their experiences.

Jobs which have high motivational power should be at least amongst one of the three factors which lead to job worth. Furthermore, considering independence and liberty in doing a work and feedback of the work, these jobs should be in high levels. If MPS is high, the model predicts that motivation, performance, and satisfaction will be positively affected and the possibility of being absent from work and leaving the work will be reduced (Robbins, 2010).

The score of MPS on the stated questionnaire ranged from 1 to 125, and the categorization of MPS score is as follows: < 50 = low; 50 to 87.5 = medium; and > 87.5 = high. To measure the scene time, for each technician, a mean score of scene time was calculated. That is, the scene time of the incidences for each technician was randomly selected and then their mean was estimated.

The validity of this questionnaire has been approved in a study by Faraji et al. (2008). To measure the reliability of John Wagner's job recognition questionnaire in this study, 20 questionnaires were distributed amongst emergency medical technicians. Cronbach, α , was calculated to be 0.76.

RESULTS

In this research, 55 questionnaires were distributed among the selected emergency technicians from which 45 were completed and returned to the researcher. The findings revealed that the age mean score of the participant was 28 years, with standard deviation (SD) = 3.95 year. The youngest emergency technician was 22 and the oldest one was 42 years old. The mean score of working experience was also 4.0 years with SD = 2.05 years. The minimum and maximum of technicians' working experience was 1 and 8 years, respectively. With regards to the marital status, 75.6% were married and 24.4% single (Table 1). Information on technician's educational level, working sector, and the type of employment are presented in Table 1.

To investigate the job characteristics of emergency technicians, the second part of the questionnaire was used, which contained 15 questions. These questions used 5-point Likert scale. Table 2 represents the mean score, and standard deviation of each dimension of job characteristics model, potential motivational power, and scene time.

The findings in Table 2 reveal that the mean score of each dimension of job characteristics is above the amount of average, and there is no much dispersion among the stated scores. The mean score of scene time was estimated to be 11.93 min, with SD of 4.17 min; where, minimum and maximum values were 5.64 and 28.43 min, respectively.

A negative correlation between technicians' mean scene time, and the skill diversity, job importance, feedback, and motivational power score was observed in this study (Table 1). This means that an increase in skill diversity of technicians, importance of their job, their feedback, and potential motivational power will lead to decrease in average scene time. No significant relationship was observed between job identity and average scene time (Table 3). This result shows that increase or decrease in job identity do not have any effect on average scene time. The results on job independence are the same.

The relation between personal characteristics (age and work history) and mean scene time was evaluated using a Pearson correlation test. The findings did not show any significant correlation between age variable and mean scene time ($r = -0.05$, $P = 0.7$), and work history and scene time ($r = -0.1$, $P = 0.55$).

The mean scene time for married and single technicians was 23.07 and 22.77 min, respectively (Table 4). To investigate the effect of marital status on scene time,

Table 2. Statistical indices for five dimensions of Wagner's job characteristics questionnaire and potential motivational power (MPS).

Variable	Statistical index				
	Frequency	Average	Minimum	Maximum	SD
Skill diversity	45	2.8	1.33	5	0.8
Job identity	45	2.7	1	4.68	1.33
Importance	45	2.65	1	5	0.91
Independence	45	3.05	1	5	0.902
Feedback	45	3.03	1.33	4.67	0.81
Potential motivational power	45	29.18	4.89	93.33	21.82

Table 3. Coefficient of correlation between scene time, on one hand and job characteristics' dimensions and potential motivational power, on the other hand.

Parameter	Skill diversity	Job identity	Job importance	Independence	feedback	Potential motivational power
Average scene time	-	-	-	-	-	-
P-value						

Table 4. The average rating, considering marital status of emergency medical technicians.

Variable	Marital status	Frequency	Average rank	Total rank
Average scene time	Married			
	Single			

Table 5. Results of comparison between Hackman and Oldham's job characteristics dimensions' average scores and potential motivational power (MPS) with global standards.

Job characteristic	Average score	Standard score	T- value	P-value	Average difference
Skill diversity	.	.	- .	0.075	- .
Job identity	.	.	- .	<0.001	- .
Job importance	.	.	- .	<0.001	- .
Job independence	.	3.5	-3.	.	- .
Job feedback	.	.	- .	<0.001	- .
Potential motivational power (MPS)	.	45.5	- .	<0.001	- .

Mann Whitney U test was used (the number of single people was less than 30 people). The findings reveal that marital status have no significant effects on the scene time (Mann Whitney U: 184.5, test statistic: -0.066, P = 0.94).

In order to compare the average scores obtained on Hackman and Oldham's job characteristics model's dimensions and MPS, with the global standards, a T-test was used in this research. The findings are shown in Table 5. The results show that the average amount of all variables, except the skill diversity, is below the standard score, and these differences are significant.

DISCUSSION

The findings of this study reveal that there is a significant relationship between motivational power of the job and average scene time. These findings support Oldham and Hackman (1980) job characteristics model. If the time is considered as a performance criteria, jobs which show better characteristics regarding Oldham and Hackman (1980) model, can improve somebody's performance and enhance his/her job satisfaction.

In this research, the average score of "job identity" was lower than that of global standard. Khalili (2000)

mentioned that all the investigated jobs, except computer services and communication job groups, do not have job identity. As Khalili (2000) performed his study in a hospital, it can be said that the results of this study support his results. In this study, no significant relationship was observed between "job identity" and "scene time" of Mashhad emergency medical technicians. If "time" is considered as an efficiency index, the results of this study agree with those of Faraji et al. (2008).

The findings indicate that the average score of "skill diversity" dimension for the investigated emergency medical technicians (2.8) is almost equal to the global average score (3.1). Therefore, it can be said that job design has been made possible for employees to use all their skills and capabilities. In this field, Majidi (1998) obtained similar results for job holders and management jobs in "construction ministry".

According to the results of this study, there is a significant relationship between "skill diversity" and "scene time" for Mashhad emergency medical technicians. With regards to the "job importance" of emergency medical technicians, the results of this study show that the average score of this dimension (2.65) is lower than that of global standard. This indicates that technicians believe that their job has a moderate effect on life of other people. These results do not agree with those obtained by Miresmaili (2005), who carried out his researches on nurses. Furthermore, according to the results of this study, there is a significant relation between "job importance" and "scene time" of Mashhad emergency medical technicians. In other words, if the person thinks that his/her job can have a considerable effect on others' life, he/she will show a better performance regarding scene time.

The results of this study indicate that the average score for "operation freedom" and "feedback" dimensions were 3.05 and 3.03, respectively, which are below the global standards. It means that the investigated emergency medical technician did not feel independence and feedback in their job. This result agrees with that of Khalili (2000) and Miresmaili (2005). Khalili (2000) concluded that employees of all of job groups, receives no feedback from their activities. Miresmaili (2005) in his research on nurses found that there is no feedback in different jobs.

Based on the findings of this study, there is no significant relationship between action freedom (independence) and scene time of Mashhad emergency medical technicians. Considering the degree of sensitivity of these technicians' job, such results are acceptable. Certainly, these technicians are not allowed to do whatever they want and apply their own opinions to their work. Furthermore, it was found that there is a significant negative correlation between the feedback and scene time of technicians. This means that an increase in feedback received by technicians leads to a decrease in scene time.

The average amount of "scene time" in this research was

11.93 min, which is an acceptable score in comparison with global standards. The estimated scene time by global standard is 10 min, which is not much far from 11.93. As there are many interfering variables in Iran, this result is an acceptable-arbitrary treatment for injured people, people who gather around the location of the accident, emotional behaviors while facing an accident, and lack of correct disaster management by parties being involved are amongst interfering factors which increase the average scene time. Therefore, taking all of these interfering factors under consideration, an average of about 12 min for scene time obtained in this research is an acceptable figure.

An important point on demographic characteristics of the investigated subject is the type of cooperation between Mashhad emergency medical services (EMS) system and its personnel. According to the findings of this study, only 4.4% of the employees have tenure track position and 57.8% do not have. This indicates that rate of job insecurity among these technicians is high. The results of this study showed that marital status and work section (public or private) do not have any effects on average scene time.

Decreasing scene time is one of key indices of pre-hospital emergency system's performance. One of the effective factors for this index is increasing motivation of employees by considering their job's characteristics and their job security. The results of the present study reveal that the investigated technicians do not have an ideal feeling about their job's identity which can have a negative effect on their performance, especially scene time. A question which might arise here is "how to enhance emergency medical technician motivation at job and improve their feeling about their job identity", Since about 60% of the investigated technicians have little job security in this organization, awarding a tenure track position to these employee is highly recommended. Furthermore, since the MPS and the score on its components (job identity, job importance or significance, job independence or autonomy and feedback) are lower than the standard, therefore, job redesign and job enrichment using the JCM approach is also recommended. As Chareonvan (2011) reported, "motivation in the work place can be achieved through both external (compensation) and internal factors" and JCM focuses on internal aspects. Useful details for applying the JCM and its core components at work by human resource officers can be seen in the work of Chareonvan (2011), and this researcher, to a large degree, recommended the same solutions for improving the emergency medical technicians motivation and job identity as well.

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