ASSESSMENT OF THE SAFETY STATE IN DISASTER OF SOME STRATEGIC AND CAMPAIGN-LEVEL MILITARY HOSPITALS

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ABSTRACT

Aims: *To evaluate the level of safety in disasters of a number of strategic and campaign-level military hospitals.*

Subjects and methods: *The surveys were conducted at 9 strategic and campaign-level military hospitals. The hospitals were instructed to establish their own assessment teams and follow the steps outlined in the toolkit for evaluating safe military hospitals in disasters.*

Results: *The structural and non-structural groups had the highest proportion of criteria fully met (85.78%), while the lowest was the group managing operations in emergencies and disasters (38.00%). Regarding the level of safety in disasters, 4 hospitals (44.44%) achieved a high safety level, 5 hospitals (55.56%) achieved a medium level, and no hospital achieved a low safety level.*

Conclusion: *It is necessary to improve the level of safety in disaster military hospitals, especially the criteria related to the management of activities in emergency and disaster situations.*

Keywords: *Safety in disasters, military hospitals*

1. INTRODUCTION

According to the World Health Organization (WHO), a "safe hospital" is understood as a medical facility that can maintain maximum operational capacity along with the "integrity" of the infrastructure before, during, and after the impact of emergencies and disasters [1]. The Disaster Safety Hospital Assessment Toolkit was issued by the World Health Organization (WHO) in 2008 and revised in 2015 [1], [2].

In Vietnam, based on the criteria of the 2008 version of the toolkit, the WHO, the Ministry of Health issued a toolkit in 2013 for assessing hospital safety in emergency and disaster situations, which has not yet been updated to the 2015 WHO version [3].

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The Disaster Safety Assessment Toolkit for Military Hospitals was developed based on the Ministry of Health's toolkit, updated with the 2015 WHO version and current legal documents. This study evaluated the results of applying the toolkit at a number of military hospitals at the campaign and strategic levels.

2. RESEARCH OBJECTS AND METHODS

The study utilized some surveys conducted at 9 military hospitals operating on the campaign and strategic front lines, including Military Hospital 109/Military Region 2, Military Hospital 4/Military Region 4, Military Hospital 7/ Military Region 3, Military Hospital 121/ Military Region 9, Military Hospital 211/Army Corps 3, Military Hospital 105/General Department of Logistics, Military Hospital 87/General Department of Logistics, Military Hospital 175 - Ministry of National Defense and Le Huu Trac National Burn Hospital - Vietnam Military Medical University.

These institutions were instructed to form their own assessment teams and adhere to a standardized assessment procedure. Each criterion was evaluated based on 3 levels of achievement: achieved (1.0 points), partially achieved (0.5 points), and not achieved (0 points). The overall safety score for each hospital was calculated using the following formula:

Safety score = $(X_1 + X_2 \times 0.5) \times 100/224$

In which: X_1 represents the number of fully met criteria; X_2 represents the number of incompletely met criteria; 224 is the total number of criteria in the toolkit.

Hospital safety is calculated as follows:

- Level I (0 - 50 points): Low safety level, requiring urgent intervention.

- Level II (51 - 75 points): Average safety level, necessitating short-term intervention.

- Level III (76 - 100 points): High safety level, with ongoing measures to maintain and improve emergency and disaster management capacity.

The collected data were processed using statistical algorithms and analyzed with Stata 14.0 software.

3. RESULTS

Table 3.1. Summary of evaluation results of hospitals by group

Group	Fully Achieved		Incomplete		Not achieved	
	n	%	n	%	n	%
A (n = 54)	46.33 ± 5.22	85.78 ± 9.54	2.67 ± 0.68	5 ± 1.1 5	5 ± 1.52	9.22 ± 8.54
B (n=131)	82.44 ± 4.82	63 ± 3.74	27.89 ± 10.55	21.13 ± 8.12	12.77 ± 8.28	9.89 ± 6.15
C (n = 39)	14.77 ± 8.22	38 ± 20.92	10.66 ± 8.9	38 ± 20.92	14.89 ± 8.55	38.11 ± 22.01

Note: Structural and non-structural elements related to architecture; Group B. Construction equipment systems ensuring safety for users; Group C. Management of activities in emergency and disaster situations.

Comment: The highest level of full achievement is observed in Group A (85.78%), while the lowest is in Group C (38.00%). Group C also has the highest percentage of incomplete achievement (27.44%) and the highest percentage of criteria not achieved (38.11%).

Table 3.2. Detailed evaluation results of criteria groups

Group	Fully Achieved		Incomplete		Not achieved	
	n	%	n	%	n	%
A1 (n = 20)	18.44 ± 1.5	92.22 ± 7.54	0.22 ± 0.06	1.11 ± 0.34	1.33 ± 0.5	6.67 ± 0.79
A2 (n = 34)	27.89 ± 3.98	81.78 ± 11.73	2.44 ± 1.58	7.33 ± 1.59	3.66 ± 1.23	10.89 ± 3.14
B1 (n = 76)	54.55 ± 5.1	71.66 ± 6.85	12.67 ± 3.31	16.44 ± 4.27	8.78 ± 4.26	11.55 ± 5.54
B2 (n = 44)	22.11 ± 3.29	50.33 ± 7.5	11 ± 6,12	25 ± 13.96	1.56 ± 1.3	3.55 ± 1.04
B3 (n = 11)	5.78 ± 2.68	52.67 ± 24.62	4.22 ± 3.3	38.33 ± 30.24	1 ± 0.7	9 ± 6.36
C1 (n = 8)	3 ± 0.74	37.78 ± 27.78	0.66 ± 0.44	8.44 ± 5.58	4.33 ± 0.86	54.55 ± 32.58
C2 (n = 5)	1.11 ± 0.3	22.22 ± 18.55	0.77 ± 0.52	15.56 ± 10.42	3.11 ± 0.65	62.22 ± 32.30
C3 (n = 5)	1.11 ± 0.2	22.22 ± 12.08	0.77 ± 0.52	15.56 ± 5.55	3.11 ± 0.65	62.22 ± 25.38
C4 (n = 5)	1.67 ± 0.62	33.33 ± 12.47	1.78 ± 0.36	35.55 ± 21.86	1.56 ± 0.47	31.11 ± 24.48
C5 (n = 3)	2.33 ± 0.23	77.89 ± 23.57	0.11 ± 0.11	3.66 ± 3.16	0.55 ± 0.17	18.33 ± 5.79
C6 (n = 8)	4 ± 0.97	50.22 ± 36.7	3.11 ± 0.79	39.11 ± 29.38	0.89 ± 0.35	11.11 ± 4.39
C7 (n = 5)	1.56 ± 0.47	31.11 ± 28.48	2.11 ± 0.51	40.22 ± 30.73	1.33 ± 0.33	26.67 ± 20

Note: A1. Hospital structure; A2. Architectural structure; B1. Technical systems infrastructure; B2. Medical and laboratory facilities; B3. Safety and security of people and equipment; C1. Coordination of activities in emergency and disaster situations; C2. Emergency and disaster response and recovery plans; C.3. Information and communication management in emergency and disaster situations; C.4. Human resources in emergency and disaster situations; C.5. Emergency and disaster logistics; C.6. Support services, care in emergency and disaster situations; C.7. Evacuation, decontamination, and security in emergency and disaster situations.

Comment: In the structural subgroup (A1), 92.22% of the criteria were assessed as fully achieved. For the non-structural subgroup (A2) were 81.78% of the criteria fully achieved. In Group B, the highest proportion of criteria achieving full

compliance is found in the Technical Infrastructure System subgroup (B1: 71.66%), while the lowest is in the Safety and Security for People and Equipment subgroup (B3: 50.33%). In Group C, the highest level of achievement is in the Logistics subgroup (C5: 77.89%), whereas the lowest levels are observed in the Communication Management subgroup and the Response and Recovery Plan subgroup during and after emergencies and disasters (C2 and C3: 22.22%). Additionally, the highest failure rate belongs to the Information and Communication Management subgroup (C3: 62.32%).

Table 3.3. Results of total score calculation by criteria group

Group	Mean	Min - Max
Group A (n = 54)	48 ± 4.77	38 - 54
Group B (n = 131)	96.56 ± 5.36	87 - 103
Group C (n = 39)	19.55 ± 7.76	11 - 32
Total (n = 224)	163.88 ± 8.16	156 - 179

Comment: The average score for Group A was 48 out of 54 points. Group B achieved an average score of 96.56 out of 134 points, and Group C scored an average of 19.55 out of 39 points. The overall average score was 163.88 out of 224 points, with a range from 156 to 179 points.

Table 3.4. Results of Hospital Safety Rating

Group	Quantity	Percentage
Level I (76-100 points)	04	44.44
Level II (51 - 75 points)	05	55.56
Level III (0 - 50 points)	0	0

Comment: Of the total 9 hospitals surveyed, 4 hospitals (44.44%) achieved level I, 5 hospitals (55.56%) achieved level II, and no hospital achieved level III.

4. DISCUSSION

The purpose of assessing hospital safety in disasters is to raise awareness among hospital leaders and staff about the risks posed to the hospital by hazards both within the hospital and in the surrounding areas. The assessment aims to identify areas and activities that are particularly vulnerable during emergencies and disasters and to evaluate the hospital's ability to respond effectively to such events. Additionally, the assessment is intended to guide the development and implementation of intervention activities designed to enhance hospital safety during emergencies and disasters.

Disaster Safety Hospital Assessment Toolkit not only assesses the operational capacity of hospitals during and after emergencies or disasters but also provides authorities with the ability to identify the level and priority items to improve the safety and functionality of hospitals in particular and the health system in general. Worldwide, there have been many reports assessing hospital safety in disasters using the 2008 and then 2015 versions of WHO with very different results between countries as well as between hospital

classes within each country. In 2015, a study in Indonesia at 11 primary hospitals in 4 provinces showed that some gaps needed urgent intervention, especially in the two provinces of West Java (achieving 0.601 points) and Yogyakarta (0.602 points) to ensure the structural safety of buildings, water supply systems, fuel storage; Need to organize disaster response committees, training activities, structures to be prepared to respond to disasters [4].

In Tunisia, a study using the 2015 WHO toolkit found that 7 out of 9 university hospitals were classified as moderately safe, with an overall safety index ranging from 0.37 to 0.62. Additionally, 4 out of 9 university hospitals had a safety score below 0.20 for emergency and disaster management [5].

In 2015, a study of 421 hospitals in Iran found that 82 hospitals (19.4%) were classified as unsafe. In terms of resilience to natural disasters, 339 hospitals (80.6%) were classified as moderately safe, and no hospital was classified as highly safe [6].

In Moldova, of the 61 public hospitals evaluated, 24.6% were classified as good, and 67.2% were classified as average [7].

The safety level of hospitals in Vietnam remains quite modest. In 2009, Ha Van Nhu and colleagues conducted an assessment of 51 hospitals across three provinces: Quang Ninh, Da Nang, and Can Tho. The study revealed that most medical facilities are vulnerable to disasters to varying degrees. Provincial hospitals achieved higher safety indexes compared to district hospitals, with the non-structural and functional indexes being the lowest-performing groups [8].

In 2010, the results of the pilot safety assessment of 15 hospitals in three provinces (Thua Thien Hue, Quang Nam, Quang Ngai) revealed that the preparedness for emergency situations in hospitals had many limitations across structural, non-structural, and functional criteria. Specifically, 5 out of 15 hospitals were built in low-lying areas prone to flooding, 8 out of 15 hospitals had at least one asymmetrical building, and 5 out of 15 hospitals did not have wheelchair ramps. Additionally, 13 out of 15 hospitals placed heavy medical equipment on the ground floor, all 15 hospitals failed to properly secure chemical containers, 5 out of 15 hospitals lacked the system of emergency signs, 12 out of 15 hospitals did not have building diagrams, 10 out of 15 hospitals lacked of fire alarms, 13 out of 15 hospitals did not have plans for emergency operations centers, and 14 out of 15 hospitals did not conduct emergency response drills [8].

Do Thi Hanh Trang and Ha Van Nhu reported the results of assessing hospital safety in disasters in 3 provinces: Quang Ngai, Phu Yen, and Bac Lieu. The assessment focused on three groups of non-structural indicators: the electrical systems, the firefighting systems, and the evacuating systems. The results indicated that the number of medical facilities meeting the indicators in these groups was low. Specifically, 11 out of 33 hospitals had backup generators capable of providing sufficient power for the hospital's priority needs; 11 facilities had lights at the exits with backup batteries; 7 facilities had smoke detectors installed in the appropriate locations; 15 facilities met the standard of having a portable fire

extinguisher in each room; 17 hospitals had staff trained in fire prevention; and 20 hospitals had lighting equipment installed at all exits [9].

Recently, military hospitals have received significant investments for upgrading, constructing new facilities, and purchasing modern equipment to enhance the quality of medical examination and treatment for both soldiers and civilians. This improvement is objectively reflected in the evaluation results in Part A, which focuses on structural and non-structural aspects, with an average score of 48 out of 54 points.

The assessment results indicate that the current limitations that need to be addressed by military hospitals are concentrated in Group C, which deals with the management of activities in emergency and disaster situations. The total score for this group is approximately 50% (19.55 out of 39 points). The primary reason for this is that this is a relatively new field that has not received much attention. Additionally, human resources and specialized forces are not adequately ensured, particularly in the development of procedures, training, and exercises. Nevertheless, some hospitals have achieved 32 out of 39 points, representing a bright spot and serving as a model for other hospitals to emulate.

It should be noted that the results of this assessment are only valid at the time of evaluation and may be subjective for many criteria. Furthermore, the list of criteria in the toolkit is extensive, and the assessment process can be time-consuming, depending on the size of the hospital. Moreover, it requires the assistance of experts beyond medical staff, such as those in structural engineering, technical systems, and management. To ensure success, the assessment should not be a one-time event but rather a continuous process managed by the hospital's Disaster Management or Quality Management and Planning departments.

Limitations of the study: The survey was conducted at only 9 military hospitals, which constitutes nearly one-third of the total number of military hospitals currently in operation. These hospitals self-formed evaluation teams and conducted assessments according to the toolkit's procedures, which could lead to bias or lack of objectivity in the evaluation results. These evaluation results were only valid at the time of assessment and subjective for many criteria. Additionally, the toolkit's criteria lists were quite extensive, and the evaluation process could be time-consuming, depending on the hospital's scale. Moreover, full assistance from experts outside the medical staff, such as those in structural engineering, technical fields, and management, was required. To be successful, the evaluation should not be a one-time activity but a continuous process, with responsibilities assigned to a dedicated department within the hospital to enhance the effectiveness of intervention measures and improve hospital safety.

Recommendations to address limitations: Conduct studies on more hospitals to ensure that the data results represent the safety criteria of all military hospitals during disasters. Establish evaluation teams comprising independent experts who are not hospital employees to ensure the objectivity and accuracy of the evaluation results. Organize intensive training sessions for the evaluation teams

on the assessment procedures and criteria to minimize subjectivity. Mobilize participation from experts outside the medical field, such as structural, technical, and management experts, to ensure comprehensive and accurate evaluations. Hospital safety evaluations should be performed periodically (for instance: Annually) to monitor improvement progress and implement timely intervention measures. Establish an ongoing evaluation process and assign responsibilities to the Disaster Management or Quality Management Department and the Hospital Planning Office to ensure the maintenance of safety and readiness to respond to disasters. Evaluations should not cease at a single point in time but need to be ongoing and monitored, which includes preparing periodic evaluation reports and organizing meetings to reassess intervention measures.

5. CONCLUSION

The Disaster Safety Assessment Toolkit for Military Hospitals was piloted at 9 military hospitals at the strategic and operational levels. The results indicated that the Structural and Non-Structural Groups related to structures had the highest percentage of criteria fully achieved (85.78%), while the Management of Activities in Emergency and Disaster Situations group had the lowest percentage (38.00%). In terms of safety levels during disasters, 4 hospitals (44.44%) achieved a high safety level, 5 hospitals (55.56%) achieved the average level, and no hospital achieved a low safety level.

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