

# Disaster Medical Support Plan as an Element of the Hospital Disaster Resilience

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## Abstract

**Introduction:** Every disastrous event, by definition, results in infrastructure damage and a large number of casualties that exceeds the community's ability to respond effectively and quickly to the human and material losses. The ability to respond quickly, adequately, and effectively in emergency situations, by changing the activities performed and to restore the state of functionality in a short time before disaster is defined as hospital disaster resilience. In order for disaster resilience to be granted for effective and adequate disaster response, the medical staff has to be aware of and trained on medical specialists' activities described in the disaster medical support plan.

**Aim:** To analyse the medical professionals' awareness of hospital disaster medical support plan and its impact on the disaster resilience.

**Materials and methods:** A 55-question anonymous survey was conducted among 295 hospital professionals in Plovdiv Region between July and September 2019. The respondents were questioned about their awareness of the medical activities described in the hospital disaster medical support plan. Descriptive statistics was used to calculate the relative percentages, along with the Pearson chi-square test and Spearman's correlation. All descriptive and analytical analyses were performed using SPSS v. 21 for Windows XP.

**Results:** Thoroughly performed analyses of the respondents' answers presents that the medical specialists in Plovdiv Region are not well informed about the hospital disaster medical support plan's content.

**Conclusions:** Poor knowledge about the required changes into every medical specialist's activities in case of a disaster has a negative impact on the hospital resilience.

## Keywords

disaster medical support, disaster sustainability, medical staff readiness

## INTRODUCTION

Every disastrous event, by definition, causes infrastructure damage and brings a large number of casualties that exceeds the community's ability to respond in an adequate, timely manner to the human and material losses. Disaster relief operations require that extraordinary measures should be implemented within an extremely short time period. Moreover, the majority of casualties require emergency,

often life, limb or eyesight saving medical assistance with shortage of human, medical and technical resources. The extraordinarily and the extent of sustained damage along with the time constraint and resource shortages are the real challenges to the disaster medical support. To address this challenge, hospitals must be able to respond quickly, adequately and effectively in case of a disaster in order to provide life-saving therapeutic and surgical medical assistance to casualties with multiple, diverse injuries. In order

to meet the increased demands for medical care, hospitals need to adjust their work regimen.<sup>[1-3]</sup> The ability to respond quickly, adequately and effectively in emergency situations, by changing the performed activities and to restore the state of functionality in a short time before disaster is defined as hospital disaster resilience. The disaster hospital resilience is a function of two components: static and operational. Operational component consists of 3 elements: disaster planning, disaster management, and preparedness of medical staff. The medical staff readiness is determined by their knowledge and skills for adequate disaster response described in the disaster reaction plan.<sup>[4-8]</sup> However, the existence of the disaster medical support plan is not equal to the achieved disaster readiness. In order for disaster resilience to be granted for effective and adequate disaster response, the medical staff has to be aware of and trained on medical specialists activities described in the plan.<sup>[9-13]</sup>

## AIM

To analyse the awareness of medical professionals about hospital disaster medical support plan and its impact on the disaster resilience.

## MATERIALS AND METHODS

A 55-question anonymous survey was conducted among 295 hospital professionals in Plovdiv region in Bulgaria

between July and September 2019. The questions are focused on knowledge and skills of hospital medical staff in a case of a disaster and their role in the disaster medical support according to the disaster plan.

Descriptive statistics was used to calculate the relative percentages. Pearson chi-square test and Spearman's correlation was used in testing hypotheses for a statistically significant relationship between the studied factorial and performance traits. We also used graphic analysis to illustrate processes and phenomena, certain regularities or dependencies.

Microsoft Office Excel 2013 was used for tabular and graphical analysis.  $P < 0.05$  was considered to be statistically significant for all analyses. All descriptive and analytical statistics are calculated using SPSS v. 21 for Windows XP.

## RESULTS

**Table 1** summarises the general characteristics of the participants.

Statistically significant greater proportion of women (73.9%,  $n=218$ ) compared to men (26.1%,  $n=77$ ) ( $p < 0.05$ ) was found. The comparison of the two groups shows predominance of health care medical professionals ( $u=5.13$ ,  $p < 0.001$ ), as the ratio is 1:1.52 (doctors to healthcare specialists).

More than half of the respondents (63.4%,  $n=187$ ) were familiar with the disaster plan of the hospital they work in. 56.6% of the respondents ( $n=167$ ) answered that they were not aware about the disaster notification system.

Less than half of the medical specialists (42.7%,  $n=126$ )

**Table 1.** Baseline characteristics of respondents

Characteristics	Number	Relative share %	
Sex	Male	77	26.1
	Female	218	73.9
Age	Younger than 30 years	52	17.6
	31-40 years	54	18.3
	41-50 years	93	31.5
	>51 years	96	32.5
Education degree	Master of Medicine	117	39.7
	Medical college	81	27.5
	Professional bachelor	47	15.9
	Bachelor of Health Care Management	32	10.8
	Master of Health Care Management	18	6.1
Profession	Nurse	178	60.3
	Physicians	117	39.7
Position held	Managers	28	9.5
	Executive medical specialists	267	90.5
Workplace	University multidisciplinary hospital for active treatment	191	64.7
	Multidisciplinary hospital for active treatment	104	35.3
Years at the hospital	Less than 1 year	19	6.4
	1-10 years	110	37.3
	10-20 years	62	21.0
	>21 years	104	35.3

were informed about personal protective equipment (PPE) existence in the hospital. Awareness about the doctors' role in the triage area was very low – only 14.2% (n=42) knew it.

The highest percentage of medical specialists aware of the hospital disaster plan and obligations related to it is noticed among the managers (Fig. 1).

Masters of medicine show lower plan awareness level compared to other study groups – 49.6% (n=58) ( $p=0.001$ ,  $\chi^2=18.21$ ). Bachelors and masters of Health Care Management demonstrate the highest familiarity, respectively 78.1% (n=25) and 77.8% (n=14) (Fig. 2).

Nurses showed the highest level of knowledge about the disaster plan – 73.9% (n=113) ( $p=0.004$ ,  $\chi^2=18.90$ ). The lowest awareness was among doctors specializing in emergency medicine – only 33.3%. Surgeons' familiarity is also insufficient – less than half of them knew about it (43.3%, n=13). In contrast, more than half of the physicians with a therapeutic specialty and those without a specialty were informed, respectively 53.6% (n=15) and 52.8% (n=28) (Fig. 3).

It is noteworthy that those the most familiar with the presence of PPE were young people aged 20-30 years –

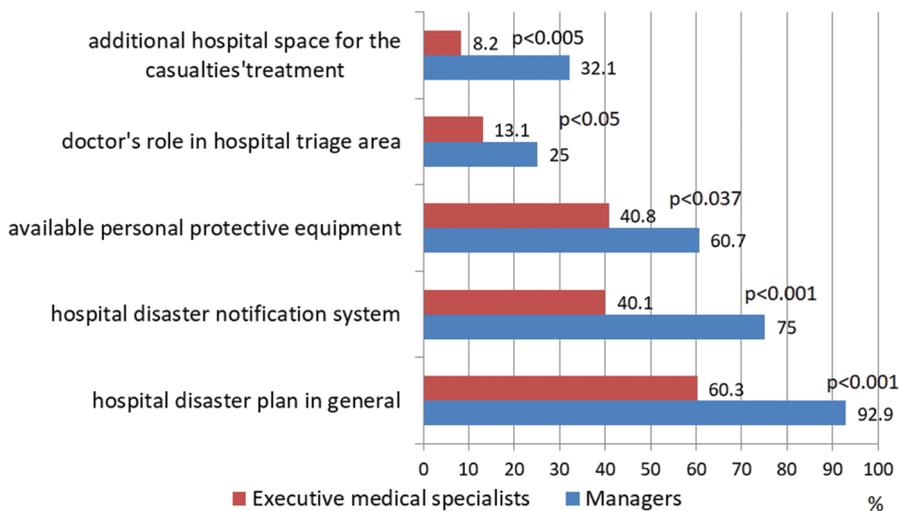


Figure 1. Respondents' knowledge about the hospital disaster plan and obligations related to it according to their position held.

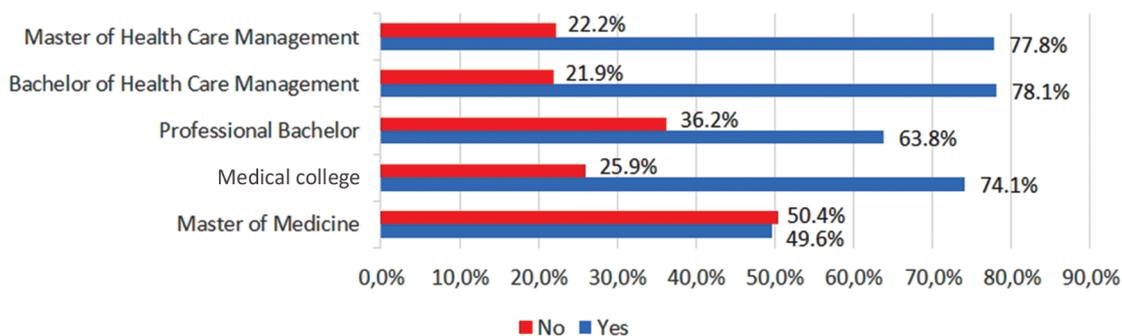


Figure 2. Respondents' knowledge about the hospital disaster plan according to their education degree.

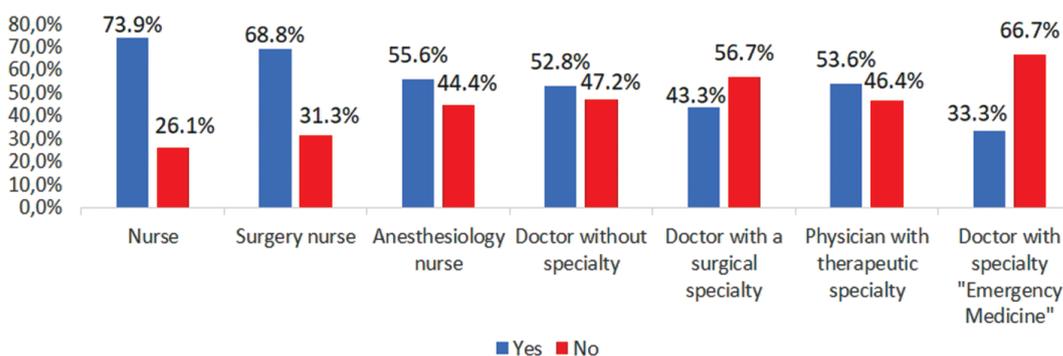


Figure 3. Respondents' knowledge about the hospital disaster plan according to their specialty.

51.9% (n=27). With age, the knowledge of the respondents decreases ( $p=0.01$ ,  $r=-0.158$ ).

The question: “Do you know how much additional hospital space (beds, rooms, wards) for the casualties’ treatment is planned in your hospital?” verify low awareness level regarding resources planned for casualties. Only 10.5% (n=31) were informed.

## DISCUSSION

Medical staff readiness to deal with disaster medical support challenges depends on the hospital disaster plan awareness, as well as the familiarity with the knowledge and skills described in it. In order to prepare medical specialists to react quickly and adequately in case of a disaster, hospital plans include specific measures and tasks that medical staff has to know about and be able to do.

Medical professionals’ awareness about the plan is satisfying – 63.4% of them were familiar with the plan. A similar result was reported in another study – 66.7% (n=241) of respondents in that study know the content of the disaster management plan.<sup>[14]</sup> Chimenya found values that differed from those reported by us. Most respondents (63.7%) in his research did not know whether their hospital had a disaster plan or not.<sup>[15]</sup> The high awareness level about the plan that we found for the managers (92.9%) is impressive. They manage disaster medical support in the hospitals and disaster plan familiarity is a prerequisite for making well-informed management decisions. In a study done by Chimenya, the results differed from ours – those that are familiar within all studied groups do not exceed 42.9%.<sup>[15]</sup> The high plan awareness level that is demonstrated by the managers in our study is a prerequisite for improving disaster management. Improved management has a positive impact on the operational component of disaster resilience.

For disaster medical support execution, it is necessary to establish communication among its participants. It is done through the hospital disaster notification system. It is worrying that more than half of the respondents (56.6%) were not familiar with that system. A study performed in the capital of our country indicates an extremely high level of awareness (100.0%) about the hospital disaster notification system which differs significantly from our results.<sup>[16]</sup> The managers’ high awareness level about this system contributes to effective communication amid managers, and hence to adequate management performance. However, the other employees’ low familiarity level suggests poor communication between managers and subordinates, as the latter’ show insufficient knowledge. Moreover, a question arises – how come that the executive medical specialists know the plan but do not know about one of its essential elements – the notification system. Insufficient knowledge about the notification system among the other employees leads to untimely and inadequate disaster reaction due to difficult communication, which strongly endangers disaster resilience.

Adequate disaster response also requires that the medi-

cal staff safety should be ensured by using appropriate PPE. Hospitals must have PPE stocks that are properly stored and medical staff has to know their location in order to use them when needed. Less than half of the medical specialists (42.7%, n=126) were informed about PPE that the hospital possess. Kiongo reports in his study that awareness level about available PPE is less than 50.0% (44.0%), which is consistent with our results.<sup>[14]</sup> Chimenya found that over 50% of respondents were familiar with it (54.9%), which is higher than ours.<sup>[15]</sup> The managers show the greatest awareness of the available PPE, but their relative share (60.7%) is below the expected 90-100%. Chimenya reports in a study that 66.7% of managers know if a hospital has PPE resources when needed.<sup>[15]</sup> Our survey shows similar results. Although more than half of the managers were aware of the available PPE resources, we believe that their knowledge is not sufficient, as they are responsible for the PPE storage and provision. Insufficient information suggests that they will not store and provide them adequately in case of a disaster. The awareness level about PPE in hospitals calls into question the medical teams’ safety during disaster medical support which is the most important principle of disaster medicine. This, in turn, leads to reduced disaster resilience by negatively influencing its static component.

Ensuring the safety of medical specialists is also achieved through proper triage of the casualties. When medical specialists perform it they need to know not just the place, but also the role of doctors in the disaster triage area. The resident doctors’ role in the triage is to be the main executants. In case of a disaster a large part of the casualties are directed to the emergency medicine departments where the nurses working there have the responsibility to sort them.<sup>[17]</sup> The low awareness level established among both resident doctors and nurses that are executive medical specialists suggests insufficient knowledge about their triage tasks. In a study done by Goniewicz, almost all respondents declared having the ability to conduct triage, which in turn suggests that they were familiar with their specific triage tasks.<sup>[18]</sup> Poor triage tasks awareness level of medical specialists is a prerequisite for reducing disaster medical staff readiness and therefore to reduce operational component of hospital disaster resilience.

Hospital disaster readiness to meet the challenges facing disaster medical support requires availability of additional space for the treatment of casualties. The disaster plan specifies how many beds can be provided if needed, as well as which wards and departments can be adapted for casualties’ admission. If an additional hospital space is needed, the plan provides information regarding the maneuvers with the beds to accommodate more casualties. Patients with minor injuries are discharged and patients in some of the wards can be treated as outpatients, whereby the available beds can be used by the casualties that need hospital treatment. According to CDC recommendations, each region (state, respectively) must be prepared to provide disaster medical support resources of 500 casualties, but it is not mentioned how many of them will go into hospital

for definitive treatment.<sup>[19]</sup> Higgins et al.<sup>[19]</sup> report in their study that if 25% of casualties need hospital treatment, all surveyed hospitals met the 500 casualties planning standard. However, if they are 50% of the total, then about half of the hospitals will not be able to provide treatment for all who needed it.<sup>[19]</sup> In our study, the total number of beds in the surveyed hospitals was 933<sup>[20]</sup>, but the medical staff did not know how many of these can be used for disaster medical support. Poor awareness of additional hospital space is a sign of insufficient disaster plan knowledge among both managers and executive medical specialists. Insufficient familiarity about the number of beds provided for casualties' treatment leads to a decrease in medical professionals' disaster readiness, as well as to a decrease in the operational component of resilience.

The high awareness level of disaster plan among hospital medical staff contrasts with the low awareness level of key plan elements (disaster notification system, available PPE, doctors' role in the triage area, additional hospital space (beds, rooms, wards) for treatment of casualties). All the information related to the above elements is included in the plan. Our results suggest that the medical staff misunderstood or underestimated the plan elements, which had a negative effect on the hospital disaster resilience.

## CONCLUSIONS

Medical specialists in Plovdiv region are not well informed about the hospital disaster medical support plans. The survey has proven an extremely poor level of awareness regarding the vital for the disaster medical support activities – triage, communication, prevention. The most informed about the plan and obligations related to it are the managers. Their good awareness level is a prerequisite for adequate planning of the disaster medical support activities, but it does not guarantee the performance quality by regular medical staff. Bachelors and masters of Health Care Management demonstrate the highest familiarity about the hospital disaster medical support plan. Poor knowledge about the hospital role in case of a disaster among the rest of medical staff has a negative impact on the effectiveness of disaster medical support.

What is more, low awareness level about the hospital disaster medical support plan increases with age and higher education degree. This requires urgent changes to post-graduate disaster medical support training. This training has to include both theoretical lectures and practical field, on-site, life exercises that have to follow one unified by the Ministry of Health program for continuous improvement of the hospital disaster resilience.

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# План медицинской поддержки при стихийных бедствиях как элемент устойчивости больницы к стихийным бедствиям

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## Резюме

**Введение:** Каждое катастрофическое событие по определению приводит к повреждению инфраструктуры и большому количеству жертв, что превышает возможности сообщества эффективно и быстро реагировать на человеческие и материальные потери. Способность быстро, адекватно и эффективно реагировать в чрезвычайных ситуациях путём изменения выполняемых действий и восстановления функционального состояния за короткое время до стихийного бедствия определяется как устойчивость больницы к стихийным бедствиям. Чтобы обеспечить устойчивость к стихийным бедствиям для эффективного и адекватного реагирования на бедствия, медицинский персонал должен быть осведомлён и обучен действиям медицинских специалистов, описанным в плане медицинской поддержки при стихийных бедствиях.

**Цель:** Проанализировать осведомлённость медицинских работников о плане медицинской помощи больницам при ЧС и его влиянии на устойчивость к ЧС.

**Материалы и методы:** Анонимный опрос из 55 вопросов был проведён среди 295 медицинских работников в Пловдивской области в период с июля по сентябрь 2019 года. Респондентам был задан вопрос об их осведомлённости о медицинской деятельности, описанной в плане медицинской помощи больницам при стихийных бедствиях. Описательная статистика использовалась для расчёта относительных процентов вместе с критерием хи-квадрат Пирсона и корреляцией Спирмена. Все описательные и аналитические анализы были выполнены с использованием SPSS v. 21 для Windows XP.

**Результаты:** Тщательный анализ ответов респондентов показывает, что медицинские специалисты в Пловдивской области недостаточно информированы о содержании больничного плана медицинской помощи при стихийных бедствиях.

**Заключение:** Слабое знание необходимых изменений в деятельности каждого медицинского специалиста в случае ЧС отрицательно сказывается на устойчивости больницы.

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## Ключевые слова

медицинская помощь при стихийных бедствиях, устойчивость к стихийным бедствиям, готовность медицинского персонала

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