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Hospital initial decision-making in meteorological disasters: a protocol of scoping review

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Daisuke Yamahira^{1,2}, Kasumi Satoh³, Manabu Okuyama³, Emiko Ishii², Yuichi Koido²

¹Department of Nursing, Akita University Hospital, Akita, Japan, Akita, Japan;

²Division of Disaster Medicine, Graduate School of Medical and Welfare Sciences, International University of Health and Welfare, Tokyo, Japan;

³Department of Emergency and Critical Care Medicine, Akita University Graduate School of Medicine, Akita, Japan



Kasumi Satoh

Akita University

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Abstract

Climate change has increased the frequency and severity of meteorological disasters, exposing hospitals to a realistic risk of functional loss even when physical damage is limited. Although events such as flooding and severe storms are often predictable, criteria and processes for initiating protective actions in hospitals (for example, activating a disaster response headquarters or mobilising staff) are frequently unclear and dependent on individual judgment, creating tension and the potential for delayed response. Internationally, tools such as the incident command system, timelines, and checklists are used to support decision-making, but there has been no comprehensive synthesis of how hospitals decide when and how to initiate protective actions during meteorological disasters. This scoping review will map the criteria, processes, and decision-support tools used to guide initial hospital decision-making for meteorological hazards, and identify key evidence gaps. Eligible sources will describe decision-making processes in healthcare facilities (e.g. acute care hospitals, community hospitals, tertiary centres) that have experienced flooding, heavy rainfall, windstorms, typhoons, cyclones, hurricanes, or similar meteorological events. We will focus on decisions related to activation of command and control structures, staff mobilisation and staffing, and the use of decision-support tools. MEDLINE (via PubMed), Scopus, and CINAHL will be searched systematically using database-specific combinations of free-text terms and subject headings, complemented by grey literature searches of major disaster and emergency preparedness agencies (e.g. World Health Organization, United Nations Office for Disaster Risk Reduction, Federal Emergency Management Agency). Searches will be limited to English-language sources published from 2000 onwards. Two reviewers will independently screen records and assess full texts in Rayyan, with disagreements resolved by discussion or consultation with a third reviewer. The review will follow Joanna Briggs Institute methodology for scoping reviews, be reported in line with PRISMA guidelines, and is registered with "protocols.io".

Introduction

- 1 In recent years, climate change has led to increasingly severe and frequent natural disasters, and loss of function in healthcare facilities has become a realistic risk. Among disaster types, certain meteorological hazards such as flooding are relatively predictable, and it has been suggested that timely initial actions can prevent or at least minimize damage [1]. Nevertheless, if the criteria and processes for initiating protective actions before the onset of a disaster are not clearly defined, there is a risk that the response will be delayed.

In designated disaster base hospitals and similar facilities, plans for responding to wind and water hazards are often developed. Still, decisions on when to initiate protective actions are difficult to codify and tend to rely on individual judgment. In practice, physical measures such as setting flood barriers are relatively easy to implement, whereas activating a disaster response headquarters or mobilizing staff requires calling in senior staff and reorganizing duty rosters, with substantial implications for operations and hospital management. As a result, decision-making in this area has been reported to be accompanied by considerable tension and conflict [2]. Thus, the structures underpinning the criteria, processes, and support tools for initiating protective actions have not been sufficiently organized or described.

Internationally, a variety of decision-support approaches are used, including the incident command system (ICS), timelines, and checklists. However, few reviews have comprehensively compared and synthesized the processes of hospital initial decision-making in meteorological disasters. Systematizing existing knowledge on the initiation of protective actions and clarifying the evidence gaps are important steps toward designing measures to strengthen hospital resilience to meteorological hazards.

This scoping review aims to comprehensively elucidate the structure and key features of hospital decision-making processes for initiating protective actions in response to meteorological disasters, and to identify the associated evidence gaps.

Review question

- 2 What criteria, processes, and decision-support tools are available to hospitals to guide initial decision-making during meteorological disasters (e.g. criteria for activating a disaster response headquarters, procedures for staff mobilization, and the use of timelines or checklists)?

2.1. Participants

Healthcare facilities (e.g. acute care hospitals, community hospitals, tertiary centres) that have experienced and responded to meteorological disasters.

2.2. Concept

The concept of interest is the decision-making process used to initiate protective actions in hospitals during meteorological disasters, including:

- (1) activation of command and control structures,
- (2) staff mobilization and staffing decisions, and
- (3) the use of decision-support tools.

2.3. Context

Context

The review will focus on meteorological disasters, including flooding, heavy rainfall, windstorms, typhoons, cyclones, and hurricanes. Disasters that are not primarily meteorological in origin, such as earthquakes and volcanic eruptions, will be excluded. No restrictions will be placed on hospital characteristics or geographical setting. The review will be limited to sources available in English, and both published and unpublished materials will be eligible.

In addition, we will restrict inclusion to sources published from the year 2000 onwards. This cut-off was chosen in light of the increased risk of weather-related hazards associated with recent climate change and major shifts in international disaster risk reduction frameworks, such as the Hyogo Framework for Action (2005) and the Sendai Framework for Disaster Risk Reduction (2015) [3].

2.4. Methods

This protocol has been developed in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P). The scoping review will follow the methodology proposed by the Joanna Briggs Institute (JBI) for scoping reviews. The protocol has been registered with the "protocols.io" (<https://www.protocols.io>)

2.5. Search strategy

A systematic electronic search will be conducted in the following databases: MEDLINE (via PubMed), Scopus, and CINAHL. For each database, a comprehensive search strategy will be developed using keywords drawn from the titles, abstracts, and full texts of relevant articles, together with appropriate index terms (e.g. MeSH, Emtree) used to describe those articles (see Appendix 1). In addition, the reference lists of all included studies will be screened to identify further eligible studies.

Grey literature searches will target the official websites of the World Health Organization (WHO), the United Nations Office for Disaster Risk Reduction (UNDRR), the Federal Emergency Management Agency (FEMA), and similar agencies responsible for disaster risk reduction or emergency preparedness. For each website, relevant sections on disasters or emergency response will first be identified. We will then use either the

internal site search function or Google with the `site:` operator, applying a predefined set of English keyword combinations (Appendix 2). For each query, we will screen up to the first 10 pages of search results and retain only those documents that describe how hospitals decide to initiate protective actions during meteorological disasters. To minimise the influence of personalisation and prior search history, all Google searches will be conducted while logged out of Google accounts and using a private/incognito browsing mode.

For every grey literature search, we will record the search date, target website, search terms, search method (internal site search or Google `site:` search), number of records screened, URLs of candidate documents, and eligibility decisions in a search log, to ensure transparency and reproducibility of the search procedures. Guidelines and reports issued by other governmental bodies, professional societies, individual hospitals, or local authorities will not be systematically searched; however, if such documents are identified through the reference lists of academic articles or the aforementioned grey literature sources, they will be assessed against the same eligibility criteria and included where appropriate.

For both academic and grey literature, search strategies and filters will be configured so that only English-language sources published in or after the year 2000 are retrieved.

2.6. Study/source of evidence selection

All records identified through the searches will be imported into Rayyan (Rayyan Systems Inc., Cambridge, MA, USA), and duplicate entries will be removed. After a pilot screening exercise, two independent reviewers (Daisuke Yamahira and Kasumi Satoh) will screen titles and abstracts against the inclusion criteria. Following this, the same two reviewers will independently assess the full texts of articles judged to be potentially relevant, to determine final eligibility.

Reasons for exclusion at the full-text screening stage will be documented and reported in the main manuscript. Any disagreements at any stage of the selection process will be resolved through discussion between the two reviewers (Yamahira and Satoh), and, if consensus cannot be reached, by consulting a third reviewer (Manabu Okuyama). The overall study selection process, including the number of records identified, screened, included, and excluded (with reasons), will be reported in the final scoping review and presented using a flow diagram in accordance with the PRISMA-ScR extension.

Appendix 1. Draft database search strategiesUntitled section

3 A. MEDLINE (PubMed)

The following line-by-line strategy will be used in PubMed; it may be refined iteratively based on pilot searches.

1. Meteorological hazards

("Floods"[Mesh] OR flood*[tiab] OR inundat*[tiab] OR "heavy rain"[tiab] OR "heavy rainfall"[tiab] OR rainstorm*[tiab] OR windstorm*[tiab] OR hurricane*[tiab] OR typhoon*

[tiab] OR cyclon*[tiab] OR "storm surge"[tiab] OR "tropical storm"[tiab])

2. Hospitals/healthcare facilities

("Hospitals"[Mesh] OR hospital*[tiab] OR "Health Facilities"[Mesh] OR "health facilit*" [tiab] OR "healthcare facilit*" [tiab] OR "medical center*" [tiab] OR "medical centre*" [tiab] OR "acute care" [tiab])

3. Initial decision-making, command structures, and support tools

("Decision Making"[Mesh] OR "decision making" [tiab] OR "decision-making" [tiab] OR activat*[tiab] OR mobiliz*[tiab] OR mobilis*[tiab] OR "staff recall" [tiab] OR staffing [tiab] OR evacuation [tiab] OR "shelter in place" [tiab] OR "shelter-in-place" [tiab] OR "incident command system" [tiab] OR ICS [tiab] OR HICS [tiab] OR "hospital incident command system" [tiab] OR "hospital emergency incident command system" [tiab] OR "emergency operations plan*" [tiab] OR EOP [tiab] OR checklist* [tiab] OR timeline* [tiab] OR "standard operating procedure*" [tiab] OR SOP [tiab] OR playbook* [tiab])

4. Combine

1 AND 2 AND 3

5. Limits

4 AND english[la] AND ("2000/01/01"[PDAT] : "3000/12/31"[PDAT])

B. Scopus

The Scopus strategy will use free-text terms in titles, abstracts, and keywords; controlled vocabulary is not available.

(TITLE-ABS-KEY (flood* OR inundat* OR "heavy rain" OR "heavy rainfall" OR rainstorm* OR windstorm* OR hurricane* OR typhoon* OR cyclon* OR "storm surge" OR "tropical storm")) AND (TITLE-ABS-KEY (hospital* OR "healthcare facilit*" OR "health facilit*" OR "medical center*" OR "medical centre*" OR "acute care")) AND (TITLE-ABS-KEY ("decision making" OR "decision-making" OR activat* OR mobiliz* OR mobilis* OR "staff recall" OR staffing OR evacuation OR "shelter in place" OR "shelter-in-place" OR "incident command system" OR ICS OR HICS OR "hospital incident command system" OR "hospital emergency incident command system" OR "emergency operations plan" OR EOP OR checklist* OR timeline* OR "standard operating procedure" OR SOP OR playbook*)) AND PUBYEAR > 1999 AND PUBYEAR < 2026

C. CINAHL (EBSCOhost)

CINAHL will use both subject headings and free-text terms. CINAHL Headings will be adapted during implementation.

1. Meteorological hazards

(MH "Floods+" OR TI (flood* OR inundat* OR "heavy rain" OR "heavy rainfall" OR rainstorm* OR windstorm* OR hurricane* OR typhoon* OR cyclon* OR "storm surge*" OR "tropical storm*")

OR AB (flood* OR inundat* OR "heavy rain" OR "heavy rainfall" OR rainstorm* OR windstorm* OR hurricane* OR typhoon* OR cyclon* OR "storm surge*" OR "tropical storm*"))

2. Hospitals / healthcare facilities

(MH "Hospitals+" OR MH "Health Facilities+")

OR TI (hospital* OR "healthcare facilit*" OR "health facilit*" OR "medical center*" OR "medical centre*" OR "acute care")

OR AB (hospital* OR "healthcare facilit*" OR "health facilit*" OR "medical center*" OR "medical centre*" OR "acute care"))

3. Initial decision-making, command structures, and support tools

(MH "Decision Making+" OR MH "Emergency Service, Hospital+" OR MH "Disaster Planning+")

OR TI ("decision making" OR "decision-making" OR activat* OR mobiliz* OR mobilis* OR "staff recall" OR staffing OR evacuation OR "shelter in place" OR "shelter-in-place" OR "incident command system" OR ICS OR HICS OR "hospital incident command system" OR "hospital emergency incident command system"

OR "emergency operations plan*" OR EOP OR checklist* OR timeline* OR "standard operating procedure*" OR SOP OR playbook*)

OR AB ("decision making" OR "decision-making" OR activat* OR mobiliz* OR mobilis* OR "staff recall" OR staffing OR evacuation OR "shelter in place" OR "shelter-in-place" OR "incident command system" OR ICS OR HICS OR "hospital incident command system" OR "hospital emergency incident command system"

OR "emergency operations plan*" OR EOP OR checklist* OR timeline* OR "standard operating procedure*" OR SOP OR playbook*))

4. Combine and limit

1 AND 2 AND 3

Limiters: English Language; Published Date: January 1, 2000–present

Appendix 2. Prespecified keyword combinations for grey literature searches

- 4 For grey literature, the following English keyword combinations will be used with either (a) internal search functions on each website or (b) Google with the site: operator (e.g. site:who.int "hospital" flood preparedness), applied separately to each target site (WHO, UNDRR, FEMA, and similar agencies).

Each bullet represents one query; where parentheses are used, terms will be combined with OR.

1. "hospital" AND "flood" AND ("preparedness" OR "response" OR "activation")
2. "hospital" AND ("flooding" OR "river flooding" OR "coastal flooding") AND ("emergency plan" OR "emergency operations plan" OR "EOP")
3. "hospital" AND ("hurricane" OR "typhoon" OR "cyclone") AND ("evacuation" OR "shelter in place" OR "shelter-in-place")
4. ("hospital" OR "healthcare facility") AND ("incident command system" OR "ICS" OR "hospital incident command system" OR "HICS") AND ("disaster" OR "emergency")
5. "hospital" AND "flood" AND ("checklist" OR "toolkit" OR "playbook")
6. "hospital" AND ("flood" OR "hurricane" OR "typhoon") AND ("timeline" OR "action plan")
7. "healthcare facility" AND "flooding" AND ("continuity of operations" OR "COOP")
8. "hospital" AND ("severe weather" OR "storm surge" OR "windstorm") AND ("preparedness" OR "response")

These queries will be run for each target website (e.g. site:who.int, site:undrr.org, site:fema.gov), and adapted as needed to internal site search engines.

Protocol references

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