Turk Neurosurg 34(6):941-945, 2024

Turkish Neuro - Excursion

DOI: 10.5137/1019-5149.JTN.46154-23.2

Received: 13.12.2023
Accepted: 15.01.2024

Published Online: 23.10.2024

Surviving the Big One: Turkish Neurosurgical Society's Innovative Disaster Management Model for Istanbul Earthquake

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ABSTRACT

The Turkish Neurosurgical Society (TNS) played a pivotal role in providing critical medical support during the Kahramanmaraş earthquake. Recognizing the urgent need for neurosurgeons, our team collaborated with various institutions to address material shortages and meet medical requirements. However, this experience underscored the necessity of having a comprehensive disaster organization model and a well-defined disaster management plan. TNS should pioneer the creation of a dedicated trauma group to ensure coordination among neurosurgeons in future disasters.

Minimize confusion during critical moments, the trauma group will have a regional structure, with smaller subagencies assigned distinct roles and responsibilities. Standardized triage and patient management practices, as defined in the created guidelines, will ensure consistency in trauma response across the board. The wealth of knowledge gained from field experiences will be shared through these guidelines, providing valuable insights for future generations.

By proactively establishing a trauma group within the TNS and developing a robust disaster management plan, we aim to strengthen our resilience and enhance the overall effectiveness of neurosurgical response during emergencies. Together, we can pave the way for a more coordinated and efficient approach to disaster relief, ensuring that best neurosurgical care for those in the face of catastrophic events. The establishment of a dedicated trauma group within TNS represents a significant leap forward in enhancing our preparedness and response capabilities during disasters. The invaluable lessons learned in the Kahramanmaraş earthquake have underscored the critical importance of a well-organized and coordinated approach to neurosurgical intervention in times of crisis. The implementation of standardized triage and patient management practices, as outlined in comprehensive guidelines, will further ensure a consistent and effective trauma response across various disaster scenarios.

KEYWORDS: Disasters, Earthquake, Guidelines, Trauma group, Management model, Turkish Neurosurgical Society

ABBREVIATION: TNS: Turkish Neurosurgical Society

INTRODUCTION

Floods, forest fires, and terrorist attacks are among the natural and man made threats faced by Türkiye. The most serious of these challenges is earthquake risk, as more than 50% of Turkey's territory is susceptible to varying degrees of seismic activity. This susceptibility is shown in the official earthquake zone map of 2018, which is still in force (5).

Türkiye and its neighboring regions experienced 170 earthquakes of magnitude ≥4 in 2022 alone. In 2023, two major earthquakes occurred in the southeastern part of Türkiye just

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9 hours apart, with magnitudes of 7.8 and 7.5, respectively. Official reports indicated that >50,000 people die dowing to these earthquakes (4).

Emergency and disaster plans should be proactively prepared, rather than as a reaction following the occurrence of a disaster. Preplanning, specialized skills, and systematic management are essential for effective emergency and disaster management. However, a review of the available literature reveals limited emergency and disaster management studies. As one of the trauma departments, there is a need for a more systematic organization of neurosurgery within the Turkish Neurosurgical Society (TNS) for dealing with disaster situations. Thus, a sample model for a trauma board was developed.

The TNS Disaster Response Board was developed as a model for horizontal organization, with a regional organizational structure and clearly defined powers. It aimed to establish a hierarchical structure within the Board. The Board will form separate groups for supervision, in-service training, and counseling based on the disciplines. This aims to develop a more systematic action plan for the organization in the event of a potential disaster.

REGULATIONS and ORGANIZATIONAL PLANNING

The Regulation on Disaster and Emergency Response Services, which was published and came into effect in Türkiye in the Official Gazette on December 18, 2013, defines emergencies as events and the resulting crises that halt or disrupt the normal life and activities of the entire community or specific segments thereof, necessitating immediate intervention (6). In contrast, disasters are events of natural, technological, or man made origin that cause physical, economic, and social losses for individuals and communities. They interrupt or disrupt human life and activities (1).

Disaster management is a systematic approach to preventing disasters and mitigating damages. It involves directing and organizing necessary efforts during the main phase of the event. It primarily aims to manage resources from all institutions and organizations to develop and implement effective strategies aligned with this shared goal (2,4).

In the event of a crisis, our organization focuses on coordination to provide the highest level of benefit. To achieve this, we are developing a disaster management plan that will enable us to take more strategic and planned actions in the event of an incident. We must adhere to this plan to effectively respond to and manage possible emergencies.

Various classifications of disasters exist based on factors, such as magnitude, occurrence, or speed of development. Regardless of their origin, rate of development, or magnitude, disasters and related events can be analyzed and categorized into five main sections (1) (Figure 1):

1. Risk mitigation: This involves measures taken to reduce the potential impact and vulnerability to disasters, including identifying hazards, assessing risks, implementing preventive measures, and promoting community resilience.
2. Preparedness: This phase focuses on preparing for potential disasters through planning, organizing resources, and conducting training and drills. It involves developing emergency response plans, establishing communication channels, and ensuring the readiness of the response teams and infrastructure.
3. Response: This phase encompasses immediate response to a disaster, including search and rescue operations, medical assistance, evacuation, and provision of essential supplies and services. It aims to save lives, alleviate suffering, and stabilize the situation.
4. Recovery: After the immediate response is underway, efforts focus on improving response strategies and effectiveness. Prior experiences from the disasters are evaluated, and adjustments are made to improve future disaster management skills. This phase includes refining coordination systems, updating protocols, and implementing necessary improvements.
5. Prevention: After the initial response and stabilization, the focus shifts to long-term recovery and reconstruction. This phase involves rebuilding infrastructure, restoring essential services, addressing the needs of affected communities, and promoting sustainable development to mitigate future risks.

By recognizing and addressing these five main sections, disaster management efforts can be more comprehensive, proactive, and effective in mitigating the impactof disasters and promoting community resilience (2,3).

The first two steps, risk mitigation and preparedness, are crucial predisaster stages. When a disaster occurs, it is crucial to quickly and accurately respond during the response stage.

Figure 1: Disaster management cycle.

An organizational structure that aligns with the disaster chain is critical for the establishment of the "Turkish Neurosurgery Disaster Response Board" within the TNS. Thus, the primary objective is to develop an execution plan and ensure a faster and more effective response in the event of a potential disaster (Table I).

During this stage, collaborative efforts involving various disciplines should be initiated with the shared goal of long-term preparedness. It involves conducting comprehensive studies that require the collective efforts of an organization. One crucial aspect is reviewing and evaluating institutional structures and plans to ensure their effectiveness during a disaster. Education, information dissemination, and awareness promotion are significant in this phase. Emphasis should be placed on providing in-service training and developing specific plans.

The preparedness phase focuses on implementing risk reduction strategies and developing response plans at the central level, which includes preparing and refining provincial, regional, and institutional plans and fostering interinstitutional coordination nationwide. Regular drills should be conducted to assess the effectiveness of these plans and response capabilities. Additionally, efforts can be made to stockpile necessary materials or develop a material supply chain plan for emergencies.

The response phase begins immediately after the disaster occurs and its duration lasts 1–2 months, depending on the magnitude of the event. During this stage, organizations must utilize all their resources and capabilities in the affected area to maximize their effectiveness. It is crucial to employ the fastest and most efficient methods to ensure that the preparation completed prior to intervention is comprehensive and appropriately executed. Effective coordination becomes vital during this phase because it requires assuming authority and responsibility in extraordinary circumstances.

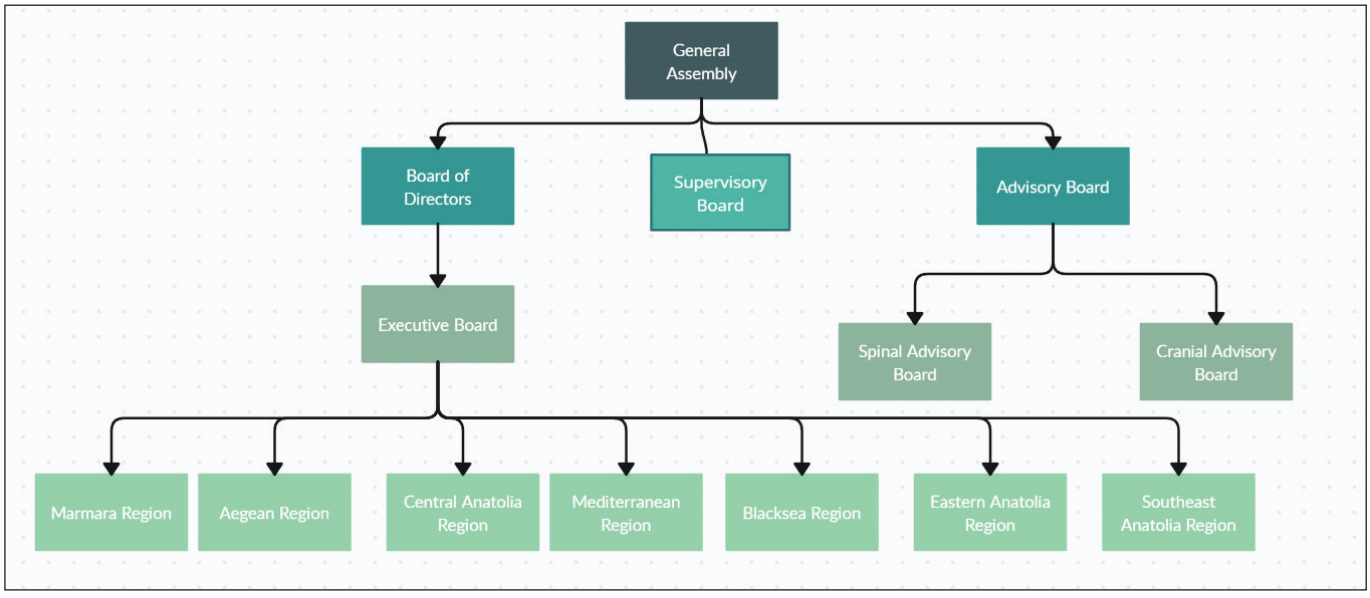
The recovery phase is closely associated with the prevention phase. Following the initial impact of the disaster, these stages focus on addressing the long-term needs of the affected communities. The primary objective is to fulfill, at the very least, the basic requirements of the affected communities and, if possible, to go beyond that. This period also represents the beginning of a new phase of risk reduction and disaster preparedness, aiming to minimize future vulnerabilities and enhance resilience.

DISCUSSION

Proper predisaster planning is essential for ensuring an efficient, coordinated, and timely disaster response. Thus, this study recommends establishing a Disaster Response Board within the TNS to provide the necessary management and decision-making power in neurosurgery during emergencies. The establishment of this Board will enable effective functioning of our organization and in a more coordinated manner in the event of a disaster. We can improve our ability to provide timely and appropriate neurosurgical care during critical times by centralizing disaster response efforts and leveraging the expertise within our organization. This effort improves patient outcomes despite emergencies by optimizing our response capabilities, streamlining communication, and ensuring efficient resource allocation.

The Disaster Response Board will be established using an organic organizational model focusing on effective task fulfillment rather than a hierarchical structure. It will function based on the necessity of the work, with directives obtained from the authorized person. This approach ensures a horizontal division of labor where authorities and responsibilities are clearly defined and shared among the board members. The Disaster Response Board improves coordination, optimizes decision-making processes, and facilitates efficient execution of

Table I: Vertical Structure Diagram of "Turkish Neurosurgery Disaster Response Board"



duties during critical situations by adopting this organizational model.

It is crucial to emphasize the significance of fostering collaboration and synergy not only within the Turkish Neurosurgical Society but also across associations representing various medical specialties. The Disaster Response Board strives to complement and align its operations with well-established emergency protocols. It is critical to create interconnectedness across medical specialty associations by parallel structuring of similar emergency response teams. Ideally, boards affiliated with necessary entities, such as the Ministry of Health, the Turkish Red Crescent, and the Disaster and Emergency Management Presidency (AFAD) under the Ministry of Interior, should facilitate these relationships and organizational efforts. This interconnected approach enables a cohesive and unified response strategy throughout the healthcare and emergency management sector.

While response teams and systems are conceptualized in great detail on paper, their functionality requires actual simulation assessment, particularly when faced with a disaster. The neurosurgical response team should be evaluated in three stages: first, scrutinizing the methodology; second, assessing response time and efficiency, task distribution, and communication within the brain surgery response team; and third, conducting evaluations with response teams established by various medical branch associations. Importantly, comprehensive testing should include the collaboration of all response teams with government agencies. To ensure the precision and effectiveness of these tests, it is advisable to outsource their planning and implementation to specialized institutions, such as the Turkish Red Crescent or AFAD. This approach ensures that the neurosurgical response team and its interconnected networks are thoroughly and expertly evaluated in various disaster scenarios.

The Board will be established within the TNS and will be comprised of members serving on a voluntary basis. It will operate under the guidance and cooperation of the association's management. The Board will be led by a chairman and deputies who will act as liaisons with the General Assembly. During intervention periods, the Intervention Board will maintain internal discipline and coordination, ensuring that exceptional powers are consolidated under a single authority, facilitating coordinated actions from a centralized point. In addition, the Board will serve as the official representative of the organization and liaise with the Ministry of Health for assignments and in times of disaster.

The General Assembly comprises the Auditing Board, Advisory Board, and Management Executive Board. The Board will be divided into three main groups, each led by a group head who will oversee auxiliary tasks and responsibilities (Table I).

The Supervisory Board will be responsible for the organization's operations during the predisaster, disaster response, and postdisaster recovery periods. They will also organize and supervise in-service training, which is crucial in disaster risk mitigation. These trainings will be conducted online and open to all associations, following a program developed by experienced neurosurgeons with previous disaster experience. These trainings will prepare young neurosurgeons with no prior training for the challenges of the disaster period by providing information on surgical decision-making, including war surgery and disaster triage algorithms. The association may ensure that the knowledge and experience accumulated within the organization are passed on to future generations without loss through this in-service training.

The Advisory Board is designed to comprise experienced and senior neurosurgery professors who have actively participated in surgery during disasters, particularly cranial and spinal surgeries. Their valuable experience will be utilized in the in-service trainings organized by the Supervisory Board, where they will serve as instructors. Additionally, they will serve as an Advisory Board member in predisaster preparedness and intervention.

While personal involvement in the field during a disaster may not always be possible, the Advisory Board's knowledge and experience in the response phase will play an essential role as a consultative body. They will be available for consultation on surgical cases, contributing to a more coordinated and systematic approach to algorithms during the intervention phase of a potential disaster.

Turkish Neurosurgery Disaster Response Board, consisting of volunteers, will be the largest group within the association. It will adopt a regional organizational model, with separate groups representing the seven geographical regions of Türkiye. Each region will have a regional president and three vice-presidents who will report to the president. The vice-presidents will be assigned as volunteer officers, inventory officers, and dispatchers.

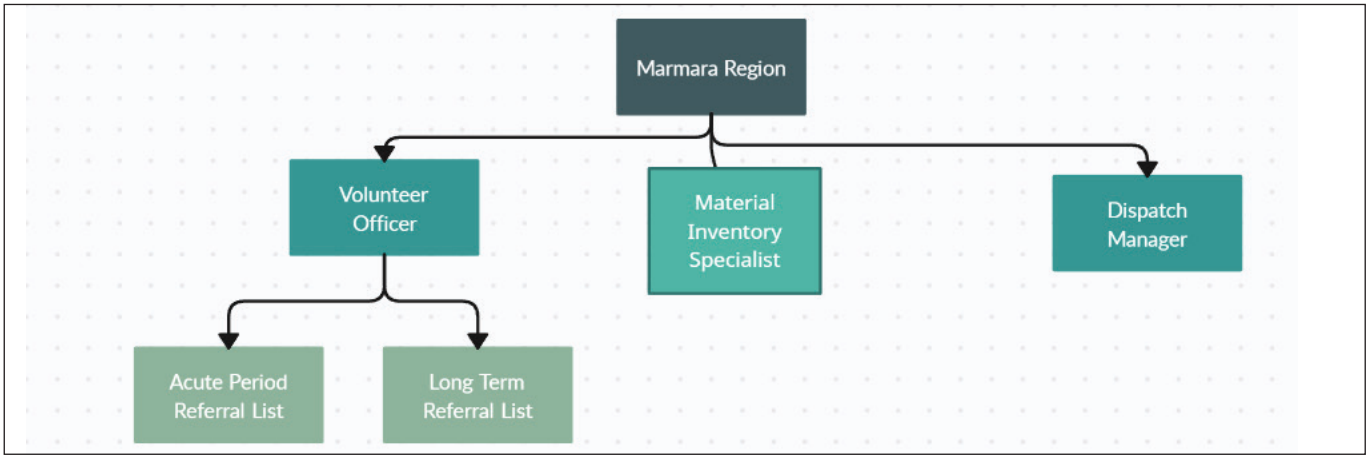
The volunteer officer will keep a volunteer list of association members. Volunteers will be assigned during a disaster depending on their suitability for the specific circumstances, such as expertise, health conditions, and training participation. This ensures that a neurosurgeon with a respiratory condition, for example, is not assigned to a dusty earthquake zone. Participation in in-service training will result in more efficient assignments (Table II).

The inventory officer will be in charge of managing the inventory data of surgical facilities at hospitals. In the event of a disaster, they will actively participate in addressing inventory deficiencies throughoutthe response phase.

The referral officer will possess knowledge of hospital capacity and the referral chain throughout the preparation phase. They will ensure that referrals are balanced and coordinated during the response phase. These Board of Directors roles improve the overall effectiveness and coordination of the association's response during a disaster.

During the preparedness phase, the volunteer, inventory, and dispatch officers of each region, along with the regional officer, will collaborate to develop the intervention plan. The TNS will review the disaster response plan and prioritize the cities requiring immediate assistance. An intercity referral chain and voluntary transfers will be established to promote support across communities. Each region will develop its

Table II: A Regional Hierarchy Chart Has Been Created as an Example for the Marmara Region. This Chart Demonstrates the Hierarchical Structure and Organization within the Region. It Outlines the Different Levels of Authority and Responsibility, Showcasing the Coordination and Management of Resources in the Event of a Disaster. The Chart Serves as a Visual Representation of the Planned Structure, Ensuring Effective Decision-Making and Efficient Response Efforts in the Marmara Region



disaster management plan, which will be evaluated by the respective regional officers in regional meetings.

These plans will ensure a more coordinated response phase. The Disaster Response Board will address the needs of its members affected by the disaster during the postdisaster recovery and prevention period. Apart from addressing the physical needs of its members, the board will also provide psychological support to minimize the impact of the devastating disaster processes. Interassociation communication with psychiatric associations will be established to support members affected by the disaster. The primary focus will be on assisting and caring for the neurosurgical association's members physically and psychologically affected by the disaster.

CONCLUSION

In the event of a disaster, the proposed Disaster Response Board, which will be established within the TNS, would provide an efficient and effective response. This will be achieved by utilizing the experiences gained from previous disasters and implementing disciplined preparation measures. The board's primary goal is to ensure a coordinated and organized approach to disaster management, maximizing the association's capacity to respond effectively to emergencies.

Declarations

Funding: No external funding was received for this study.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request. All materials, including protocols and software used in the study, are also available upon request. Any restrictions on data sharing, such as privacy or proprietary considerations, will be discussed on a case-by-case basis to ensure ethical use of the data and materials.

Disclosure: All authors declare that they have no conflict of interest to disclose.

AUTHORSHIP CONTRIBUTION

Study conception and design: GG, ZD
Data collection: GG
Analysis and interpretation of results: GG, ZD, EC, ADB
Draft manuscript preparation: GG, EC, ZD
Critical revision of the article: GG
All authors (GG, ZD, EC, ADB) reviewed the results and approved the final version of the manuscript.

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