

Hazard Identification and Risk Assessment (HIRA)

Definitions

Acceptable Risk: The level of potential losses that the hospital considers acceptable given existing social, economic political, cultural, technical and environmental conditions.

Critical Infrastructure: Interdependent, interactive, interconnected networks of institutions, services, systems and processes that meet vital human needs, sustain the economy, protect public safety and security, and maintain continuity of and confidence in government.

Critical Infrastructure Impact: The negative consequences of the occurrence of a hazard on the interdependent, interactive, interconnected networks of institutions, services, systems and processes that meet vital human needs, sustain the economy, protect public safety and security, and maintain continuity of and confidence in government.

Current Risk: The present level or risk associated with a hazard.

Historical Risk: The level of risk associated with a hazard in the past. The level of risk may have been altered by changes in consequence, frequency or prevention, preparedness, mitigation, response or recovery practices.

Impact: The negative effect of a hazardous incident on people, property, the environment, the economy and/or services.

Mitigation: Actions taken to reduce the adverse impacts of an emergency or disaster.

Recovery: The process of restoring hospital function to pre-disaster levels.

Four main steps in the HIRA process:

1. **Hazard Identification:** Identify the hazards that are relevant for the area included in the risk assessment. May involve consultation with the scientific community, insurance companies, historical records and government agencies.
2. **Risk Assessment:** The level of risk for each hazard is examined; involves the examination of past occurrences, possible scenarios, and current vulnerability. Evaluate likelihood and extent of impact.
3. **Risk Analysis:** Identify which hazards should be considered a priority for emergency management based on frequency and potential consequences.
4. **Monitor and Review**

Hazard Identification

Natural Hazards

- Agricultural and Food Emergency
 - Food Emergency: impact on food security
 - Farm Animal Disease
 - Plant Disease and Pest Infestation
- Drinking Water Emergency
- Drought / Low Water
- Earthquake
- Erosion
- Extreme Temperatures
 - Heat Wave
 - Poor Air Quality
 - Cold Wave
- Flood
- Extreme Weather
 - Snow Storm
 - Hail
 - Rain
 - Fog
- Forest/Wildland Fire
- Freezing Rain
- Hail
- Human Health Emergency
 - Epidemic
 - Mental Health
 - Drug Use
 - Obesity / Heart Disease / Chronic Illness
 - Pandemic

- Hurricane
- Land Subsidence
- Landslide
- Lightning
- Snowstorm / Blizzard
- Tornado
- Windstorm

Technological Hazards

- Building / Structural Collapse: fire, explosion, snow, ice, wind, earthquake, flaws, deterioration
- Critical Infrastructure Failure: electricity, water treatment and distribution, sewage treatment and disposal, communications systems, food production and distribution, transportation, emergency services, healthcare
- Energy Emergency (Supply)
- Explosion / Fire
- Hazardous Materials Incident
 - o Fixed Site: where it is produced/stored
 - o Transportation: while it is being transported
- Nuclear Facility Emergency
- Oil / Natural Gas Emergency
- Radiological Emergency
- Transportation Emergency
 - o Air
 - o Rail
 - o Road (Highway)

Human-Caused Hazards

- Civil Disorder
- Cyber Attack
- Sabotage

- Special event: large groups of people, attendance of prominent individuals
- Terrorism / CBRNE: chemical, biological, radiological, nuclear and explosive
- War and International Emergency

Frequency

$$\text{Risk} = \text{Frequency} * \text{Consequence}$$

Frequency	Category	Percent Chance	Description
1	Rare	Less than a 1% chance of occurrence in any year	Recurrence period >100 years
2	Very Unlikely	Between a 1-2% chance of occurrence in any year	Occurs every 50-100 years and includes hazards that have not occurred in the area, but are reported to be more likely to occur in the near future
3	Unlikely	Between a 2-10% chance of occurrence in any year	Occurs in the area every 20-50 years
4	Probable	Between a 10-50% chance of occurrence in any year	Occurs in the area every 5-20 years
5	Likely	Between a 50-100% chance of occurrence in any year	Occurrences within five years
6	Almost Certain	100% chance of occurrence in any year	The hazard occurs annually

Consequence

- **Social Impacts:** Negative consequences on the physical health of people.
 - o Fatalities
 - o Injuries
 - o Evacuations
- **Property Damage:** The negative consequences on buildings, structures, and other forms of property, such as crops.
- **Critical Infrastructure Service Disruptions / Impact:** The negative consequences on interdependent networks of institutions, services, systems and processes that meet vital human needs, sustain the economy, and protect public safety and security.

- **Environmental Damage:** Negative consequences on the environment (soil, water, air, and/or plants and animals).
- **Business / Financial Impact:** Negative economic consequences.
- **Psychosocial Impact:** Negative response of community to a hazard caused by their perception of risk (self-evacuation, mass hysteria, hoarding, etc.).

Social Impacts: Fatalities

Rating	Category	Definition
0	None	Not likely to result in fatalities.
1	Minor	Could result in fewer than five fatalities.
2	Moderate	Could result in 5-10 fatalities.
3	Severe	Could result in 10-50 fatalities.
4	Catastrophic	Could result in 50+ fatalities.

Social Impact: Injuries

Rating	Category	Definition
0	None	Not likely to result in injuries.
1	Minor	Could injure fewer than 25 people.
2	Moderate	Could injure 25-100 people.
3	Severe	Could injure 100+ people.

Social Impact: Evacuation

Rating	Category	Definition
0	None	Not likely to result in an evacuation, shelter-in-place order, or people being stranded.
1	Minor	Could result in fewer than 100 people being evacuated, sheltered-in-place, or stranded.
2	Moderate	Could result in 100-500 people being evacuated, sheltered-in-place, or stranded.
3	Severe	Could result in more than 500 people being evacuated, sheltered-in-place, or stranded.

Property Damage

Rating	Category	Definition
0	None	Not likely to result in property damage.
1	Minor	Could cause minor and mostly cosmetic damage.
2	Moderate	Localized severe damage (a few buildings destroyed).
3	Severe	Widespread severe damage (many buildings destroyed)

Critical Infrastructure Service Impact

Rating	Category	Definition
0	None	Not likely to disrupt critical infrastructure services.
1	Minor	Could disrupt 1 critical infrastructure service.
2	Moderate	Could disrupt 2-3 critical infrastructure services.
3	Severe	Could disrupt more than 3 critical infrastructure services.

Environmental Damage

Rating	Category	Definition
0	None	Not likely to result in environmental damage.
1	Minor	Could cause localized and reversible damage. Quick clean up possible.
2	Moderate	Could cause major but reversible damage. Full clean-up difficult.
3	Severe	Could cause severe and irreversible damage. Full clean-up not possible.

Business / Financial Impact

Rating	Category	Definition
0	None	Not likely to disrupt business / financial activities.
1	Moderate	Could result in losses for a few businesses.
2	Severe	Could result in losses for an industry.

Psychosocial Impact

Rating	Category	Definition
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0	None	Not likely to result in significant psychosocial impacts.
1	Moderate	Significant psychosocial impacts including limited panic, hoarding, self-evacuation and long-term psychosocial impacts.
2	Severe	Widespread psychosocial impacts, e.g. mass panic, widespread hoarding and self-evacuation, and long-term psychosocial impacts.

Once all of these impacts are added up for each hazard, the magnitude of the risk can be classified according to this chart:

Total	Description
1 - 4	Minor
5 - 6	Slight
7 - 8	Moderate
9 - 10	Severe
11 - 12	Very Severe
13 +	Catastrophic

Changing Risk

Changes to the frequency or consequence of any risk can occur due to mitigating strategies implemented at the hospital, or larger changes that then impact the potential frequency of consequence, such as technological changes, political unrest, etc.

Changing Risk = Change in Frequency + Change in Vulnerability

Change in Frequency

1. Is the number of reported non-emergency occurrences of the hazard increasing?
 - a. Is human activity (e.g. population expansion, etc.) likely to lead to more interaction with the hazard or more frequency?
 - b. Is there an environmental reason (e.g. climate change) why the frequency of this hazard may increase?
 - c. Are human factors such as business, financial, international practices, etc., more likely to increase the risk?

If the answer is yes to two or more, change in frequency = 2.

If the answer is yes to one or fewer, change in frequency = 1

Change in Vulnerability

1. Is a large percentage of the population vulnerable to this hazard or is the number of people vulnerable (see vulnerable groups) to this hazard increasing?
 - a. Does our reliance on critical infrastructure make the population more vulnerable?
 - b. Are response agencies not aware of, practiced, and prepared to respond?
 - c. Are no prevention / mitigation measures currently used for this hazard?

If the answer is yes to two or more, change in vulnerability = 2.

If the answer is yes to one or fewer, change in vulnerability = 1

Risk Analysis

This table takes into consideration both the frequency and magnitude of each of the potential hazards, to identify the total risk associated with each hazard. The hazards are then prioritized based on the total risk.

Hazard	Frequency (a)	Consequence (b)	Change (c)	Total (a x b x c)

Classification of Risks

Level of Risk	Description
< 10	Very Low
11 - 20	Low
21 - 30	Moderate
31 - 40	High
41 - 50	Very High
> 50	Extreme

Monitor and Review

Hazards and risks may change over time, so it is important to review the HIRA annually.

Date of current HIRA:

Date of next revision:

Vulnerable Group Identification

Some individuals may be more vulnerable to certain hazards than others, due to their increased exposure (for example, stemming from lower socioeconomic status or poor mental health), their inability to self-evacuate or take the appropriate safety precautions, poor health status, or a lack of access to healthcare, transportation, or other critical services. It is therefore important to consider the differing impact of hazards on these vulnerable groups.

Vulnerable Groups Worksheet

Hazard	Possible Vulnerable Groups	Plans to Reduce Vulnerability

Mitigation Actions Worksheet

Hazard	Action	Priority	Estimated Timeline	Estimated Cost	Funding Sources	Notes