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Health Care Organization During Disasters

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Abstract

In recent years, both natural disasters and massive events have been increasing in our country as well as worldwide. During disasters, the health system, which routinely provides health care suddenly, loses its function. In case of any disaster or emergency, crisis management should be immediately initiated, and medical service delivery should be accordingly arranged. In such cases, instead of providing the utmost medical care to a single injured person, it is more vital to give the basic medical care to a maximum number of victims. In order for this to work, it is necessary to follow the prehospital and hospital triage principles.

The preparations should be arranged in advance, the hospital disaster plan should be prepared, and practical training should be frequently done in certain periods for improving health care services in disasters.

Keywords: Health care, disaster, organization

Introduction

Our country is a country with a high potential risk for disasters in terms of its geographical characteristics and strategic location. Especially in the past few days, after the earthquake with a magnitude of 7.7 and 7.6 consecutively, the highest loss of life in the Republican period happened, and more than 100 000 buildings were damaged or destroyed. Apart from these, events such as terrorism and floods have caused serious damage to our country in recent years. For this reason, disaster preparedness and planning are issues that should be emphasized. In particular, health care administrators have great responsibilities in the stages of disaster, such as immediate response, prevention, preparation, planning, and organization both inside and outside the hospital.

Health service delivery in disasters is not the same as routine. In order to achieve the goal of providing "the most benefit for the maximum number of injured people," a radical change should be made in medical care organizations, and crisis management should be immediately started. This seems in contrast to the goal of traditional medical care, which is "providing the greatest benefit to every patient." It is important to apply the principles of crisis management to all stages of disaster management.[1]

Definition of Emergency and Disaster

Emergency is an extraordinary event that occurs as a result of natural or man-made activity that threatens people's living spaces, body integrity, or interrupts their activities.[2] According to the hospital disaster plan preparation guide of the Turkish Ministry of Health, an emergency is a situation that requires urgency, which is large but generally on a scale that can be dealt with local opportunities.[3] According to Article 5902 of the law, emergency is "the events that stop or interrupt the normal life and activities of all or certain segments of the society which requires urgent intervention resulting in crisis.'' In summary, emergency means the events that stop or interrupt the normal life and activities of the whole or certain segments of the society and require urgent intervention together with the crisis created by these events.[2]

Emergencies are characterized by a series of unexpected events, including epidemics, mass food poisonings, bomb alerts, industrial accidents, natural events, and disasters. In an emergency, time is one of the essential factors. Organization and intervention must be quick, and it is necessary to be in a race with time at every stage. For this, preprepared plans are very important. Emergency management includes arrangements to prevent disasters, to be prepared to reduce their effects, and to reduce damages at the time of disaster.[4] If the nature of the emergency exceeds the conditions to be taken under control by the existing organization organized for this purpose, the crisis or disaster management phase will be initiated.[5] When disaster is mentioned, we often think of situations such as earthquakes, floods, and fire, but other than these, any unexpected situations that overwhelm the capacity of the resources are included in the scope of disaster.[4] More simply, it can be defined as any event that exceeds the response and response capacity of the system. This response and response capacity might vary according to different regions, even within the same region, at different times of the day or different days of the week.

To make a proper definition, a disaster is a natural, technological, or man-made event that causes physical, economic, and social losses for the whole or certain segments of the society, stops or interrupts normal life and human activities, and exceeds the coping capacity of the affected society. Disaster is the result of an event rather than itself.[6]

Disaster Classifications

In terms of hospitals, disaster is subdivided into 2 types: internal and external.[2,5] Internal disasters occur within hospital boundaries. Radiation leakage, power outage, fire, laboratory accident, explosion, armed attack, system failure, bringing a potential attacker or criminal to the hospital, gatherings, and patient's violence are

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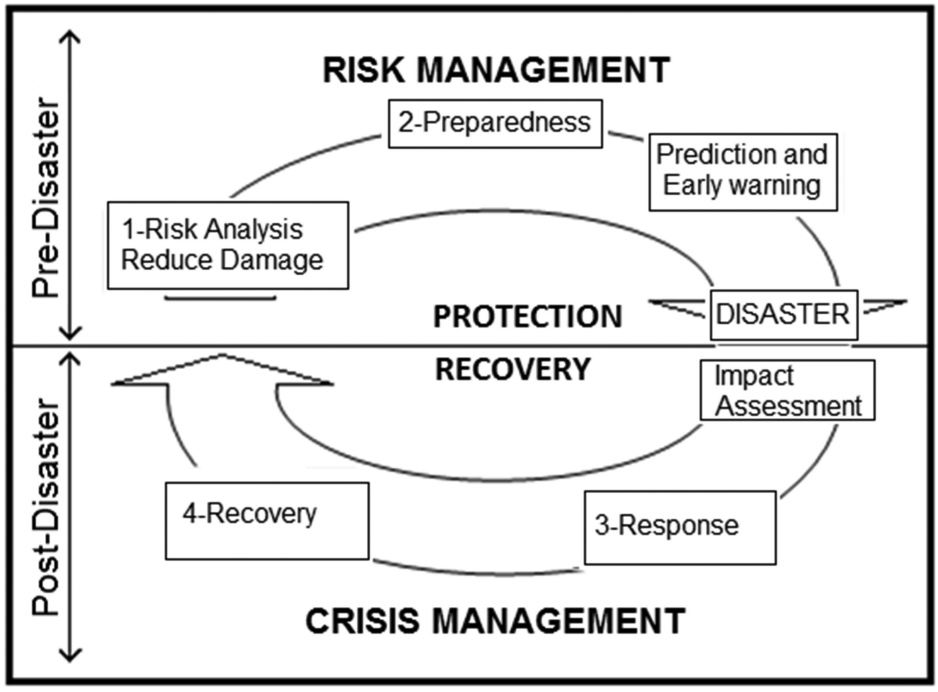

Figure 1. Risk management cycle (6).

some examples of internal disasters. External disasters take place outside the hospital. Building fires, industrial explosions, terrorist bombing, and mass poisonings are some of external disasters. Some disasters such as earthquakes, pandemics, atomic explosions, torrents, and wars may include both types. Disasters are also divided into 2 as natural and man-made.[7] In some sources, a distinction is made according to the number of people affected. Apart from these, classifications were made according to many features such as formation forms, sizes, types, and warning levels. Nevertheless, as we mentioned before, the important thing is the adequate response to the emergency.[8]

According to the response, disasters have 4 levels. It is the first level if local opportunities are sufficient to solve the problem, the second level if a support is required from the provinces, the third level if assistance is required from all national resources, and the fourth level if the state and foreign countries' assistance is required.[9]

Disaster Management

Disaster management is a collective struggling process that must be carried out by the society in order to prevent disasters, reduce risks and damages, respond to disasters timely, make rapid and effective interventions, and create a safer and more developed living environment for communities affected by the disasters.[10] Integrated disaster management covers all current and potential disaster hazards and risks, all basic phases of disaster management (prevention/damage reduction, preparedness, response, and rehab ilitation/remediation), and institutions and organizations from all sectors (public, private, civil, and academic). It is an approach that expresses participation in disaster management processes and the mobilization of all resources.[6]

In other words, the concept of "disaster management" covers all of the analysis, planning, decision-making, and evaluation processes that organize the available resources for being prepared for all kinds of danger, damage reduction, intervention, and improvement.[11] For this reason, disaster management studies are a whole and require many disciplines to work together in harmony.

In the Modern Disaster Management System, activities for predisaster prevention and protection, such as risk and loss reduction, preparation, forecasting, and early warning, and having knowledge and awareness about disasters, are called "risk management." On the other hand, studies carried out to improve postdisaster life and functioning, such as impact analysis, intervention, recovery, and reconstruction, are called "crisis management" (Figure 1). Postdisaster crisis management cannot be successful, fast, cheap, and effective if studies on risk management, such as possible harm reduction and preparedness, are carried out primarily across the city, the region, and the country as a whole.[6]

Today, disaster management consists of 4 main phases such as risk and harm reduction, preparedness, response, and recovery. However, these phases also include sub-phases such as forecasting and early warning, understanding disasters, impact and requirement analysis, and restructuring. Risk management determines the predisaster, and crisis management determines the working system of postdisaster activities.[5]

There are studies such as planning and risk reduction at every stage of disaster management, and these stages do not always have to follow each other, but they often overlap. Particularly, risk management should be able to take the new risks that may arise at every stage of the disaster management system. On the other hand, reconstruction activities should aim to prevent future hazards and minimize their risks.[6]

All phases of disaster management should be handled with integrity and should be implemented effectively before, during, and after the disaster. It is notable that these phases are related cyclically, not linearly. Efforts in disaster preparedness and damage reduction should be implemented effectively. Response during the disaster and recovery after the disaster, based on the experience gained, are necessary to go back to the beginning phases of preparedness and risk reduction. The 4-phase disaster management cycle, which consists of risk reduction, preparedness, response, and recovery stages, also explains that the activities carried out at each stage will affect the success of the activities that need to be

done in the next stage. For this reason, the entire disaster management system is comprehensive and integrated.[6,12]

Protocols of Prehospital Emergency Medical Systems

Every hospital should be included in the disaster plans of the region and should know these plans. Centers providing prehospital service should also know the service capacity of the hospitals. For example, the prehospital service center should know which hospital could care for the sick and injured, in what number, and to what extent.[3] Agreements should also be made between hospitals and regions strictly for support before bigger disasters occur.

Organization of the Prehospital Disaster Area

The disaster area is organized by dividing it into several different areas. The command point is the center of the movement area, and the person in command should be in this area. Ambulance, personnel, and supplies should be located in a support area outside the scene. If an air transport method, such as a helicopter, will be used, a safe area (marked H) should be quickly identified. The areas where the injured will be collected and the morgues where the dead will be collected should be determined.[13]

Stages of Disaster Response

Activation is application, relief, and improvement. The activation phase indicates when the event was first noticed or reported. Appropriate persons and units are informed of the incident, and a first response is created. During the implementation period, the evaluation of the event scene and the organization of the command center are made. In addition, search-and-rescue work begins.[3] The second phase of this period is the triage, stabilization, and transport of patients. The recovery phase begins with leaving the scene. Normal functions are then returned, and finally, the service is interpreted and the rescuers' psychological support is provided.[3,5]

Prehospital Disaster Plan

The responsibility of planning and implementing what a hospital should do in an emergency or disaster belongs to the hospital disaster management unit. This unit should consist of hospital administrators and employees. The task of the unit is to organize and monitor the preparation of the hospital and its sub-units for the process before, during, and after the disaster.[14] In addition, it provides, organizes, and controls the communication between all units within the institution and external institutions. Hospital disaster plan activation is made and finalized by the head of the management unit.

Before the disaster, the task definition of the subunits of the disaster management unit is made, and the people who will work are determined. They are trained according to their duties and are reinforced by conducting field exercises. Workflow is created and announced in line with the disaster action plan. Necessary materials, equipment, and devices are determined and procured. In case of emergency, alternative duty zones are determined in order for the subunits to work safely and effectively. Meeting places are determined, a communication system is established, and the contact information of the persons in charge is kept up to date.[15] Maintenance and calibration of devices that are not actively used are routinely performed. Necessary documents and forms are prepared, and all these are checked.

The unit should meet routinely to evaluate possible hazards, update disaster plans, plan training, conduct exercises, and organize the disaster plan according to the events in the country.[16]

In the first 2 hours (stage I) during a disaster, the unit gathers under the leadership of the chairperson, assignments are made, job descriptions are read, and subunit responsibilities are assigned. A disaster action plan is implemented. Status reports and records are collected. The latest status information about equipment, medicine, water, food, etc. is obtained from assistance services and reported to the chef. After that, in the second stage (2-12 hours), while information flow continues between the units, the security status of the hospital, medical capacity, and workforce flow plan are reviewed.[3] Those in charge meet determined requirements. Up-to-date information is obtained from the Provincial Disaster Coordination Board, and according to the latest situation, a disaster action plan is reviewed. All this is reported to the president. At the third, final stage (12 hours later), inter-unit briefings and safety and security analysis continue. Incoming reports are evaluated, and new reports are prepared accordingly. At last, reached stages are evaluated, and solutions are sought for critical problems. If damage occurs to the health institution or if it becomes insufficient in capacity, attempts are made, and the disaster action plan is rearranged with the president according to the latest situation.[3,16] In and out, communication within the organization is coordinated and controlled. Information should be given to the new president in case of assignment. In the phase of ending the extraordinary situation, normal work is restored.

Equipment and materials are collected, checked, and, if any, deficiencies are addressed. Postintervention activities are planned. Recorded documents are collected. Evaluation meetings are held, and necessary revisions are determined.[17] Annual Report and Development Plan are written. After the intervention, participation in meetings and activities is ensured.

Stress management is carried out. The public is informed through the press. Psychosocial support is provided to those affected. The relevant senior manager is informed about the latest situation.[18]

1. The hospital is damaged. The hospital is unusable.
    - All patients should be taken to the hospital garden. Their treatment should continue.
    - Medicines and medical supplies must be moved outside the hospital, but in a secure place.
    - A separate place should be arranged for the injured people coming outside the hospital.
    - Patients should be transported at an appropriate time.
2. There is no damage to the hospital. Patient care can continue.
    - Emergency rooms and operating rooms should be prepared for patients coming outside.
    - The surrounding health personnel should come to the hospital immediately if they are not injured.
    - Health personnel coming to help from nearby places should be evaluated and must be added to the system.

In case of significant destruction, especially within the first 72 hours, it should be assumed that external help might not arrive, and interventions must be conducted within available means. In order to save the maximum number of injured during this intervention, the health system must follow triage rules.[3]

After the aid team arrives, the working system should be transferred to the new head. Three-five days after the event, patient screening should be done in tent cities, and medication should be given to patients in need.

Public health studies should be carried out to prevent infectious diseases 5-7 days after the event.

From the beginning of the event, first of all, psychiatric care should be provided to health personnel and earthquake victims.[5,7]

It should be thought that the effect of the disaster may last for 2-3 months, depending on the magnitude of the event, and health care should be provided accordingly. Teams and supplies should be arranged, and support teams should be sent to the disaster area.

Response and recovery periods after disasters are difficult and costly periods.

During risk and harm reduction periods, all risks, including building risks, should be considered and must be corrected immediately. According to the disaster plans prepared during the preparation period, all personnel should be informed, and routine exercises should be carried out. Our aim in disaster situations is that the buildings providing health services should not be damaged, and all services, even in case of disaster, must be able to continue without interruption.

Disaster Logistics

Logistics during disasters consist of rapid transportation of the right amount of supply kept in good conditions to the most required zone. Logistics have a major role in disaster management. It is the essential and most pricey part of management. Almost 80% of expenses are for adequate water, food, medicine, shelter, heating and ventilation, clothing, and similar demands.[19] Disaster logistics usually covers expense areas, so both organization and transportation are more complex than in commercial logistics. It requires national and international support and quick and precise organization. Therefore, the conditions during disasters may change suddenly, so alternative plans are a must. In addition, every stage of organization must be flexible as well.

Main problems in logistics are defective infrastructure causing inadequate road and railway conditions and insufficient airport and port capacities for transport. Storage capacity shortages and insecurity are the troubles that follow.

The health care supply chain includes only medical requirements of supply, such as medicines, vaccines, antivirals, intravenous fluids, and various medical equipments. The shortage of medicines is one of the major problems during disaster relief operations. Requirement of medicine and medical equipment have to be fulfilled in disasters. However, there is usually an imbalance between medicine supply and requirement.[20] Stochastic approach is an alternative model for the storage and distribution of medical needs.[21]

Triage

Triage is the heart of the health care and the response stage. Triage principles in the field are quite different from hospital triage principles. In the field, the goal of the triage is to save maximum number of victims possible. Thus, victims in serious conditions should be sacrificed. The red triage scale, indicating severe cases, may turn to black, signifying death in the field. The easiest technique for rapid triage with mass gatherings in the field is to call all the victims who can walk. They are forming green scale, meaning non-urgent cases. Then, the differentiation of unconscious victims needing resuscitation from immobile ones came. Conscious but immobile victims belong to the red scale. Finally, victims who require resuscitative intervention are in the black scale. However, triage must be repetitive for red- and green-scaled victims in the field because, in the absence of necessary health interventions, victims' clinical severity might change.

In addition, there are many types of triage system for various conditions. To select the appropriate triage model is essential for adequate response. Experience is the major characteristic for rapid decision-making with minimum error.[22]

Hospital triage is the second level and is crucial for every patient. Especially in mass casualty incidents, hospital triage is as much important as field triage. Experience is also the cardinal feature in agile and right decision-making.

Health Care

Each type of disaster has its own type of health problems. Traumatic injuries and acute kidney injury due to rhabdomyolysis and dehydration are typical occurrences during earthquakes.[23] Hypothermia, diarrhea, various infections such as cholera, hepatitis, leptospirosis, and tetanus, burns, carbon monoxide poisoning, compartment syndrome, and trauma are frequently observed deseases in disasters.[24] Acute stress disorder, anxiety, depression, posttraumatic stress disorder (PTSD), and sleeping disorders are classical mental health problems associated with disasters. Environmental health problems are another critical issue during disasters. Every stage of management must be planned according to the primary health concerns related to the disaster.[25]

Solutions

Despite multiple disaster experiences throughout the world, there are still inadequate responses at disasters. The cardinal common shortages reported during disasters are water, power, heating/ventilation, supplies, safety/security, communications, staffing, structural/nonstructural damage, and health information technology.[26] It ıs certain that planning is crucial; however, unexpected situations may always happen during disasters.

There are a high number of operational studies providing organizational models. Using efficient new technology to improve personnel interoperability is a good combination. Efficient use of new technology for improving personnel interoperability is essential. Multi-disciplinary trainings, combined with technology, and developing a common language are crucial, especially in international organizations.[27]

Recruiting agencies which prepare disaster scenarios is a good suggestion for preparedness.[28] Performing repetitive drills with as many different and various scenarios as possible seems the best solution. Virtual reality technology is a useful tool for every kind of disaster training to improve preparedness.[29]

Improving willingness of health care professionals via different implementations would provide appropriate support to increase their resilience. Implementing models like "Battle Buddy" from the US Army, a system for mental health support, positively contributes to healthcare personnel's strength and willingness.[30]

Disaster Psycology

Disasters may have negative impacts on mental health. This is considered a neglected issue. Economic and social losses may trigger a mental instability that might lead to anxiety, PTSD, and depression. Elderlies, women, and children are more vulnerable to psychological distress. Therefore, they require special care. Sleeping disorders are frequent in children.

Disasters are unpredictable thus, victims usually develop a state of shock. Then denying the loss occurs. Natural disasters generally cause severe and uncontrollable stress, hopelessness, deep sorrow, and sadness. Anxiety during rainfall is the most common effect on flood victims. Alcohol and drug abuse, sleeping disorders, depression and high level of anxiety are other effects. Posttraumatic stress disorder is more frequent in man-made disaster than natural ones. Victims' resilience is the cardinal feature, which affects the course and the recovery.[31]

As a recent example, the pandemic seriously effects population's psychology. The impact grows with exposition degree. In the preparedness stage, psychological stress must be considered, and long-term effects should be studied.[32]

Recent Examples

Coronavirus disease 2019 pandemic was the recent disaster worldwide. Disaster organization during 2020 Tokyo Games was a well-planned example. By following disaster management, principles, and exhaustive planning with the contribution of experienced emergency physicians, despite the extreme hot conditions, this international triathlon competition finished without any uncontrolled trouble.[33] Unfortunately, a very recent earthquake, which was held in Turkey, was not a good organized example of disaster management. Logistics was the most ineffective part of the organization. In this case, possessing detailed plans did not lead to success. Response stage was inadequate due to tardiness. Inappropriate infrastructure was the major cause for slowness. The extent of earthquake was too large covering a quite large area about 108.812 km^2, including 2 main airport ground. Therefore, the highway conditions at nearby areas were not adequate. The expanse and severity of destruction were too large and serious. The only usable way to reach the area was airline. However, the closest active airport capacities were not sufficient, and chaos were inevitable.

To conclude, every stage of disaster management is crucial and should not be considered apart from each other. Multidisciplinary and holistic approach is essential. Planning is a must, but plans are not always useful and sufficient. Learning lessons from past devastating situations would improve the preparedness. However, disaster management is still a neglected issue almost all over the world. New innovative models constituting technological tools is lacking. There is a big gap in the literature of current studies and guidelines on disaster management.

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References

1. Briggs SM, Cherian DT, Rosales AC. Medical response to disasters. In: James Chambers, ed. *Field Guide to Global Health & Disaster Medicine*. USA: Elsevier; 2023:347-356.
2. Eryılmaz M. Terminoloji Sözlüğü. In: Eryılmaz M, Dizer U, eds. *Afet Tıbbı*. Ankara: Ünsal Yay; 2007:23-28.
3. Korkut S, Emer E. *Hastane Afet ve Acil Durum Planı (HAP) Hazırlama Kılavuzu*. Ankara: Kuban Matbaacılık Yayıncılık; 2021:17-19.
4. Hendrickson RG, Zane Horowitz B. Disaster preparedness. In: Tintinalli JE, ed. *Tintinalli's Emergency Medicine A Comprehensive Study Guide*, 8 edn. USA: Mc Graw Hill; 2016:23-29.
5. Kadıoğu M. *Afet ve Acil Durum Yönetimine Giriş*. Atatürk Üniversitesi Açıköğretim Fakültesi Yayınları; 2014:1-22.
6. Şahin Ş. Türkiye'de afet yönetimi ve 2023 Hedefleri. *Turk J Earthquake Res*. 2019;1(2):180-196.
7. Akdur R. Afetler ve Afetlerde Sağlık Hizmetleri. Türkiye Sorunlarına Çözüm Konferansı-3 21. Yüzyılda Türkiye. Ankara Üniversitesi Basımevi. 2000:1-16.
8. Eryılmaz M. Afet Sınıflaması. In: Eryılmaz M, Dizer U, eds. *Afet Tıbbı*. Ankara: Ünsal Yay; 2007:77-85.
9. (https://www.afad.gov.tr/kurumlar/afad.gov.tr/39514/xfiles/mudahale_kapasitesi.pdfLast Access Date: 02, 2023).
10. Erkal T, Değerliyurt M. Türkiye'de afet yönetimi. *Doğu Coğrafya Derg*. 2009;22:147-164.
11. Işık Ö, Aydınlıoğlu HM, Koç S, Gündoğdu O. Afet Yönetimi ve Afet odaklı Sağlık Hizmetleri. *Okmeydanı Tıp Derg*. 2012;28(2):82-123.
12. Gökcen S, Sofuoğlu T. Afetlerde Olay Yeri Yönetimi. In: Eryılmaz M, Dizer U, eds. *Afet Tıbbı*. Ankara: Ünsal Yay; 2007:245-267.
13. Çoban H. Afet sonrası İyileştirme planı Hazırlanması. *Resilience*. 2019;3(2):239-246. [CrossRef]
14. Lök U, Yıldırım C, Al B, Zengin S, Çavdar M. Şahinbey Araştırma ve Uygulama Hastanesi Hastane Afet Planı. *Akademik Acil Tıp Dergisi*. 2009;8(3):38-46.
15. Vatan F, Salur D. Yönetici Hemşirelerin Hastanelerdeki deprem afet planları Konusundaki Görüşlerinin İncelenmesi. *Maltepe Üniversitesi Hemşirelik Bilim ve Sanatı Dergisi*. 2010;3(1):32-44.
16. Öztürk N. Türkiye'de afet yönetimi: Karşılaşılan sorunlar ve çözüm Önerileri. *Çağdaş Yerel Yönetimler*. 2003;12(4):42-64.
17. Çakmak H, Er AR, Öz YC, Aker AT, İli K. 112 acil yardım Birimlerinde çalışan Personelin Marmara Depreminden Etkilenme ve olası Afetlere hazırlık Durumlarının Saptanması. *Akad Acil Tıp Derg*. 2010;2:83-88.
18. Uz Ç. Afetlerde Ambulans Hizmetleri Personeli ve Donanımı. In: Eryılmaz M, Dizer U, eds. *Afet Tıbbı*. Ankara: Ünsal Yay; 2007:397-402.
19. Koseoglu AH, Yıldırımlı H. The role of logistics in disaster management and disaster logistics issues. *J Teach Educ*. 2015;04(03):377-388.
20. Mohanty A, Chakravarty N. An epidemiological study of common drugs in the health supply chain. *J Humanit Logist Supply Chain Manag*. 2013;3(1):52-64. [CrossRef]
21. Syahrir I, Suparno VI, Vanany I. Healthcare and disaster supply chain: literature review and future research. *Procedia Manuf*. 2015;4:2-9. [CrossRef]
22. Christian MD. Triage. *Crit Care Clin*. 2019;35(4):575-589. [CrossRef]
23. Vanholder R, Sükrü Sever M, Lameire N. Kidney problems in disaster situations. *Nephrol Ther*. 2021;17S:S27-S36. [CrossRef]
24. Willson KA, FitzGerald GJ, Lim D. Disaster management in rural and remote primary health care: a scoping review. *Prehosp Disaster Med*. 2021;36(3):362-369. [CrossRef]
25. Makin S, Ross D. Priorities of primary care in disaster medicine. *BMJ Mil Health*. 2022;168(6):444-448. [CrossRef]
26. Melnychuk E, Sallade TD, Kraus CK. Hospitals as disaster victims: lessons not learned? *J Am Coll Emerg Physicians Open*. 2022;3(1):e12632. [CrossRef]
27. Gastaldi S, Horlait M. Health care organizations' interoperability during multi-organizational disaster management: a scoping review. *Prehosp Disaster Med*. 2022;37(3):401-408. [CrossRef]
28. Vanvactor JD. Health care logistics: who has the ball during disaster? *Emerg Health Threats J*. 2011;4(4):7167. [CrossRef]
29. Duan YY, Zhang JY, Xie M, Feng XB, Xu S, Ye ZW. Application of virtual reality technology in disaster medicine. *Curr Sci*. 2019;39(5):690-694. [CrossRef]. Erratum in: Curr. *Med Sci*. 2020; 40(6):1205.
30. Karimi Dehkordi N, Abbasi AF, Radmard Lord M, Soleimanpour S, Goharinezhad S. Interventions to improve the willingness to work among health care professionals in times of disaster: a scoping review. *Inquiry*. 2021;58:469580211059959. [CrossRef]
31. Makwana N. Disaster and its impact on mental health: A narrative review. *J Fam Med Prim Care*. 2019;8(10):3090-3095. [CrossRef]
32. Lindert J, Jakubauskiene M, Bilsen J. The COVID-19 disaster and mental health-assessing, responding and recovering. *Eur J Public Health*. 2021;31(suppl 4):iv31-iv35. [CrossRef]
33. Yagi M, Kasanami R, Tarumi Y, Dohi K. Medical care management based on disaster medicine for the triathlon events at the XXXII olympiad and Tokyo 2020 Paralympic Games. *Int J Environ Res Public Health*. 2023;20(19):20(19):6891. [CrossRef]