Determining Key Influences on Patient Ability to Successfully Manage Noncommunicable Disease After Natural Disaster

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Abstract

Introduction: Natural disasters often damage or destroy the protective public health service infrastructure (PHI) required to maintain the health and well-being of people with noncommunicable diseases (NCDs). This interruption increases the risk of an acute exacerbation or complication, potentially leading to a worse long-term prognosis or even death. Disaster-related exacerbations of NCDs will continue, if not increase, due to an increasing prevalence and sustained rise in the frequency and intensity of disasters, along with rapid unsustainable urbanization in flood plains and storm-prone coastal zones. Despite this, the focus of disaster and health systems preparedness and response remains on communicable diseases, even when the actual risk of disease outbreaks post-disaster is low, particularly in developed countries. There is now an urgent need to expand preparedness and response beyond communicable diseases to include people with NCDs.

Hypothesis/Problem: The developing evidence-base describing the risk of disaster-related exacerbation of NCDs does not incorporate the perspectives, concerns, and challenges of people actually living with the conditions. To help address this gap, this research explored the key influences on patient ability to successfully manage their NCD after a natural disaster.

Methods: A survey of people with NCDs in Queensland, Australia collected data on demographics, disease, disaster experience, and primary concern post-disaster. Descriptive statistics and chi-square tests with a Bonferroni-adjustment were used to analyze data.

Results: There were 118 responses to the survey. Key influences on the ability to self-manage post-disaster were access to medication, medical services, water, treatment and care, power, and food. Managing disease-specific symptoms associated with cardiovascular disease, diabetes, mental health, and respiratory diseases were primary concerns following a disaster. Stress and anxiety, loss of sleep, weakness or fatigue, and shortness of breath were common concerns for all patients with NCDs. Those dependent on care from others were most worried about shortness of breath and slow healing sores. Accessing medication and medical services were priorities for all patients post-disaster.

Conclusion: The key influences on successful self-management post-disaster for people with NCDs must be reflected in disaster plans and strategies. Achieving this will reduce exacerbations or complications of disease and decrease demand for emergency health care post-disaster.

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Abbreviations:
HHS: Hospital and Health Services
NCD: noncommunicable disease
PHI: public health service infrastructure
WHO: World Health Organization

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Introduction

The United Nations has recognized the risk disasters pose to people with noncommunicable disease (NCD) in the *Sendai Framework for Disaster Risk Reduction: 2015–2030* (Sendai Framework).[1] The Sendai Framework item 30(k) recommends that people with life-threatening and chronic diseases are included in the design of policies and plans to manage their risks before, during, and after disasters.[1] This recommendation builds on the World Health Organization (WHO; Geneva, Switzerland) *Global Action Plan for the Prevention and Control of Noncommunicable Diseases – 2013-2020* (Action Plan).[2]

Noncommunicable diseases are rarely cured, prolonged illnesses that are not passed from person to person.[3,4] There are four major groupings that account for 79% of NCD deaths globally: cardiovascular diseases; cancers; chronic respiratory diseases; and diabetes.[2,4,5] Other groupings include obesity and mental health conditions.[3–6] Almost three-quarters of all NCD deaths, and 82% of people who die prematurely (before reaching 70 years of age), occur in low- and middle-income countries.[7,8] The World Economic Forum (WEF; Cologny, Switzerland) regularly ranks NCD risks on par with fiscal crisis and is only exceeded by the impact of an asset price collapse, or the increase in oil and gas prices.[9] Despite this, the traditional focus of disaster and health system focus before, during, and after disaster has been on communicable diseases and immediate trauma, but the risk is low, particularly in developed countries.[10]

Natural disasters often damage or destroy the protective public health service infrastructure (PHI) required to maintain the health and well-being of those affected.[11,12] This is particularly problematic for people with NCDs, where interrupted access to PHI can increase the risk of an acute exacerbation or complication of their condition, potentially leading to a worse long-term prognosis or result in death.[13–15] Noncommunicable disease conditions also account for the majority of the disease burden, health care costs, and deaths globally.[16,17] People with cardiovascular and respiratory diseases, unstable diabetes, mental health conditions, renal diseases, and those undergoing cancer treatment are at greatest risk post-disaster.[11,13] This risk was demonstrated during Hurricane Katrina (2005) where 33% of people presented to emergency shelters with NCD exacerbation before, during, and after the event.[18] Following Hurricane Sandy (2012), cardiac incidence increased by 22% and mortality of people with NCDs by 31%.[13,19]

Disaster-related exacerbations of NCDs will continue, if not increase, due to a sustained rise in the frequency and intensity of disasters, along with rapid unsustainable urbanization in flood plains and storm-prone coastal zones.[1,20–22] However, the focus of disaster and health systems response remains on communicable diseases and immediate trauma, despite a low-risk of disease outbreaks post-disaster in developed countries.[11,13,15] For this reason, there is an urgent need to expand the health response beyond communicable diseases and immediate trauma to include people with NCDs.[13,23]

There is a developing evidence-base describing the risk of disaster-related exacerbation of NCDs.[8,11,13–15,24–26] However, this existing literature does not incorporate the perspectives, concerns, and challenges of people actually living with a NCD. To help address this gap, the objective of this research was to explore the key influences on patient ability to successfully manage their NCD after a natural disaster.

Methods

A survey of people with a NCD using SurveyGizmo (operated Widgix Software, LLC; Boulder, Colorado USA) was undertaken, which asked research participants a series of open and closed questions regarding their concerns regarding management of their NCD following a natural disaster. Questions related to: the type of disaster experienced; if they needed others to help manage their condition; the signs and symptoms of greatest concern; their treatment and care issues and priorities post-disaster; and demographic information. The face-validity of the survey was tested prior to launching with a group of people (n = 5) using convenience sampling.

Participants

To be eligible for inclusion in this study, participants had to be living in the State of Queensland, Australia, and self-reported as having both a self-reported NCD and experienced a disaster. In Queensland, NCDs are responsible for 90% of all deaths, are responsible for 83% of recurrent health expenditure, and are 88% of the burden of disease (there are similar trends across Australia).[17] These conditions include, but are not limited to, people with cardiovascular diseases, cancers, chronic respiratory diseases, diabetes, mental health conditions, and renal diseases.

Research Location

The research was conducted in the State of Queensland, Australia. Health services in Queensland are delivered by 16 Hospital and Health Services (HHS) with a centralized Department of Health providing overall management, including monitoring performance.[27] The term "Queensland Health" refers to both the Department of Health and HHS.[28] Approximately one in eight people in Queensland are aged 65 years or older, with the proportion forecast to increase to one in five by 2036.[8] The majority of the land mass (90%) is remote or very remote with 97% of the population (4.9 million; 20% of Australia) clustered in coastal and hinterland areas.[29,30] Queensland's land mass is 1.7 million square kilometers, two-and-one-half-times the size of Texas (USA), seven-times Great Britain, and five-times Japan.[31,32]

Recruitment Strategy

A purposive sampling strategy was used to recruit participants.[33] This included 25 letters and e-mails to government organizations (n = 7), non-government organizations (n = 8), and NCD support agencies (n = 10) seeking support to complete and distribute the survey across Queensland to people with a NCD.

Data Collection and Analysis Techniques

A survey was used to electronically collect data via SurveyGizmo and was completed by participants from September 21 through December 22, 2016. There were 156 surveys returned, and after excluding incomplete surveys and those where the respondent had not previously experienced a disaster, 118 were analyzed. The survey was tested and refined before being launched. This process included a review by all authors and testing with people working in disaster management and/or had a NCD (n = 5).

The data collected were downloaded and imported into SPSS Statistics Version 23 (IBM Corp.; Armonk, New York USA). For the closed questions, descriptive statistics were used to analyze demographic data and Chi-Square tests conducted to test significance of the categorical variables for signs and symptoms with $P < .05$ considered statistically significant.[34] The Pearson Chi-Square test was used where cells had a count above five and Fisher's Exact Test when the count was below five.[35] As there were 15 categories tested, the probability (P) value was adjusted

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(recommended when more than two variables).[36,37] A Bonferroni-adjustment was made with the new statistical significance being $P < .003$.[36,37] The open-ended questions related to concerns zero to seven days and eight to 28 days post-disaster. The zero to seven days period related to the impact and rescue phase and the eight to 28 days to the post-impact phase.[38] This timeframe was not extended further as the research focused on understanding concerns post-disaster, not during recovery. A thematic analysis was undertaken by hand to analyze these data and included the phases of: organizing data into key phrases, ideas, and concepts, followed by data classification and interpretation.[33]

Ethical Considerations

Ethical approval was provided by: James Cook University (H6646), Queensland, Australia; and Townsville Hospital and Health Service Human Research Ethics Committee (HREC/16/QTHS/67), Queensland, Australia. This was complemented by letters to organizations seeking permission to invite staff, members, and people with NCDs who had experienced a disaster to participate in the research.

Results

Demographics

A total of 156 surveys were returned. After excluding surveys where mandatory questions were not completed and a respondent had not previously experienced a disaster, 118 surveys were analyzed. Of the surveys analyzed, 63% of participants were female, 36% male, and one person did not wish to indicate their gender (Table 1). The highest age grouping was 45 to 54 (31%), followed by 55 to 64 (29%), 18 to 44 (22%), and 65 or older (17%); one person chose to not answer. The majority of participants had experienced a cyclone (86%), followed by flood (60%), bushfire (28%), earthquake (10%), and tornado (2%). The other disaster experiences were a storm (n = 1) and heatwave (n = 1).

The top three NCDs reported were respiratory conditions (n = 33), cardiovascular diseases (n = 31), and mental health (n = 25). The other conditions (n = 28) included: autoimmune diseases (n = 3), coeliac disease (n = 3), hashimoto's disease (n = 3), multiple sclerosis (n = 3), arthritis (n = 3), inflammatory bowel syndrome (n = 2), spinocerebellum ataxia (n = 2), fibromyalgia, meniere's disease, peripheral neuropathy, prostatic hyperplasia, sleep apnea, and thyroid conditions. Two participants also had a pancreatic transplant. One participant indicated "other" as their NCD but did not complete the non-mandatory sub-question.

Forty-seven percent of participants were involved in disaster management. This group included responders (doctors, nurses, or paramedics); coordinators (disaster coordinator/planner, disaster management officers, and members of disaster groups); and government officials (people with a state-wide role in disaster management). [8] The most frequently reported role was a paramedic at 25%. This was followed by emergency services (for example, police officer or firefighter; 21%), nurse (16%), administration officer (13%), manager (9%), disaster coordinator/planner (7%), volunteer (5%), doctor (4%), social worker (4%), and rescue helicopter crew member (2%). Of these roles, five percent were volunteers, which included government emergency reserve, fire fighter, and food provision worker (Lions Australia; New South Wales, Australia).

Signs and Symptoms of Concern Post-Disaster

The key concerns that research participants identified in regards to signs and symptoms of NCDs included stress and anxiety (50%), loss of sleep (36%), weakness or fatigue (36%), shortness of breath (24%), chest pain or discomfort (18%), chronic pain (16%), and chest infection (14%; Table 2).

Stress and anxiety was an issue for 84% ($P < .003$; 71% female and 29% male; 57% involved in disaster management) of participants with mental health conditions (Table 2). For people with respiratory conditions, 67% ($P < .003$; 73% female and 27% male; 27% involved in disaster management) were worried about shortness of breath and 36% ($P < .003$; 67% female and 33% male; 33% involved in disaster management) a chest infection. Chest pain and discomfort was a concern for 52% ($P < .003$; 75% male and 25% female; 31% involved in disaster management) of those with cardiovascular diseases, and no other issues were identified by this group. Hypoglycemia was a sign and symptom of concern for 47% ($P < .003$; 63% male and 37% female; 37% involved in disaster management) of people with diabetes. Weakness or fatigue was a concern for 64% ($P < .003$; 94% female and six percent male; 56% involved in disaster management) of people with other NCDs. No signs and symptoms were statistically significant for participants with cancer and renal diseases.

Concerns Post-Disaster

The key concern after a disaster was access to medication (Table 3). Participants were also concerned about having access to: medical services, water, treatment and care, power, and food. These issues were of most concern during the first week after a natural disaster, and were most frequently reported by participants with cardiovascular disease, diabetes, mental health conditions, renal diseases, respiratory diseases, and other NCDs. For research participants who self-reported as having cancer, accessing appropriate treatment and care was the primary concern. Medication remained the priority for participants during the eight to 28-day period with cardiovascular diseases, diabetes, mental health conditions, respiratory diseases, and renal diseases. For people with cancer and other NCDs, access to appropriate medical services was the main concern during the eight to 28-day period after a disaster.

Dependency on Others to Manage Condition

Thirty percent of research participants self-reported as being dependent, at some stage, on others to manage their condition (Table 4). This dependency was most frequently reported by participants with renal diseases (50%), cardiovascular diseases (29%), cancer (27%), respiratory conditions (27%), diabetes (24%), and mental health conditions (24%). For people with other conditions, 39% self-reported as being dependent. The dependency on others to manage their condition after a disaster also varied by sign and symptom of concern with 75% indicating shortness of breath. This was followed by slow healing sores (74%), numbness or swelling in the hands and feet (73%), excessive thirst (60%), chest pain or discomfort (58%), and nausea and vomiting (57%).

Discussion

The influences for successful self-management must be reflected in disaster plans and strategies to maximize treatment and care for people with NCDs before, during, and after a disaster. These influences include access to medication, medical services, water, treatment and care, power, and food. By understanding these influences, disaster and health planners can develop strategies that enable effective self-management and integrate the role of health professionals, family, friends, and the broader community into teaching individuals to identify challenges and solve problems associated with their illness.[39] Achieving this will assist in better mitigating, from the standpoint of the patient, the anticipated risks of their health outcomes,

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Signs and Symptoms (n = 155)	Concern	Dependent
Chest Infection (n = 1)	9%	36%
Chest Pain or Discomfort (n = 21)	9%	58%
Chronic Pain (n = 19)	27%	47%
Diarrhea (n = 13)	9%	26%
Excessive Thirst (n = 9)	9%	60%
Hypoglycemia (n = 10)	0	36%
Increased Hunger (n = 2)	0	29%
Loss of Sleep (n = 42)	55%	39%
Nausea/Vomiting (n = 12)	0	57%
Numbness/Swelling in Hands and Feet (n = 11)	27%	73%
Shortness of Breath (n = 28)	27%	75%
Slow-Healing Sores (n = 8)	0	74%
Stress and Anxiety (n = 59)	64%	32%
Weakness or Fatigue (n = 43)	55%	42%
Other (n = 14)	9%	23%

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Table 4. Signs and Symptoms by Dependency
Note: The concern column reflects the number of participants who indicated they were concerned about this sign and symptom (linked with Table 2). The dependent column is proportion of these participants who require care from others to manage their condition. Some participants responded twice to the signs and symptoms.

acute exacerbations, or complications, both during and post-disaster, resulting in a more engaged and informed community, which will be much more resilient during the next natural disaster.

This research provides the platform required for disaster and health planners to justify the need to integrate the perceived concerns and challenges faced by people with NCDs into disaster planning. For example, disease-specific signs and symptoms were the common concerns after a disaster for people with cardiovascular diseases, diabetes, mental health, and respiratory diseases. Stress and anxiety, loss of sleep, weakness or fatigue, and shortness of breath were signs and symptoms of concern across all NCDs. For those dependent on others to manage their condition, the main concerns were shortness of breath, slow healing sores, numbness or swelling in the hands and feet, and excessive thirst. In addition, those dependent on care from others were most concerned about medication, medical services, power, transport, and water in the first 28 days after a disaster.

By ensuring that disaster and health planning properly address the challenges faced by people with NCDs, there will be better mechanisms for self-management, delivery of health services, and health outcomes improved for those impacted by a disaster. Strategies for achieving this are discussed in the following.

Targeted Strategies

Focusing on the provision of medications and medical services for people with NCDs would help improve the ability of patients to self-manage their NCD following a disaster. From a mitigation perspective, this would involve initiatives such as education on the need for supplies of medications and having plans in place for managing their NCD at home. A response strategy could include the use of telemedicine for consultations and alternative transport mechanisms such as drone-aided delivery and pick-up of medication and test kits for people with NCDs.[40] This would be completed by mapping of NCD risk profiles at local and state levels as part of preparedness activities and, if possible, during the response and recovery phases.[11] Beyond medication and medical services, which was the greatest concern for all participants, the three priorities for the dependent group were power, transport, and water. Strategies for addressing these concerns could include: back-up power for people reliant on medical equipment; multiple transport options (including cars, boats, buses, and aircraft); and evacuation of people reliant on safe water for treatment.[11]

Strengthening the Role of Primary Health in Disaster Management

A focus on strengthening primary health care role in the disaster setting and integrating this sector into existing systems and mechanisms is required. In Australia, this sector provides the majority of treatment and care for people with NCDs.[41–43] This would include streamlining access to prescription medications and connecting those who are dependent on others to manage their condition with treatment and care outside the acute care setting (hospital). To achieve this, there must be training, support, and communication provided to the primary health care workforce (carers, clinicians, nurses, and pharmacists) on how they can be integrated into all levels of the disaster management system.[10,44]

Progress has been made in strengthening the role of primary health care in the disaster system with the United Nations International Strategy for Disaster Reduction (UNISDR; Geneva, Switzerland) Office for Northeast Asia and Global Education and Training Institute (Incheon, Korea) partnering with the Northern Queensland Primary Health Network (Queensland, Australia) to deliver primary health sector workshops in Australia.[45] The outcome of these workshops was enhanced awareness among disaster stakeholders and the role primary health care plan before, during, and after disasters. This initiative was a good start; however, further work is required to ensure the disaster and health systems can sustainably meet the treatment and care needs of people with NCDs before, during, and after a disaster. This would include developing options beyond acute care (for example, emergency department) for people with NCDs to rapidly access the required treatment and care post-disaster. For example, 80% of primary care clinicians would be willing to assist after a disaster; however, only 20% consider themselves well-prepared to respond.[46] This demonstrates the desire of this sector to be further engaged and integrated into the disaster system. Ultimately,

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improving the primary health care capacity and capability will enhance the disaster response for people with NCDs by reducing the post-disaster burden on hospital emergency departments.[47]

Understand the Ratio of People with NCDs Who are Dependent on Care from Others

To help determine treatment and care resources required before, during, and after a disaster, planners must understand the proportion of people with NCDs who rely on others to manage their condition. This research identified a baseline figure of 30%; however, there is little to no other data available. A "dependency ratio" of seven percent has been identified for developed countries. This is the prevalence of those requiring daily assistance from another person in carrying out health, domestic, or personal tasks in proportion to the "working-age" population.[48] Meanwhile, in the USA, among those aged over 65 years, the dependency rate is estimated to be 21%.[49] Further research is required to understand the rate of dependency, to identify the type of care required, and to determine if this varies by severity of the NCD.

Incorporating Perspectives of People with NCD into Disaster Management Systems

Perspectives of people with NCDs must be incorporated into the "all hazards" and "all agencies" approach to disaster management to ensure seamless introduction of mitigation strategies into practice.[20,50] In Australia, this includes prevention, preparedness, response, and recovery phases of the disaster cycle, which are delivered through collaborative partnerships with all agencies, organizations, and communities.[20] Integrating into this system is vital to help ensure relevance and implementation of the needs of people with NCDs. For example:

- Prevention and Preparedness Phases: Gathering data to understand the NCD burden (including those who are dependent on others to maintain their condition), review of health service (including facility) disaster readiness, and arrangements in-place to support health professionals care for people with NCDs (ideally general practitioners) to help patients develop a personal management plan for disasters.[51] The personal management plan would be jointly developed by health professionals and their patients, and include, but not be limited to, key contacts, strategies for storing medication, food and water, medication requirements, and locations of alternate treatment and care sites.
- Response and Recovery Phases: Rapid assessments could include essential PHI for people with NCDs such as communication, equipment, supplies, transport, and the workforce.[11] This would be followed by disaster and health planners mapping service provision and using this to focus on supporting primary health care, circulating information about service availability, and promotion of self-care through media mechanisms (for example, television, radio, and social media).[51]

Integration with Social Determinants of Health

Application of the social determinants of health provides another platform for all government and non-governmental agencies to meet the needs of people with NCDs across the disaster cycle (prevention, preparedness, response, and recovery). The social determinants of health are important because they are the conditions in which people are born, grow, work, live, and age, and the wider set of systems shaping the conditions of daily life.[52] Also, people from poorer social or economic circumstances are at greater risk of poor health than people who are more advantaged.[53] For example, low levels of education and literacy are linked to poor health status, poverty reduces access to health care services, and smoking is associated with lower socio-economic status.[54,55] All are factors that influence an individual's and the communities' ability to prepare for and recover from a disaster. The areas of action could be aged care, education, housing, health care services, living and working conditions, and water and sanitation.[53] To achieve this, leaders in the government, non-governmental, and private sectors need to understand that NCD morbidity and mortality post-disaster can be influenced by access to treatment and care. Implementation would require a collaborative governance approach due to the range of sectors and agencies directly and indirectly involved.[8]

Monitoring and Performance Indicators

The key influences on effective self-management of NCDs following a natural disaster must be incorporated into disaster management system monitoring and performance indicators. This would help track preparedness and ensure accountability beyond disaster and health planners. Input would be required from multiple stakeholders to ensure specific, measurable, achievable, and relevant indicators.[51] A collaborative governance approach could be used to achieve this due to the sectors, disciplines, and organizations involved.[56] This would be an amalgamation of organizations beyond the current disaster management system (primarily governmental) to allow non-governmental organizations such as universities, the primary health care sector, and community members to participate in formal and informal disaster meetings.[57] This would complement the comprehensive approach to disaster management in Queensland, Australia, the social determinants of health, and hold government and non-government organizations to account.[11,58]

Finally, the findings and strategies presented add value across the world for developing and developed countries with similar NCD burdens and disaster risks. As in Queensland, Australia, a combination of population aging, increasing obesity and being overweight, decreasing physical activity, environmental change, and reduction in communicable disease in populations across the world has contributed to a "disease transition" to NCDs.[4,23,59,60] Also, developing countries generally have limited capacity to provide adequate treatment and care for people with NCDs compared with developed countries.[4] The international relevance of these findings are complemented by alignment with the Sendai Framework item 30(k) (focused on NCDs) and the WHO *Global Action Plan for the Prevention and Control of Noncommunicable Diseases – 2013-2020*.[1,2] All highlight that the research findings can be applied and transferred to disaster and health systems in other countries with similar risks.

Limitations

The research focused on one state in Australia (Queensland) where weather-related disasters are the greatest disaster risks. Future research should include a more representative sample of the population. The findings are limited by the sample size. To increase generalizability, the authors grouped the results for all NCDs together when conducting the analysis. Future studies should increase the sample size for each of the NCD groups across disaster-prone areas. There was a skew towards survey responses to North Queensland (Cairns and Townsville) followed by Brisbane, the capital. However, this skew represents the most commonly impacted areas by disasters in Queensland. The severity of disaster experienced may have varied between participants. For this reason,

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caution should be taken if applying the results to other disaster types and areas with different disaster burdens. However, the findings may be transferable to other locations with a similar disease burden and disaster types/impacts. Another limitation is that this study was conducted in a high-income per capita setting, limiting the transferability of the findings to low- and middle-income countries. As the NCD priorities, PHI and disaster system will differ in these areas, it is important for further research to be conducted in low- and middle-income populations.

Evidence of medical diagnosis and disaster experience was not required to complete the survey. The self-reporting approach questions the validity of conditions and disaster experience of those completing the survey. However, the survey circulation and supporting information was targeted at people with NCDs, which would have helped minimize the impact of this limitation. Also, this method ensured the level of NCDs did not preclude them from completing the survey (for example, disability). It is important that this limitation be considered when interpreting the findings.

Another limitation is that the survey did not explore why respondents answered in a certain way. For example, what was it about the things that they listed as being their key concerns that made them concerned? Also, how did they define stress and anxiety and other concerns? It is recommended future research in this area focus on the "why" factors.

Despite these limitations, this research represents an important and new contribution of knowledge by describing the concerns and challenges faced by people with NCDs, a perspective that has been previously lacking in existing evidence.

Conclusion

Understanding the key influences on successful self-management of NCDs following a natural disaster is integral to maximize treatment and care before, during, and after a disaster. Effective self-management support from health professionals, family, friends, and the broader community teaches people with NCDs to take an active role in their treatment and care and reducing demand on health systems post-disaster. Key influences on self-management include access to medication; medical services; water; treatment and care; power; and food. These issues are of most concern during the first week (zero to seven days) after a natural disaster. Access to medication is a priority for participants during the eight to 28-day period after a disaster. Stress and anxiety, loss of sleep, weakness or fatigue, and shortness of breath are common concerns for all patients with NCDs. Those dependent on care from others were most worried about shortness of breath and slow healing sores. By understanding these influences and concerns, disaster planners can develop strategies to improve the ability of patients to self-manage their NCD. Achieving this will assist in better mitigating, from the standpoint of the patient, the anticipated risks of their health outcomes, acute exacerbations, or complications, both during and post-disaster, resulting in a more engaged and informed community, which will be much more resilient during the next natural disaster.

Disclaimer

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Daniel K. Inouye Asia Pacific Center for Security Studies (Honolulu, Hawaii USA), the Department of Defense (Arlington, Virginia USA), or the US Government.

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		Cancer (n = 11)	Cardiovascular (n = 31)	Diabetes (n = 17)	Mental Health (n = 25)	Renal (n = 10)	Respiratory (n = 33)	Other (n = 28)	Overall (N = 118)
Gender	**Female (N = 74)**	73%	36%	41%	68%	70%	76%	86%	63%
	Male (N = 43)	27%	65%	59%	32%	20%	24%	14%	36%
	Prefer Not to Answer	0%	0%	0%	0%	10%	0%	0%	1%
Age Group	**18-44**	9%	13%	6%	40%	30%	33%	0%	22%
	45-54	9%	26%	35%	32%	40%	24%	43%	31%
	55-64	46%	39%	47%	24%	20%	12%	32%	29%
	65 +	36%	23%	12%	4%	0%	30%	18%	17%
	Prefer Not to Answer	0%	0%	0%	0%	10%	0%	0%	1%
Had a Role in Disaster Management		18%	42%	41%	56%	30%	36%	54%	47%
Region by Hospital and Health Service	**Brisbane**	9%	19%	29%	16%	20%	15%	7%	19%
	Cairns and Hinterland	46%	32%	12%	28%	10%	42%	46%	31%
	Central Queensland	0%	0%	6%	4%	0%	6%	7%	3%
	Darling Downs	0%	0%	6%	4%	0%	0%	0%	2%
	Mackay	0%	16%	12%	16%	10%	9%	0%	10%
	Sunshine Coast	0%	0%	0%	4%	0%	0%	4%	2%
	Townsville	46%	26%	29%	16%	30%	21%	25%	28%
	West Moreton	0%	6%	0%	0%	0%	0%	0%	2%
	Other	0%	0%	6%	12%	30%	12%	11%	4%
Disaster Type Experienced	**Bushfire**	9%	32%	18%	32%	30%	42%	21%	28%
	Cyclone	100%	84%	82%	84%	70%	88%	93%	86%
	Earthquake	18%	13%	0%	20%	20%	9%	11%	10%
	Flood	46%	55%	65%	60%	80%	58%	54%	60%
	Tornado	9%	3%	0%	0%	0%	0%	0%	2%
	Other	0%	3%	0%	4%	10%	3%	0%	2%
Dependent on Others for Care		27%	29%	24%	24%	50%	27%	39%	30%

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Table 1. Demographics

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	Cancer (n = 11)		Cardiovascular Disease (n = 31)		Diabetes (n = 17)		Mental Health (n = 25)		Renal Diseases (n = 10)		Respiratory Condition (n = 33)		Other (n = 28)		Overall (N = 118)
Signs and Symptoms of Concern	%	χ^2	%	χ^2	%	χ^2	%	χ^2	%	χ^2	%	χ^2	%	χ^2	%
Chest Infection	9%	p=1.0	13%	p=1.0	0	p=.127	8%	p=.521	20%	p=.636	**36%**	**p=<.003**	4%	p=.070	14%
Chest Pain or Discomfort	9%	p=.686	**52%**	**p<.003**	6%	p=.302	4%	p=.043	10%	p=.689	21%	p=.595	0	P=.003	18%
Chronic Pain	27%	p=.381	16%	p=1.0	12%	p=1.0	12%	p=.761	30%	p=.202	21%	p=.405	25%	p=.151	16%
Diarrhea	9%	p=1.0	3%	p=.180	6%	p=.689	16%	p=.470	20%	p=.303	15%	p=.512	14%	p=505	11%
Excessive Thirst	9%	p=1.0	10%	p=.696	6%	p=1.0	12%	p=.397	10%	p=.563	12%	p=.264	11%	p=.441	8%
Hypoglycemia	0	p=1.0	7%	p=1.0	**47%**	**p<.003**	8%	p=1.0	0	p=1.0	9%	p=.684	0	p=.195	9%
Increased Hunger	0	p=1.0	0	p=1.0	0	p=1.0	4%	p=.380	10%	p=.163	0	p=1.0	0	p=1.0	2%
Loss of Sleep	55%	p=.195	32%	p=.671	41%	p=.785	60%	p=.005	40%	p=.742	33%	p=.832	43%	p=.374	36%
Nausea and Vomiting	0	p=.601	10%	p=1.0	6%	p=1.0	12%	p=.716	30%	p=.065	3%	p=.175	21%	p=.035	10%
Numbness/Swelling in Hands and Feet	27%	p=.066	13%	p=.476	24%	p=.052	4%	p=.454	10%	p=1.0	12%	p=.498	11%	p=.721	9%
Shortness of Breath	27%	p=.721	29%	p=.464	6%	p=.070	20%	p=.793	10%	p=.448	**67%**	**p=<.003**	4%	p=.004	24%
Slow-Healing Sores	0	p=.1.0	7%	p=1.0	6%	p=1.0	4%	p=1.0	10%	p=.519	9%	p=.684	7%	p=1.0	7%
Stress and Anxiety	64%	p=.528	32%	p=.035	35%	p=.294	**84%**	**p<.003**	60%	p=.743	52%	p=1.0	54%	p=.829	50%
Weakness or Fatigue	55%	p=.205	23%	p=.082	18%	p=.105	32%	p=.648	50%	p=.494	39%	p=.832	**64%**	**p<.003**	36%
Other	9%	p=.456	**0**	**p<.003**	6%	p=.188	12%	p=.275	30%	p=.699	9%	p=.029	39%	p=.047	12%

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Table 2. Signs and Symptoms of Concern After Disaster
Note: Bold text had a p value below the Bonferroni adjusted significance level of P<.003; FET were Exact Sig. (2-sided); the test of significance was within disease.

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What are you Most Concerned about After a Disaster?	Cancer (n = 11)		Cardiovascular Disease (n = 31)		Diabetes (n = 17)		Mental Health (n = 25)		Renal (n = 10)		Respiratory (n = 33)		Other (n = 28)		Sum 0-7 Days	Sum 8-28 Days	Sum 0-28 Days
	0-7 Days	8-28 Days	0-7 Days	8-28 Days	0-7 Days	8-28 Days	0-7 Days	8-28 Days	0-7 Days	8-28 Days	0-7 Days	8-28 Days	0-7 Days	8-28 Days			
Medication	4	1	12	15	7	8	7	10	3	4	19	11	9	7	61	56	117
Medical Services	2	4	4	8	2	3	1	8	2	1	9	8	7	9	27	41	68
Water (Lack of and Quality)	2	-	3	3	2	2	4	2	2	3	6	5	4	1	23	16	39
Treatment/Care	7	3	5	1	-	3	-	-	2	1	7	3	3	3	24	14	38
Power	2	-	2	3	-	1	4	2	-	1	7	5	4	2	19	14	33
Food (Health and Quality)	-	-	2	3	2	4	2	1	1	1	3	5	4	2	14	16	30
Transport	2		3	-	1		3	1	-	-	4	1	5	1	18	3	21
Medical Facility	1	2	4	1	-	2	1	-	-	1	3	1	-	1	9	8	17
Shelter	1	-	1	-	-	-	1	3	1	-	3	5	-	-	7	8	15
Sanitation	1	-	1	2	-	-	1	1	1	2	2	-	1	1	7	6	13
Finance	-	-	-	1	1	-	1	2	-	-	3	4	-	-	5	7	12
Equipment	1	-	-	-	1	1	1	-	-	-	3	-	3	-	9	1	10
Communication	1	-	-	1	-	-	4	2	-	-	-	-	2	-	7	3	10
Road Closure	1	1	1		-	1	2	-	-	-	1	2	1	1	6	5	11
Infection	-	-	-	1	-	1	-	-	1	1	-	3	1	-	2	6	8
Heat	2	-	1		-	-	-	-	-	-	2	-	2	1	7	1	8
Fuel Supplies	-	-	-	1	-	1	-	-	-	-	-	1	-	-	0	3	3
Cold	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	2
Clothing	-	-	1	-	-	-	-	-	-	-	1	-	-	-	2	0	2

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Table 3. Concerns of People with Noncommunicable Diseases Post-Disaster

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