

# Application of the Plan, Do, Check, and Act Cycle in the Management of Nursing Services in Disasters: The Case of a University Hospital

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## Abstract

In recent years, the incidence of disasters has increased worldwide due to various reasons, particularly climate change, resulting in death, injury, economic loss, and environmental damage. Recent large-scale earthquakes have reaffirmed that Turkey is a country with high disaster risk. It is possible to prevent or reduce deaths, injuries, and epidemics after disasters by planning before, during, and after disasters. For the sustainability of nursing services in disasters, executive nurses should effectively perform management functions related to planning, organizing, directing, coordinating, and controlling. This study examines the nursing services provided at a university hospital where earthquake victims were transferred following the Kahramanmaraş earthquake that impacted 11 provinces on February 6, 2023. The study uses the Plan, Do, Check, and Act cycle to present the nursing activities, aiming to contribute to disaster nursing literature and guide executive nurses.

**Keywords:** Disaster, disaster nursing, nursing management, PDCA cycle

## Introduction

In recent years, the incidence of disasters has increased worldwide due to various reasons, particularly climate change, resulting in death, injury, economic loss, and environmental damage. The World Health Organization (WHO) defines a disaster as “a sudden ecological phenomenon that is unexpected, disrupts normal functioning beyond the means and capacity of the institution, and requires external assistance.”<sup>1,2</sup> These disasters, which can be of human and natural origin, can result in economic, physical, and social losses for a group or the whole society.<sup>3-6</sup>

The World Disaster Report (2020) recorded 308 disasters worldwide in 2019, resulting in 24 396 deaths and affecting the lives of 97.6 million people.<sup>7</sup> Turkey is also a country with high disaster risk, especially with large-scale earthquakes (Marmara/Gölcük and Düzce earthquakes in 1999, Van earthquake in 2011, Elazığ and Van Earthquakes in 2020, and İzmir earthquake in 2020).<sup>8,9</sup> Turkey is ranked the 12th highest-risk country in the world risk report.<sup>10</sup>

After major disasters such as earthquakes, hurricanes, floods, and forest fires in various parts of the world and Turkey, the importance of disaster preparedness has started to be emphasized.<sup>10,11</sup> Upon disasters, the need for health services increases to the highest level, creating the need for rapid and coordinated intervention that directly affects life.<sup>12</sup>

The WHO defines disasters as emergencies because they threaten human life and nature. Testing a society's emergency

response capability at the highest level requires many institutions and organizations to work in a coordinated manner.<sup>4</sup> It is possible to prevent or reduce deaths, injuries, and epidemics after disasters by planning before, during, and after disasters.<sup>13</sup> In addition, the coordination of health services is a crucial issue that should not be overlooked in order to increase the survival rates of patients and injured people after emergency intervention and disaster events.<sup>4</sup>

Nurses have provided and continue to provide health-care services during disasters throughout history, particularly large-scale disasters that have prevented the regular provision of health-care and regional emergencies that place a strain on the system.<sup>14</sup> Nurses have vital roles in many stages of health services provided in disasters.<sup>15,16</sup> One of these roles is to ensure the sustainability of health-care services provided during a disaster. In disasters, nurses are prepared to work in specialized areas such as emergency services, trauma, and intensive care, which extend to all branches of nursing. For this reason, their working areas are quite broad.<sup>17</sup> Nurses, who assume essential responsibilities at every stage of disaster planning, are held responsible for being prepared for disasters and gaining the knowledge and skills necessary for disaster conditions.<sup>18</sup> Today, patient care in disasters is defined as one of the priority issues that should be mastered by nurses working in all branches.<sup>19</sup> For this reason, there are also studies suggesting that disaster nursing should start during the nursing education process.<sup>20,21</sup>

For the sustainability of nursing services in disasters, it is necessary for executive nurses to effectively perform management functions related to planning, organizing, directing, coordinating, and controlling. In addition, they should be able to plan and administer management resources, such as human and financial resources, before, during, and after the disaster.<sup>9</sup> The fact that time management in disasters is limited in terms of planning human resources imposes more responsibility on executive nurses.<sup>22</sup>

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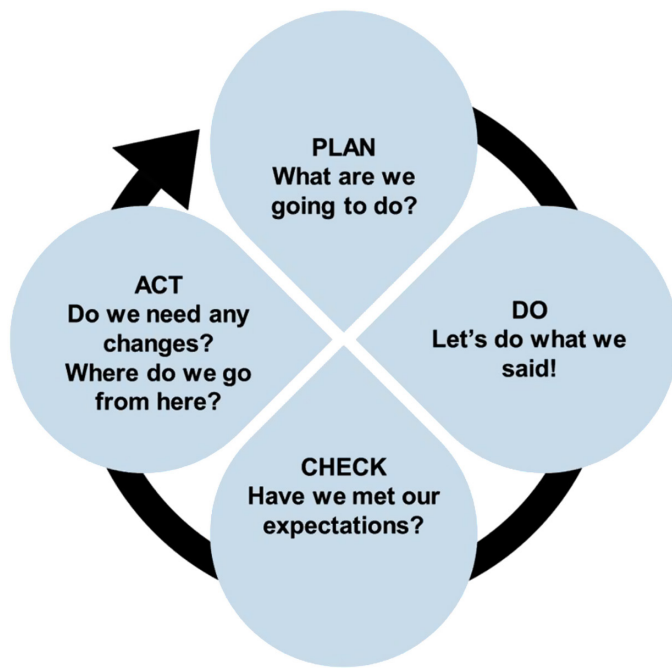
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**Figure 1.** Plan, do, check, and act cycle.

This study focuses on the nursing services provided at a university hospital to earthquake victims who were transferred due to damage to other hospitals in the region after the earthquake centered in Kahramanmaraş, which impacted 11 provinces on February 6, 2023. The study presents these nursing activities using the plan, do, check, and act (PDCA) cycle, aiming to contribute to the disaster nursing literature and serve as a guide for nurse managers. By combining PDCA management strategies with the activities of nursing services, the treatment and care processes of the injured earthquake victims were implemented quickly and efficiently. The PDCA cycle, which consists of the initial letters of the words plan, do, check, and act, is a four-stage management method used in quality processes and risk management and provides systematic information (Figure 1).<sup>23</sup> Also known as the Deming cycle, this is an effective way to solve problems and implement solutions.<sup>24,25</sup>

## Method

On February 6, 2023, 2 earthquakes of magnitude 7.7 and 7.6 struck Kahramanmaraş, affecting a total of 11 provinces in and around Kahramanmaraş. Many buildings, including hospitals, schools, universities, and public buildings, were destroyed, and tens of thousands of people were killed and many injured. The destruction of hospitals in the region led to inadequate health-care services and necessitated the transportation of injured earthquake victims.

Using the PDCA cycle model, this study explains the actions taken by the executive nurses of a university hospital that accepted earthquake victims during the preparation and maintenance phases of the process. (Table 1)

## Discussion

In this study, the nursing services activities of a university hospital during the earthquake centered in Kahramanmaraş were schematized using the PDCA cycle. Accurate and effective management of human resources is important in ensuring the rotation of health personnel affected by disasters, maintaining uninterrupted health services, and providing holistic care to individuals

affected by disasters. When the literature is examined in this context, in Yamamoto's 2013 study in Japan, in which he examined the development of disaster nursing, the problem of effective use of human resources after the Great Hanshin-Awaji earthquake in 1995 came to the fore. After this earthquake, some hospitals were flooded with patients. Although many health personnel were needed in the disaster, the lack of units and management to organize volunteers in the region prevented people from receiving health services. After this earthquake, a disaster nursing support line was developed in Japan. In this framework, professional nursing organizations, the Ministry of Health, the Japan Disaster Association, and volunteer organizations collaborated to make quick decisions and manage nurse power in disaster situations and started to work together in order to meet the needs of people in the affected area and to ensure that health-care services in other parts of the country were not disrupted.<sup>21</sup> In our hospital, firstly, nurses who were in that region or had relatives in that region were identified, and then a list of nurses who would be assigned to work voluntarily in that region in case of need was prepared.

Personnel in the area during and after a disaster tend to experience psychological problems.<sup>26</sup> Disaster stress was significantly associated with disaster competencies and disaster response motivation. This suggests that stress management among nurses is important to provide effective care during disasters. For nurses, disaster stress may affect their willingness to leave or stay in the disaster area. Therefore, disaster stress and competence are crucial to nurses' motivation to participate in disaster-related incidents.<sup>6,26</sup> In order to increase the motivation and reduce the stress of the nurses in the disaster area, the nurses were called every day, their needs were asked, and their concerns were shared.

The International Council of Nursing (ICN) and WHO have urged all nurses to prepare for disasters. In this regard, the "Disaster Nursing Competency Guide" was published by ICN in 2009. In the updated version of the guideline in 2022, ICN addressed disaster nursing in 8 basic areas and three different levels. These are preparation and planning, communication, incident management systems, safety and security, assessment, intervention, recovery, law, and ethics. It is stated that every nurse working in these areas should be able to maintain and apply these principles. The ICN also reported that all nurses, regardless of their specialty, should prepare and implement a disaster plan that best suits them.<sup>27</sup> Since this institution was located outside the disaster zone, it was prepared to provide services to patients affected by the disaster. These units' bed capacities, personnel, and material/equipment needs were provided in this direction since the need for emergency, dialysis, operating room, and intensive care units would increase. Nurses working in the relevant units were quickly identified, work lists were reorganized for patients from the disaster area, and new services were opened.

A study published in 2020, which examined the disaster preparedness of mostly Asia-Pacific countries, found that nurses had poor knowledge about disasters and described their skills as inadequate.<sup>28</sup> In 2022, Chegini's study based on the basic disaster competencies of nurses in Iran reported that nurses were inadequate in their ability to cope with disasters and considered themselves insufficient in terms of basic competencies.<sup>29</sup> The study of Almukhlifi, published in 2021, analyzed 27 different studies from 16 countries and found that particularly developing countries are less prepared for disasters than developed countries, and training of health personnel may be one of the primary reasons for this.<sup>30</sup> In the literature review study conducted by Taşkıran and Baykal in 2017 in Turkey, it was concluded that nurses in our country do not feel ready for disasters and need training.<sup>9</sup> Based

**Table 1.** Implementation of Plan, Do, Check, and Act Cycle Within the Scope of Nursing Services in Kahramanmaraş-Centered Earthquake

Plan	Do	Check	Act
The status of nurses working in our organization and on leave will be determined	All nurses working in our hospital were contacted. It was determined that 2 of our nurses who were on leave were in the area at the time of the earthquake, and 1 was trapped under the collapsed building. It was determined that out of our 82 nurses with relatives living in the earthquake zone, 60 had their houses collapsed, and 7 of them lost their relatives.	Our nurses in the earthquake zone were called every day. The health status and needs of our nurses were checked daily. The general condition of our nurse, who was trapped under the collapsed building, was confirmed to be good.	Our nurses were transferred to Istanbul, a safe city. Financial support was provided for their needs.
Nurse planning will be made for possible earthquake-victim patients	The number of nurses actively working in our hospital was reviewed. The number of emergency, operating room, intensive care, and dialysis nurses that may be needed more to care for earthquake-affected patients was identified. The shift system of the operating room and dialysis units was reorganized. Beginning from the day of the disaster, plans were made for emergency room nurses to ensure that patient transfers from the disaster area were not disrupted.	Work intensity increased in the first days in the emergency, intensive care, and dialysis units, which are the units where earthquake victims are mostly hospitalized. The shift system of the operating room and dialysis units was organized for 24 hours. Supervising nurses were ensured to take an active role in patient transfers.	Additional assignments were made to dialysis units for nurses working in other clinics holding dialysis certificates. Due to workload, nurses from other clinics were assigned to emergency, intensive care, and dialysis units. In order to ensure that the red area of the emergency department was ready for earthquake victims, attempts were made by supervising nurses to speed up patient transfers, especially under on-call conditions.
Service arrangements will be made for earthquake victims, who will be transferred to our hospital	Bed capacities in inpatient units were determined. Considering the possibility of overcapacity in the departments, "Disaster and Earthquake Victims Service" was opened. Necessary equipment and material support were provided for the newly opened service. The numbers of all patients admitted to our hospital were recorded on a daily basis and reported to the relevant units and the provincial coordination center. In cooperation with the hospital automation unit, an arrangement was made in an electronic environment for the records of earthquake victims to be determinative. Preventive measures were taken against the neglect and abuse of child earthquake patients. Changes in the health status of earthquake victims were monitored and recorded instantly.	Transferred patients were hospitalized in relevant units depending on their health needs. Patients receiving health services from our hospital were visited daily. It was checked with the daily data collected whether there were excess beds. Our relevant services accepted all patients transferred from the earthquake zone, and no patient hospitalization was at the Disaster and Earthquake Victims Service. There were no incidents of neglect or abuse of pediatric patients in our hospital. There were some difficulties in arranging safe environments for patients after discharge.	Discharge of the disaster victims, whose need for treatment and care was fulfilled, from the hospital was safely carried out with at least 1 relative or a person determined by a social service expert. Problems regarding the temporary accommodation needs of patients after discharge were reported to the hospital's top management, and measures were taken. Cooperation was ensured with the social services unit within our hospital to transfer patients to a safe environment after discharge. Discharge of child patients without parents was carried out following the procedures determined by the Ministry of Family and Social Services.
Nurse support will be provided to the disaster area	Nurses who volunteered to work in disaster zones were identified. Nurse support was provided from other departments to replace those who would go to the disaster area. Documents for deployment to disaster areas were prepared. A team was formed to transfer the care and management provided within the nursing services to a scientific environment. It was determined that although the nurses working in our hospital are experts and competent in their fields, their professional knowledge and experience are not sufficiently used by our directorate on online platforms.	All nurses deployed to the disaster area were called daily by the Directorate of Nursing Services, and information was sought about their health status and needs. Although it was observed that nurses had high sensitivity to disasters, it was also noticed that they did not have sufficient knowledge about disaster nursing. Therefore, up-to-date information on intensive care and adult and pediatric dialysis nursing was provided by video method for nurses. <sup>32,33,34</sup>	Safe transfer of volunteer nurses to the disaster area was ensured. Nurses consisting of volunteers were planned in 5 groups to ensure continuity of nurse support. The safe return of nurses whose missions ended was ensured. It was decided to organize a symposium on disaster nursing within nursing services in 2023 and to include disaster nursing in in-service training programs for nurses. For this purpose, planning has been started to share professional experience and knowledge on online platforms.

(Continued)

**Table 1.** Implementation of Plan, Do, Check, and Act Cycle Within the Scope of Nursing Services in Kahramanmaraş-Centered Earthquake (Continued)

Plan	Do	Check	Act
Solidarity and aid campaigns will be organized for earthquake victims	For inpatients and companions of earthquake survivors, a help pool called the “kindness room” was established within the nursing services for the patients’ basic needs. In order to identify and meet the needs of earthquake victims, visits were made during day and evening shifts, and the communication network was strengthened for instant needs. Volunteers from hospital staff were arranged as companions for earthquake victims without a companion. Announcements were made to nurses about blood donation. Solidarity campaigns launched for earthquake victims in the disaster zone.	Aid materials collected for the earthquake victims were delivered to the disaster zone using the university’s facilities. Blood donation booths were set up twice at the university. All the needs of earthquake victims and their relatives were met.	It was decided that the kindness room established for earthquake victims will be further developed and kept open for possible disaster situations. It was decided to organize various pieces of training and campaigns throughout the year to ensure the continuity of blood donation. A proposal was submitted to the hospital management to create a volunteer pool consisting of employees other than those providing health services in disaster situations.

on the experiences acquired during the earthquake centered in Kahramanmaraş, it was observed that nurses’ preparedness for disasters was inadequate. Accordingly, disaster nursing education was thought to take place in health institutions and organizations in undergraduate and in-service training.

Many national and international aid campaigns have been organized to meet the needs of earthquake victims in our country. In this framework, our hospital has initiated efforts to meet the needs of earthquake victims admitted to our hospital. In cooperation with the Red Crescent, a “blood donation campaign” and “aid campaign” were organized to meet the needs of the people in the earthquake zone, and a “kindness room” was established to meet the basic needs of earthquake victims and their relatives being treated in our hospital.

## Conclusion

Turkey ranks 45th among 191 countries on the Global Risk Index and is among the high-risk countries. This situation shows that Turkey should be ready for disasters at any time.<sup>31</sup> In order to prevent the disruption of health services during disasters in our country, nurses and nurse managers should be ready for disasters as if they will happen at any moment and take precautions.

In our study, the PDCA cycle was successfully applied in nursing services management in disasters. In disasters, nursing executives can actively solve existing problems and prevent possible problems by using methods that provide systematic data such as the PDCA cycle. The PDCA cycle can help standardize nursing management by developing and implementing practical nursing management approaches.

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