

## REVIEW

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# Cancer Patients During and after Natural and Man-Made Disasters: A Systematic Review

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## Abstract

**Background:** Disasters affect all social functions. In particular, hospitals must mobilize their resources for response to mass injuries. This process can affected treatment of cancer patients and may resulted in delayed care. Considering the importance of continuity of care for cancer patients, the aim of this systematic review was to identify challenges and preparedness measures for cancer patients during and after disasters. **Materials and Methods:** This systematic review that was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines between January 2000 to December 2017. The keywords searched included: “disaster,” “emergency,” “crisis,” “disruptive event,” “technological disaster,” “natural disaster,” “cancer,” “cancer patient,” “chronic disease,” “continuity of care,” and “patient with chronic disease. “The Google Scholar, ISI Web of Science, Science Direct, PubMed and Scopus databases were searched. **Results:** After screening and review of article eligibility, seven were included in the study. The selected articles were compared from several aspects. The results showed that most publications concerned all of the chronic diseases or all types of cancers. In addition breast cancer appeared a field of interest in disaster studies. Cancer studies in disaster management usually concentrated less on technological disasters. **Conclusion:** In aftermath of disasters, the concentration on measures to provide services for injuries and food, water and shelter, results in many challenges for cancer patients. Thus the health system must prepare cancer patients and caregivers for better responses to disasters. In addition, surge capacity must be considered in hospitals and other medical facilities to guarantee continuity of care.

**Keywords:** Chronic disease- disasters- cancer- social support

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## Introduction

Disasters are the adverse consequence of some natural or man-made hazards, not all of them (Coppola, 2006). Two factors affect the formation of disaster by natural hazards that included the number of people that expose to hazard and the vulnerability status and insufficient capacity (Shi, 2005). Natural disasters can be classified into several categories based on intensity, duration, and extent (Pедуzzi et al., 2009). The classification provides by the center for research on the epidemiology of disasters (EM-DAT) is based on the origin of the hazards. This classification included 5 set of disasters, geophysical disasters, hydrological disasters, meteorological disasters, climatological disasters and biological disasters (Gill, 2010). Natural disasters cause social and economic disruption and damage to the community, infrastructures, and environment and also death, injuries and other health problems (Blaikie et al., 2014). Usually, after these humanitarian catastrophes, the

social structures of the community completely collapsed and situations are going to difficulty especially for vulnerable people (Bethel et al., 2011; Raeissi et al., 2017). In natural disasters, the health system with its components can play an important role in saving lives and social support for vulnerable people (Morton et al., 2017). Initial measures after disasters focused on providing and delivering food, shelter, water and other critical requirements for affected people, managing injured patients by the disaster and response to and treatment of infectious disease and acute conditions (Ozaki et al., 2016). Patients with chronic illnesses such as cardiovascular patients, diabetes, respiratory conditions, and patients with cancers are one of the most vulnerable groups in the disastrous situations and encountered with various problems after natural or technological disasters (Kessler and Group, 2007; Heidari and Ghodusi, 2015).

After the collapse of some medical properties and overload of residual hospitals and other medical centers, providing services for chronic patients emerged as

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a critical concern (Mensah et al., 2005). Inadequately managed chronic illnesses can present a threat to life and well-being of the community in the immediate wake of these disasters, but their treatment traditionally has not been recognized as a public health or medical priority (Miller and Arquilla, 2008).

Cancer is one of the most common cause of death worldwide (Jemal et al., 2008). According to world cancer report in 2014, each year 10 million people diagnosed with all types of cancer worldwide and more than 6 million patients died from the disease annually. Currently, almost 22 million people suffered from cancer in the whole of the world (Stewart and Wild, 2017). Although incidence rates of cancer differ between countries but all societies are burned with cancer (Shahbazi et al., 2017; Mahoozi et al., 2017).

In regard to frequency of natural and technological disasters, it is essential that health system and cancer patients be prepared for these conditions. Patients with chronic diseases like cancers have several challenges and various needs during and after disasters and cancer care must continue during and after disasters. Health system should be considering surge capacity in hospitals and provide human, financial and medical equipment resources for catastrophe conditions. In this article, we are seeking challenges of cancer patients in natural disasters and preparedness measures of patients and health system for taking care for cancer patients during and after natural disasters.

## Materials and Methods

This study was a systematic review research. The present review was carried out according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Moher et al., 2010).

### Literature search and selection

A systematic literature searches of articles, books and grey literature published between January 2000 and December 2017 was conducted using the following

Major English databases including Web of Science (WOS), PubMed, Scopus, Medline, Cochrane Library, EMBASE, and CINAHL. The search was restricted to English language publications. The following keywords and their combinations were used for search: “disaster,” “emergency,” “crisis,” “disruptive event,” “technological disaster,” “natural disaster,” “cancer,” “cancer patient,” “chronic disease,” “continuity of care,” and “patient with chronic disease.”

The process of selection articles and other documents was carried out by 2 authors independently. Screening phase done by review titles and abstracts to extract relevant articles. Then the full text of selected documents was read and evaluated. Additional relevant articles gathered by reviewing the relevant article references. The duplicate articles were excluded.

### Inclusion criteria

A publication or document that was related to the treatment of cancer patients during and after natural or man-made disasters, in addition to obtaining a minimum of 8 “yes” of 12 possible according to Table 1 were included in the final review (Knobloch et al., 2011). These 12 questions are related to quality of methods, data gathering tool, target group, and the key component of the publication and analysis status.

Twelve questions that assessed quality of documents (Table 1) was considered for each publication. Publications that acquired 8 scores and higher were selected for further data extraction and analysis.

### Exclusion criteria

Publications that the full text was not available and articles that published in non-English journals were excluded.

## Results

The primary search with combinations of suitable keywords through major electronic English databases resulted in a total of 1,128 articles. Then duplicate

Table 1. The Following Questions Were Assessed for Each of the Selected Articles and Documents Relevant to Cancer Care in Disasters and Emergencies

no	Question	score	
		Yes=1	No=0
1	Are the research questions clearly stated?		
2	Is the approach appropriate for the research question?		
3	Is the study context clearly described?		
4	Is the role of the researcher clearly described?		
5	Is the sampling method clearly described?		
6	Is the sampling strategy appropriate for the research question?		
7	Is the method of data collection clearly described?		
8	Is the data collection method appropriate to the research question?		
9	Is the method of analysis clearly described?		
10	Are the main characteristics of the population well described?		
11	Is the analysis appropriate for the research question?		
12	Are the claims made supported by sufficient evidence?		

Table 2. Comparative Analysis of Selected Articles

Author (s) (year)	Title	Type of cancer	Type of disaster	challenges of cancer patients	Preparedness measures
Imamura & Ueno (2011)	How can we address cancer care after a natural disaster? (Imamura & Ueno, 2011)	All types of cancer	Earthquake Tsunami	Concentration of response actions on acute conditions, infectious diseases, obtaining shelter, food and water, and mitigating injuries; Weaken of immune system in some cases of cancers; Less of information among cancer patient in the first phase of disaster due to infrastructure corruptions; Lack of disaster knowledge among cancer caregivers.	these patients should be careful to prevent accidents or infection that may be particularly hazardous given their chronic disease status; Keep your medication logs, with the name and dose of the medication; If you have received systemic therapy that could possibly impair your immune system, avoid clean up in the disaster area; Drink plenty of fluids to prevent dehydration.
Ullman (2011)	Cancer Care During Natural Disasters (Ullman, 2011)	All types of cancer	All hazard approach especially hurricane	In disasters hospitals and other healthcare infrastructures may be destroyed, wiping out their medical records, and both physicians and patients may be forced to flee; Cancer patients are vulnerable to disaster consequences; Lapses in treatment can have an effect on treatment outcomes; Disruption of communication systems; Lack of treatment history; Lack of treatment space; Cancer care is complex. Patients don't always knows their exact diagnosis and stage, names of the chemotherapy drugs they are receiving, or where they are in their treatment cycle.	In cancer treatment, contact with colleagues is a very important part of the process; We need to educate patient about their disease, their treatment, and how to get the resources they need if uprooted again; Contact information for doctors should be known before a disaster occurs.
Bridget loehn et al. (2011)	Factors affecting access to head and neck cancer Care after a natural disaster: a post-hurricane Katrina survey (Loehn et al., 2011)	Head and neck cancer	Hurricane	Obtaining cancer treatments difficulty; Inadequate access to transportation; Factors that were found to contribute to delay in receiving treatment were an asymptomatic period caused by a slow growing tumor; Response focused on acute care; Decreasing medical resources such as fewer clinics, medical care providers, and hospitals, and reducing access to prescription medications.	Outreach programs can improve access to cancer care through various mechanisms such as mobile clinics that will provide patient access to oncologists at local sites on a scheduled basis or through dedicated transportation services that can provide scheduled pickup and drop-offs at local sites.
Arrieta, et al. (2008)	Ensuring continuity of care for chronic disease patients after a disaster: key preparedness elements (Arrieta, Foreman, Crook, & Icenogle, 2008)	All chronic diseases	Hurricane	Lack of enough information between patients; Difficulty of evacuation for chronic patient; impacting interactions between providers, providers and their patients, and provider agencies and governmental agencies due to communication collapse.	Patient education and preparedness; evacuation, particularly for special populations: patients on dialysis and/or in nursing homes, hospice and assisted living.
Kessler & Group (2007)	Hurricane Katrina's Impact on the Care of Survivors with Chronic Medical Conditions (Kessler & Group, 2007)	All chronic diseases	Hurricane	Limited access to physicians; limited access to medication; financial/insurance problems; Problems with transportation.	incorporate knowledge of local chronic care needs and build the capacity of community members to participate in planning and response.
Mensah, et al. (2005)	When Chronic Conditions Become Acute: Prevention and Control of Chronic Diseases and Adverse Health Outcomes During Natural Disasters (Mensah et al., 2005)	All chronic diseases	All natural disasters	Chronic illnesses are exacerbated by the conditions caused by a disaster (e.g., lack of food, lack of clean water, extremes of cold or heat, physical and mental stress, injury, exposure to infection) Lack of access to routine health care is a leading cause of mortality after disasters.	To ensure an adequate response, disaster preparation should be coordinated with all partners, roles should be well defined, and procedures should be clearly stated; An adequate means of communication and standardized health procedures should be available.
Ozaki, et al. (2016)	Social isolation and cancer management after the 2011 triple disaster in Fukushima, Japan (Ozaki et al., 2016)	Breast cancer	Earthquake, tsunami and nuclear accident	Social isolation is an important challenge for cancer patients in disasters and may contribute to delays; Social isolation also increases the risk of experiencing provider delay.	clinicians should be aware of, in both disaster and nondisaster settings.

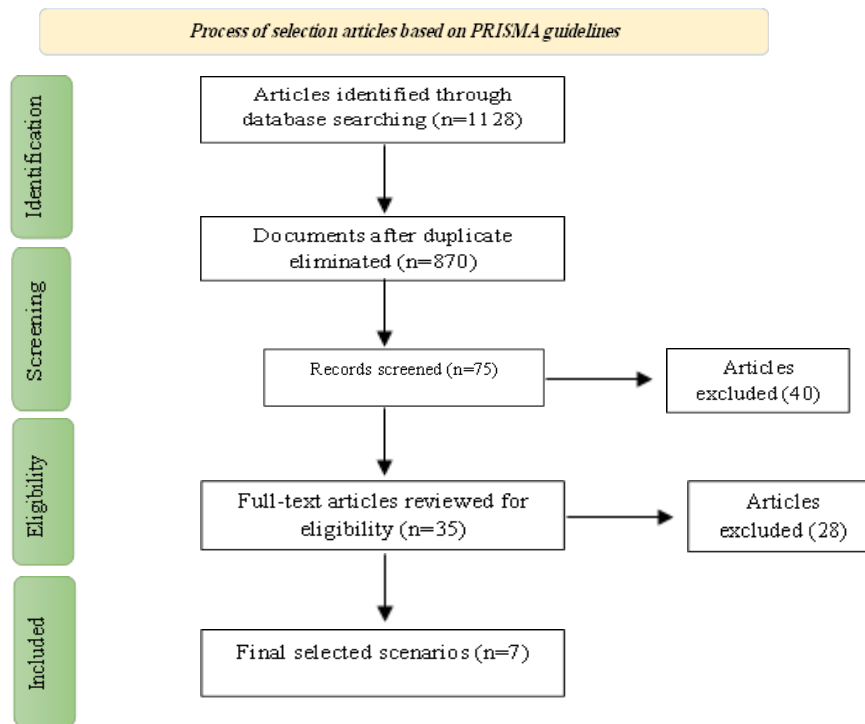


Figure 1. Process of Selection Documents Related to Cancer Care in Disasters According to PRISMA Guidelines

articles were eliminated. In this step 258 article were retrenched and total articles decreased to 870 articles. Then the gathered documents were reviewed according to titles to find the articles that were related to cancer or chronic care and cancer patients during and after disasters through systematic screening. In this step, 75 articles were selected. After that, abstracts of resident publications were reviewed and only 35 articles acquired minimum score and selected to full review and 40 articles were eliminated. In the next step, all of 35 articles were completely read by two authors independently and 7 articles that have inclusion criteria and studied at least one of all types of cancers and needs of cancer patients during and after natural or man-made disasters were selected. The process of search and selection of gathered articles based on PRISMA guidelines shows in Figure 1.

The results showed that most of the publications in which studies one of cancer care aspects in disasters considered all of the chronic diseases or all types of cancers. Just a few studies researched a specify type of cancer such as breast cancer or head and neck cancer.

Also, results demonstrated researchers concentrated on natural disasters such as the hurricane, tsunami, and earthquake especially hurricane Katrina. Few studies attend to technological or man-made disasters. In one study challenges of cancer patients after nuclear accident after earthquake and tsunami in 2011 in Japan were studied.

Studies founded cancer patients during and after disasters have multitude challenges. Challenges of cancer patients are same to formal vulnerable groups in disastrous situations. One of most repeated cancer patients' challenges is the concentration of response actions and measures on acute conditions, treatment of injuries, transportation of victims, prevention of communicable diseases, and providing food, shelter, water and other

requirements of displaced populations. This process effects on cancer patients' services and decreased access to routine healthcare services for cancer patients and patients with other chronic diseases.

Another challenge for cancer patients in disastrous situations is physically corruption of social infrastructures and medical centers. Patients with chronic conditions depend on hospitals and collapse of hospitals can affect their treatment process seriously. Also, it is difficult, access to active medical centers for patients with cancers due to the collapse of transportation infrastructures.

Lack of enough information about disasters is one another cancer care serious challenges during disasters. Both patients and caregivers need to have enough knowledge about disasters.

Social isolation is another important challenge between cancer patients during and after disasters. Because of the specific situation of affected areas, usually, cancer patients become alone and lost their social support. This social isolation makes patient's situation more difficult.

## Discussion

The number of studies that studied problems and challenges of cancer patients in natural or man-made disasters especially in developing countries is low (Hatch et al., 2005).

The results showed most of the cancer studies in disaster planning concentrated on natural disasters such as the earthquake, tsunami, and hurricane. It's essential to study challenges of cancer patients during and after floods that are one of the most common natural disasters whole of the world (Alderman et al., 2012). In recent years due to climate changes, the number of reported catastrophe floods increased in most countries (Alfieri et al., 2015). These floods collapsed medical centers that cancer patient

need to these places seriously. In addition, these studies included a gap in technological or man-made disasters. In this case, studying challenges of cancer patients during wars and social conflicts is important because of the high prevalence of these intentional disasters in the current century. Most countries in Middle East encountered with international and national wars and conflicts (Amery, 2002).

Most of the published studies in cancer field considered all types of cancers and used a general approach. Few studies in regarded to women vulnerability to disasters studied breast cancer. Because of different procedures for treating different types of cancer, it's necessary to study challenges of cancer patients in all types of cancers. This help planners and policymakers to better preparedness against disasters.

Lack of treatment history in the cancer patients encountered patients with many problems during and after disasters. So protection of patient's case has an important role. Patients must accompany their treatment records (Yzermans et al., 2005). Electronic databases of medical information can help to meet these gap. Preparedness plans must carry out to educate cancer patients about their disease, their treatment, and how to get the resources they need during disasters. Also to ensure an effective response, disaster preparedness should be coordinated with all stakeholders, roles should be well defined, and procedures should be clearly stated. Clinicians must good educate for response to disasters and how to take care of cancer patients during and after disasters. In addition, it should be developing a guidance for delivering routine care for cancer patients in disastrous situations.

Immediately after disasters, communication would severely limit, impacting interactions between providers, providers and their patients, and provider agencies and governmental agencies (Nijkrake et al., 2015). For effective treatment of cancer patients, an adequate means of communication and standardized health procedures should be available (Ghanizadeh et al., 2017). Communication infrastructures may be completely collapsed after catastrophe events. Thus the healthcare system must be prepared for these situations and develop a response plan for communication collapsing.

However, routine public health and patient education regarding options for reaching their cancer care providers in the event of a natural or man-made disaster can empower the patients to seek and receive care after the acute phase of disaster settings as well.

The results demonstrated that most important challenges of cancer patients in disastrous situations the concentration of response measures on acute conditions, treatment and transportation of injuries, management of casualties and dead bodies, and providing food, shelter, water, and other requirements for displaced victims during and immediately after disasters. To solve this problem, the healthcare system must pay attention to surge capacity and business continuity plans. Business continuity programs ignored in healthcare organizations and these organizations suffered from lack of attention on business continuity programs.

In conclusion, cancer patients during and after disasters

encountered with many challenges such as less importance of help to patients with chronic diseases for responders and emphasize on the management of injuries and prevent communicable diseases and providing basic requirements for victims and displaced populations. Another major challenge is lack of medical history for cancer patients and less information about cancer treatment in disastrous situations between patients and caregivers.

For mitigation and preparedness, there must be developed an action plan for providing necessary care to cancer patients based on guidelines. In addition, must be carried out education programs about disasters for both patients and clinicians.

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