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Can you count on willing to respond (WTR) results? In a pandemic, you may be alone

Onur HAKOĞLU[1,*], Ahmet DEMIRCAN[2], Ayfer KELEŞ[2], Fikret BİLDİK[2], İsa KILIÇASLAN[2], Burak BEKGÖZ[3], Mustafa Ramiz TEL[4], Hasan KARABULUT[5], Habibe Selmin ÖZENSOY[3], Uğur GÜLÖKSÜZ[3], Zeynep YAVUZ[6]

[1]Emergency Department, Ödemiş State Hospital, Izmir, Turkey
[2]Emergency Medicine Department, Medical Faculty, Gazi University, Ankara, Turkey
[3]Emergency Medicine Department, Ankara City Hospital, Ankara, Turkey
[4]Izzet Baysal State Hospital, Bolu, Turkey
[5]Adana Seyhan State Hospital, Adana, Turkey
[6]Kepez State Hospital, Antalya, Turkey

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Abstract

Willingness to Respond (WTR) is the measurement of employees' preferences to come to work during off-hours when needed. Are these answers given before a disaster realistic? Another question of the study was, "Can we speed up the required staff to reach the hospital?" WTR survey has applied to emergency service staff. After that, the off-duty staff was called to work at a time they did not know beforehand. The study tried to identify how much WTR reflected the reality. Ninety of 98 (91.8%) participants whose surveys were evaluated answered "Yes" to "If you are called in case of disaster, would you come to duty?" question. When asked whether they will come to work according to disaster types, this rate was measured as 36.7% in "In the case of an infectious disease of which treatment is not clear". WTR surveys can be used to predict the level of participation of staff on off-hours in meeting the need for additional labor. These surveys' results can be expected to be similar to the labor participation rates in case of a real disaster and the arrival time of the staff at the hospital can be improved with new communication methods.

Keywords: disaster medicine, hospital communication systems, disaster planning, hospital incident command system

1. Introduction

The loss of regional function that affects the people, goods, economy, and the environment that the region cannot overcome by using its means is called a disaster. Regions or organizations experiencing disasters need to increase their functional capacity at the level required by the disaster (1).

The Hospital Incident Command System (HICS) is based on the principle of increasing the functional capacity of hospitals and managing their existing facilities at the highest level. The capacity increase is directly related to the material and labor needed (2). One of the most important capacity increase elements is to call all the staff needed by the emergency plan and ensure the use of labor with appropriate timelines. However, due to the disaster's communication disorders, it may be challenging to communicate with staff who are out of working hours. Due to these difficulties in communication, time may be lost in recruiting labor (3).

This study's primary purpose is to announce the resulting labor need to the staff without losing time and design a system where the future staff information can be followed simultaneously and measuring its benefits. Another aim of the study is to determine whether the staff will participate in off-hours in disaster situations by using a survey method and to test the verisimilitudinous of this prediction in the actual drill.

2. Materials and Methods

2.1. Study design

Our study was designed as a prospective cross-sectional-descriptive study. Also, a survey was applied to investigate the reasons for the behavioral characteristics of the participants. Our study was conducted in November and December 2013 in the Emergency Medicine Department Adult Emergency Service of Gazi University Faculty of Medicine Hospital, an 1150-bed tertiary hospital in Ankara. The annual number of adult patient admissions to the emergency department is 58.000.

The ethics committee approval for the study was obtained from the Gazi University Clinical Research Ethics Committee. The study was conducted under the principles of the "World Medical Association Declaration of Helsinki."

*Correspondence:onurhakoglu@gmail.com

2.1.1. Establishing a new communication system

It was aimed to develop a system that is less likely to be affected by excessive use intensity in disaster situations, resistant to the physical effects of the disaster, and able to communicate quickly with the staff who are not on duty. Accordingly, it was concluded that satellite communication is suitable as a communication method by examining the existing literature. To transfer information quickly to the off-duty staff and to invite them to their duties, a satellite-mediated computer-aided system was established together with Globalstar Avrasya Satellite Voice and Data İletişim AŞ ®, one of the satellite communication service providers serving our region. In this system, after the decision to invite off-duty staff to the hospital, the phone number determined for the system is called; a message is left that includes the type of disaster, the number of victims affected, the location of the disaster, and the estimated arrival time of the victims to the hospital. This voicemail left is delivered to all registered participants who are designated as off-duty personnel. After the message is delivered, they are asked with the voice response system, whether they will come to the hospital to start their duty. Disaster managers over the internet can monitor this whole process; thus, it provides an idea about the quality and quantity of the staff reached and who declared that they would come and enables the logistics problems to be calculated rapidly.

2.1.2. Pre-drill survey application

With this study, we aimed to investigate the participants' willingness to come for duty in case of disaster and the behavioral characteristics that will occur if they need to stay overtime. The questions were asked about the obstacles to work out of office hours with the survey applied to the participants.

2.1.3. Disaster drill

In previous applications in our hospital, the staff to be called in case of a need were informed one by one by phone. With this study, the time measurements of the existing and new systems were performed, and it was investigated whether there was a significant difference between them.

Participants were randomly divided into two groups based on their duties and distance of their homes to the hospital. One group was called one by one by phone, the other group was called through the newly established system, and the following message was delivered: I am Dr FB, we have been notified that an explosion occurred in Kırıkkale weapon factory. It was told that there were more than 100 wounded and that the victims would reach us approximately 45 minutes later. Come to the hospital immediately to start working."

Call hours of the users were recorded. The total time spent by the caller was measured. When the called people came to the hospital, the arrival times were recorded by a member who did not know how they were called until that time. The duration between the time when the participants in both groups were called, and when they reached the hospital were recorded.

2.1.4. Post-drill survey application

Another survey was applied to those who came to the hospital to start their duty after being called, including their perceptions about the location and call at the time of application.

2.2. Statistical method

All data were recorded in SPSS 20.0 (SPSS Inc.®, Chicago, USA) program, and statistical analysis was performed. Descriptive statistics were made as arithmetic mean±standard deviation, median (minimum, maximum, frequency, and percentage).

First, the data were evaluated for the normal distribution in comparison of time measurements with the help of the Kolmogorov-Smirnov test, histogram, and P-P graphics; the comparison was made with the Mann-Whitney U Test because the measured values did not fit the normal distribution. The statistical significance level was accepted as $p<0.05$ in all analyzes.

2.3. Inclusion and exclusion criteria of participants

At the time of the study, all research assistants, intern doctors, nurses, emergency medical technicians, laboratory staff, and allied health staff working in the Emergency Department of the Emergency Medicine Department of Gazi University Faculty of Medicine were enrolled in the study. The study executor and people who did not want to participate in the study were not included in the study.

3. Results

Assistant doctor (n = 30), intern doctor (n = 26), nurse (n = 22), emergency medical technician (n = 12), laboratory technician (n = 12), warehouse supervisor (n = 5) and patient care staff (n = 18) who were on the list of emergency service staff between November and December 2013 were determined. 29 (96.7%) assistant doctors, 26 (100%) intern doctors, 16 (72.7%) nurses, 10 (83.3%) emergency medical technicians, 8 (66.7%) laboratory staff, 4 warehouse supervisors (80%) and 9 (50%) nursing staff were included in the study.

3.1. Results of the pre-drill survey

Survey No:1 was applied to a total of 103 people enrolled in the study. Five of these surveys were not considered severe due to conflicting answers and excluded. The remaining 98 surveys were taken into evaluation (Table 1). The average age of the participants was 28.1±5.5 years (median: 27, min: 19, max: 51). The average term of duty is 45.03 months when the periods of duty are evaluated (average: 45.03±52.9; median:24 (min:1, max:300)).

To the question "Would you come to work if you are called to work due to a disaster during off-hours?" directed to the participants, 90 (91.8%) of the 98 participants gave a

positive answer. In another question, they were asked whether they would go to work to start working if they accidentally receive disaster news during off-hours. 59 of 96 people (61.5% among respondents) answered the question that two people (2%) did not answer stated that they would go, while 37 (38.5%) stated that they would not.

Table 1. Demographic characteristics of the survey participants

	#	*Percentage (%)**
Gender		
Female	50	51
Male	48	49
Duty		
Researcher Physician	29	29.6
Intern Doctor	24	24.5
Nurse	17	17.3
Patient Care Staff	10	10.2
Emergency Medical Technician	9	9.2
Lab technician	9	9.2
Transportation Choice		
By foot	25	25.5
Minibus	25	25.5
Private Vehicle	22	22.4
Bus	16	16.3
Subway	8	8.2
Taxi	1	1
Unanswered	1	1
Marital Status		
Single	57	58.2
Married	41	41.8
People and Pets they take care of		
Child	20	20.4
Elders	8	8.2
Pet	8	8.2
Patient	7	7.1

****: In-title column percentage***
Total number of participants whose survey was accepted=98

Participants were asked about the factors that push them to work in case of disaster. The sense of responsibility (55%) was the answer mostly given, the second most frequent answer (39%) was the desire to help the victims, and the least common answer was avoiding problems with the employer (6%). Participants were asked that under what conditions the probability of working in case of a disaster increases? The answers to this question, to which 96 people answered, and their percentages among all the answers are shown in Table 2.

Participants were asked whether they would come to work if they received a disaster call outside of working hours by specifying the disaster type. This question was answered by 98 participants, going to work status of the staff, if called, out of office hours by disaster types is shown in Figure 1.

The relationship of the answers given whether they would come to work if they are called in case of disaster to the participants with gender, duty (clinical or allied health staff), marital status, presence of children, presence of a patient at home, presence of elderly at home and having pets were investigated. Staff is grouped under two main headings: "Clinic (assistant doctor, intern doctor, nurse, and emergency medical technicians)" and "Allied Health Staff (laboratory technicians and patient care staff)." In this study, the only factor affecting coming to work has created a statistically significant difference as "Duty" (by sing Fisher's precision test, p = 0.043). There is no significant difference in other groups.

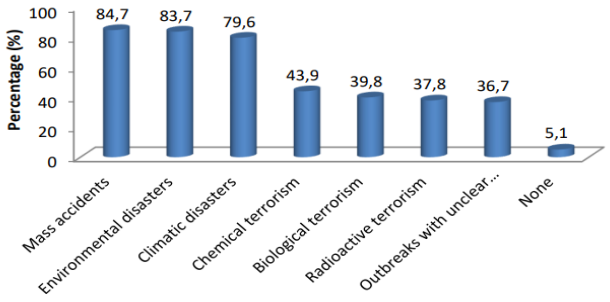

Fig.1. Going to work status of the personnel, if called, out of office hours by disaster types

3.2. Drill results

In the second part of the study, a drill including calling of off-duty personnel and time measurements was applied. The distribution of the two groups in this drill in terms of duties is shown in Table 3.

10 (12.7%) of the 79 people called due to the drill did not come to the hospital, although they were called. Sixty-nine people (87.3%) came to the hospital after being called. The method by which those who came to the drill were called, as shown in Table 3. According to the search method, when the coming rates were compared, there was no statistically significant difference (p = 0.737 was calculated using Fisher's precision test).

The duration between the beginning of the drill and the arrival of the staff (disaster-call duration) and the duration between reaching the staff and the staff's arrival to the hospital (call-hospital duration) were measured. These two measurements were collected, and the duration between the beginning of the drill and the arrival of the staff to the hospital (disaster-hospital) was calculated. The averages of these periods in both groups are shown in Table 3. When the durations occurred during the call with the two methods were compared, the "HICS activation-call" durations (p = 0.0001) and the "HICS activation-hospital" durations (p = 0.006) were statistically significant in the two groups, but there was no statistically significant difference between the call-hospital durations (p = 0.556). When the relationship between coming or not coming for duty as a result of a call and the task of the participant was investigated, it was not found statistically significant (87.9% of the clinical staff who came after the call; 84.6% of the allied health staff) (by Pearson chi-square method, p = 0.248). When the relationship between coming or not coming as a result of a call and the gender of the participant was investigated, it was not found statistically significant (using Fisher's precision test, p = 1.000).

Table 2. Factors thought to increase the probability of working in case of disaster*

What factors increase your probability of working in case of a disaster?	Answers	
	Number (n)	%
If precautions are taken against the dangers caused by disasters (such as security and vaccination)	58	20.1
If my family's safety is ensured	58	20.1
If my communication needs with my relatives are met	38	13.1
If my transportation needs are met	34	11.8
If my family's care needs (nursery, patient/elderly care) are met	32	11.1
If my duty in case of a disaster is predetermined	29	10.0
If employees working due to the disaster are appreciated	23	8.0
If employees are paid additional wages due to disaster	14	4.8
None	3	1.0
Total number of options checked	289	100.0
*: Multiple options can be marked in this question.		

Table 3. Call methods and distribution of duties

	Call Method					Total
	Manual		Automated			
	N	%*	N	*	N	%*
Clinic	34	51.5	32	48.5	66	100
Allied Health Staff	6	46.2	7	53.8	13	100
Total	40	50.6	39	49.4	79	100

Table 4. Distribution of the response to the call according to the call method

		Response to the call			
		Came		Did not come	
		N	%	N	%
Call method	Manual	34	85.0	6	15.0
	Automated	35	89.7	4	10.3

Table 5. Comparison of "Call by HICS (Hospital Incident Command System) activation", "coming to hospital by call" and "coming to hospital by HICS activation" as per the method of call

	Call method		P*
	Manual	Automated	
	Mean ± SD	Mean ± SD	
Duration between HICS activation and call (min)	18.26 ± 13.24	2.0 ± 0.00	.0001
Duration between the call and the staff's arrival at the hospital (min)	33.65 ± 23.30	31.23 ± 20.20	.556
Duration between the HICS activation and the staff's arrival at the hospital (min)	51.91 ± 33.00	33.23 ± 20.20	.006

4. Discussion

In this study, the possibility of coming to work in case of a disaster, the possibility of working overtime, the obstacles in front of both, and solution suggestions were investigated to meet the staff need, which is one of the logistics needs in disaster situations. There are a limited number of publications in the literature investigating the probability of coming to work in the event of a disaster. Among these publications, the ones that were designed similar to this study were examined in terms of the participant cluster, the types of disasters questioned, obstacles, and suggestions.

Although the desire to come to work in the event of a disaster, which is defined as "WTR - Willing to Respond" in the literature, varies from publishing to publishing, it was observed that generally close results were achieved. In this study, 91.8% (90/98) of the participants stated that they would come to work in disasters. Ogedegbe et al., who conducted a similar study, found this rate as 93% (4).

When the relationship of the probability of coming to work in case of disaster with age, gender, duty, duty term, marital status, presence of children, elderly care, patient care, and pet care was examined, a significant direct relationship was found only in the type of duty, but not in others. However, it is not statistically significant the difference between those who have. In a study conducted by Qureshi et al. in 2005, it was concluded that female gender, elderly care, and patient care affect working in disasters (5). The reason for this difference may be that other family members in our country are more likely to reduce the care burden of people in special circumstances.

In another study published by Steffen et al. in 2004, no significant difference was found between age groups and disaster participation, as in this study (6). In the article of Masterson et al., published in 2009, it was stated that they could not find any significance between coming to work due to a call and duty, age, having children; however, they explained that there is a difference in the gender that is applicable only in case of biological terror (7).

In this study, the connection between disaster types and the desire to work in disasters was also investigated. 84.7% of the participants stated that they would come to work in mass accidents and provided the highest participation. Qureshi et al. calculated this rate as 85.7% (5). In the study of Steffen et al., the willingness to come to work in a plane crash, which was presented as an example of mass accidents, was found to be 98% (6). Masterson et al. found the participation rate for plane crashes to be 98% (7).

While the rate of those who stated that they would not work even if they were called during off-duty hours in any of

the disaster types is 5.1%, only 36.7% of the participants stated that they would come to work if they were called in an epidemic with an unclear treatment. This rate was shown as the lowest participated disaster, with 48% in the study of Qureshi et al. (5).

When the factors that could cause the participants not to come in disasters were evaluated, it was measured that 32.8% of the answers could be health problems, and 30.5% could be transportation problems. In Qureshi's study, while transportation problems were first with 33.4%, health problems were reported as 14.9% (5). In the article published by Ogedegbe et al. in 2012, it was shown that child care is the biggest obstacle to coming to work in case of disaster. An important reason for this difference between the studies is thought to be due to the demographic characteristics of the participants; as a matter of fact, in the study conducted in our hospital, it was concluded that only 20.4% of the participants had children and therefore child care did not rank first as an obstacle (4).

When the factors that can increase the probability of working in case of a disaster are examined, 20.1% of the responders (60.4% of all participants) stated that they would consider working if the safety of their families is ensured, and 20.1% (60.4% of all participants) stated that they think that the probability of coming to work in disasters will increase if precautions are taken against the dangers caused by the disaster. In parallel with the results, another publication showing that taking personal security measures against the risks created by the disaster will increase participation in disasters is the study of Kruus et al. (8). In this study, Kruus et al. pointed out that the probability of working in case of a disaster will increase by ensuring the participants' family's safety. In a similar study, Mackler et al. stated that when personal protective measures are taken, the desire to participate increases (9).

The ratio of the participants who said that they would work overtime in case of a disaster is 94.7%. In total, 66.3% of the participants stated that they could work 8 hours or more, 27.4% of them up to 8 hours. In the study of Steffen et al., while the duration of overtime for the male gender was calculated approximately 7 hours more, no significant difference was found between the genders in this study conducted in our hospital (Fisher's precision test, $p = 1.000$) (6).

77% of the participants defined the willingness to work in the event of a disaster as a sense of responsibility (since it is a question with more than one answer marked, 55% of the total answers, 77% of all participants marked this answer). In a similar study, DiMaggio et al. stated that 83% of the participants had the highest rate and wanted to work in disasters because of their sense of responsibility (10).

When the disaster drill, which is the second part of the study, and the results of the survey applied after it was evaluated, it was seen that the automatic call system significantly changed the notification time, and accordingly, the duration between the disaster and the arrival of the staff to the hospital significantly decreased. Since there is no similar study in the literature, the data could not be compared with other studies. This study's distinctive feature is that it is the only study that measures the duration of coming to the hospital of the staff out of working hours if needed.

Although it is seen that calling the staff one by one in the traditional method used to reach the staff is time-consuming, it has been concluded that the computer-aided automatic call system does not contribute to the number of coming staff. It was concluded that the proportion of participants who came to those who did not come in both systems was independent of duty and gender.

The rate of coming to work in case of disaster, which appeared in the first survey and referred to as "WTR - Willingness to Respond" in the literature, was calculated as 91.8% in this study; however, no study measuring how much this ratio would be in real life could not be found in the literature. Participation in the study as a result of the drill was calculated as 87.3%. Unlike other studies in the literature, not only through a survey but also with a real drill, the rate of employees who are out of working hours to work in disasters was measured. This case, which is described as "WTR (Willingness to Respond)" in the literature, has been tested with a drill, and it was found that there is a statistically insignificant difference between the survey results and reality. Although the benefit measured in this study is time-oriented, it is thought that satellite communication will be useful in providing an uninterrupted communication channel in a real disaster.

The study was conducted in a single center. Changes in the perception of the staff in other centers may affect the outcomes. Besides, participants in the study were only emergency room workers. Hospital Incident Command System concerns all hospital staff. In multi-center studies applied to all hospital clinics, these problems will decrease, and the reliability will increase with the increase in the number of participants. The fact that the study has more than one step (application of the survey no.1, conducting a drill, and application of the survey no.2) indisposed the participants' volunteering will and made them reluctant to answer the survey questions may have affected the results. Studies conducted with shorter surveys and longer intervals between steps may be less affected by this negative effect.

The study was produced using the emergency medicine graduation thesis made in 2013. For this reason, in the course of time, serious developments have been experienced in communication systems and many applications have been developed that can be used in disaster communication other than voice calls. Due to the date of the study, these

applications could not be mentioned.

The sample size was not calculated in the study, as every person working in the emergency department was planned to be included in the study.

A computer-aided satellite communication system was investigated in this study to meet the logistics needs. In the measurements made with the new system designed to reach the staff out of working hours, it has been seen that this system, which can make mass calls compared to the existing communication system using mobile phones and fixed phones, can benefit greatly in terms of time. By developing disaster communication systems, the functions of Hospital Incident Command System can be improved by saving time in reaching logistics needs such as labor.

In order to provide labor in disasters, it will be beneficial to take precautions that protect the staff and their family from the damage caused by the disaster and improve the staff's transportation services. The reasons underlying the change in the desire to work in disasters should be investigated, and solution plans should be created.

While creating Hospital Incident Command System, WTR surveys can be used to predict the level of participation of staff on off-hours in meeting the need for additional labor. These surveys' results can be expected to be similar to the labor participation rates in case of a real disaster.

Conflict of interest

The authors have no potential conflicts to interest to declare.

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