North Shore Health Network | Réseau Santé Rive Nord

Emergency Response Plan:
Hazard Identification and Risk Assessment (HIRA)

NSHN Emergency Preparedness Committee
Last Reviewed: October 2021

HAZARD IDENTIFICATION AND RISK ASSESSMENT

INTRODUCTION

Guided by the Emergency Management and Civil Protection Act, all communities in Ontario operate using a risk-based approach to emergency management. This paradigm has proven to be a highly successful method for minimizing loss of life and property in emergency situations, and has been adopted by many public and private organizations. This risk-based approach has become part of industry-specific best practice, as outlined by the Canadian Standards Association in guidelines such as the Z1600 (Emergency Management and Business Continuity Programs) and the Z8000 (Canadian Health Care Facilities).

With the importance of risk-based emergency management now well-recognized throughout the healthcare industry, provisions for such programs have become an integral component of Accreditation Canada standards as well.

The Emergency Preparedness Committee (EPC) identifies hazards that may affect the North Shore Health Network (NSHN), assessing their associated risks to determine which hazards are most likely to result in an emergency. This approach allows for a systematic, targeted approach to emergency preparedness.

In addition to identifying high-priority hazards, this proactive approach to emergency management may result in a more disaster-resilient environment.

In order to ensure emergency preparedness activities are kept up with evolving risks, the HIRA should be reviewed annually and updated as required.

METHODOLOGY

The methods used for NSHN's HIRAs are based on a collection of government and industry-recommended best practices including:

- Ontario's Hazard Identification and Risk Assessment
- British Columbia's Hazard, Risk, and Vulnerability Analysis
- Kaiser Permanente's Hospital Hazard and Vulnerability Assessment

The first step in the process was to identify all possible hazards – no matter how unlikely, provided a greater than zero chance – that might impact a North Shore Health Network site or its surrounding community. A full list of hazards and their definitions may be found in **Appendix A**.

Second, each hazard was scored based on the relative risk it posed. The risk score is a combination of two dimensions: likelihood and consequence. Consequence was further broken down into potential impacts on people, property, finances and reputation. The goal was not to obtain exact measures of risk, but to outline a relative ranking to guide future priorities.

RISK = [LIKELIHOOD] X [SUM OF CONSEQUENCES]

The scoring system yields a minimum total risk score of 4, and a maximum of 100. Each hazard will be scored used the **Hazard Identification Risk Assessment Form (Appendix B).**

<table>
<tr><td>LIKELIHOOD: provides a standardized view of how often a given hazard event may occur, either in the hospital or its community.

Likelihood is based on a combination of history and best estimates of future frequency of events.

The ranking scale is from 1-5, with 1 being the lowest possible rank and 5 being the highest.</td><td>1 – Unlikely (but not impossible) to occur within a 100 year period in the hospital or community.
2 – May occur every 100 years in the hospital or community.
3 – May occur every 10 years in the hospital or community.
4 – May occur every year in the hospital or community.
5 – Multiple occurrences per year in the hospital or community.</td></tr>
<tr><td rowspan="4">CONSEUQENCE: is defined as the anticipated impact from a given event in a worst-case scenario.

This measure is based upon the logic that it is always preferable to over-respond to an emergency.

Consequence can be broken down into four components, each of which is of critical concern to a hospital.

These 4 aspects include:

• Human Impact
• Physical / Infrastructure Impact
• Financial Impact
• Damage to Reputation

The ranking scale is from 1-5, with 1 being the lowest possible rank and 5 being the highest.</td><td>HUMAN IMPACT: the code of a given event in human terms: lives lost and people injured.

1 – Injury or illness unlikely
2 – Low probability of injuries or illness
3 – High probability of injuries or illness
4 – High probability of injuries or illness and low probability of death
5 – High probability of injuries or illness and high probability of death</td></tr>
<tr><td>PHYSICAL IMPACT: the cost of a given event in terms of loss of the use of hospital property or equipment, whether destroyed, damaged, or requiring clean up.

1 – Property damage or loss of access unlikely
2 – Minor clean-up or recovery time
3 – Minor damage, temporary loss of access
4 – Major damage, prolonged loss of access
5 – Indefinite loss of access to the affected area; complete rebuild</td></tr>
<tr><td>FINANCIAL IMPACT: the cost of the impact of a given event in terms of dollar cost, whether for repair / replacement or for unbudgeted incident response costs. This also includes insurance claims, where appropriate.

1 – Negligible
2 – Generates expenditures or an insurance claim under $100,000
3 – Generates expenditures or an insurance claim of under $1 Million
4 – Generates expenditures or an insurance claim under $10 Million
5 – Generates expenditures or an insurance claim over $10 Million</td></tr>
<tr><td>REPUTATION DAMAGE: the cost of the impact of a given event in terms of damage to corporate or facility reputation. The impacts may affect recruitment, satisfaction and fundraising efforts.

1 – Reputation unlikely to be affected
2 – Limited negative local media coverage and/or public stigma
3 – Negative regional media coverage and strong public stigma
4 – Negative national media coverage, fundraising and/or recruitment affected
5 – Permanent association of adverse event with hospital, large effect on fundraising and/or recruitment</td></tr>
</table>

RESULTS

The full rankings of each hazard by both likelihood and consequence may be found in **Appendix C**. The results have been summarized according to three different risk classifications: High, Moderate and Low.

HIGH Preparedness Priorities (Top 10; Scores 35 – 100)	With both a high likelihood of occurrence and high potential impact on the hospital. High preparedness priorities are hazards that are candidates for immediate mitigation and preparedness efforts to reduce the likelihood or consequences of occurrence. Possible risk reduction measures include: physical fortification, staff training, and acquisition of response resources.
MODERATE Preparedness Priorities (Scores 17 – 34)	Events with either a high likelihood of occurrence and low magnitude of impact, or low likelihood but high consequence. Such potential risk exposures should be addressed in terms of mitigation and preparedness activities, after high priority events, as time and resources become available.
LOW Preparedness Priorities (Scores 4 – 16)	Events with a low incidence of occurrence and low potential impact, or events which have already received substantial mitigation and preparedness efforts. These events should be monitored for changes in frequency or consequence, but do not require immediate action otherwise.

**It should be noted that these results do not necessarily take into account mitigation and preparedness efforts that are already underway. In some cases, sufficient measures may already be in place. This should be considered when interpreting the results.*

NSHN TOP 10 HAZARDS – As of October 2021

Note: In the event of a tie, the hazard with the higher likelihood score will be ranked first.

2021 RANK	2020 RANK	HAZARD	TOTAL RISK SCORE (2020)	TOTAL RISK SCORE (2021)	RISK CLASSIFICATION
1	9	Pandemic / Epidemic (External)	36/100	60/100	High
2	1	Violent Person - Patient	50/100	50/100	High
3	2	Structural Collapse	48/100	45/100	High
4	6	Infectious Disease (Internal)	40/100	44/100	High
5	-	Computer Virus / Cyber Attack	30/100	44/100	High
6	8	Missing Patient	36/100	44/100	High
7	3	Transportation Accident	45/100	40/100	High
8	4	Workplace Injury	45/100	40/100	High
9	8	Mass Casualty Incident	36/100	39/100	High
10	5	Blizzard / Snowstorm	40/100	35/100	High
11	10	Serious Adverse Event	33/100	33/100	Moderate

As part of the annual HIRA review, the Emergency Preparedness Committee will select 1-2 of the highest ranking hazards each year to develop specific Hazard Mitigation Plans (**Appendix D**).

APPENDIX A: HAZARD DESCRIPTIONS

NATURAL HAZARDS	
Blizzard / Snowstorm	During the winter months, the Algoma region commonly experiences blizzards and snowstorms. These events are often characterized by periods of heavy snowfall, cold temperatures, and high winds. Winter storm warnings are often issued hours in advance of such events. Injuries may occur related to reduced visibility and dangerous ground and driving conditions.
Contamination – Food	Food may be contaminated by a biological, chemical, or physical agent. This contamination is more likely to occur at the food source or processing centre, but contamination within NSHN is also possible. When Recall Notifications are issued by the Canadian Food Inspection Agency, affected products will be removed from circulation and alternate suppliers will be used. However, in some cases staff and patients eating from a contaminated source may be exposed to a pathogen prior to its identification. The BR Site produces food for in-patients, long-term care Residents and cafeteria sales. Food at the TH Site is supplied by the Algoma Manor Nursing Home. The RL-M Site has limited food production capabilities.
Contamination – Water	Drinking water may be contaminated by a biological, chemical, or physical agent. This type of event differs from disrupted water supply by the actual ingestion of contaminated water. It is likely that the majority of staff and patients drinking from a contaminated source will be exposed to the pathogen prior to its identification. Effects will vary by agent, but death of susceptible patients and widespread illness is likely. Significant damage to hospital reputation would follow.
Earthquake	Earthquakes are most common along active fault lines. Northern Ontario has a very low level of seismic activity. From 1970 to 1999, on average only 1 or 2 magnitude 2.5 or greater earthquakes have been recorded in this large area. Two magnitude 5 earthquakes (1905, northern Michigan, and 1928, northwest of Kapuskasing) have occurred in this region.
Extreme Cold	Environment Canada issues Cold Alerts in Northern Ontario in anticipation of temperatures or wind chill of -30^{o}C or below. These alerts occur multiple times each year, and may last for days at a time. Extreme Cold Warnings are issued when temperature or wind chill is expected to reach -40^{o}C for at least 4 hours. Health impacts are minimized by hospital heating and environmental control systems. The hospital may experience an increase in patients seeking warmth if municipal power fails.
Extreme Heat	Environment Canada issues Heat Alerts in anticipation of temperatures or humidex values of 40^{o}C or above. Health impacts are minimized by hospital cooling and environmental control systems. Physical damage is rare, but high temperatures may affect some equipment and power infrastructure. The hospital may experience an increase in patient visits due to heat-related illness.
Flood – External	External flooding can stem from a number of sources, including overflow from nearby water sources, heavy rains, or significant snow melts. In the case of external floodwater breach, damage could occur to the hospital as well as its infrastructure and equipment. Reconstruction or cleanup should be anticipated. Patient injuries may also occur, particularly if patients must be evacuated. The most likely impact would be loss of access to the sites due to washed out roads.

Geomagnetic Storm	With the continued evolution of technology, solar activity represents a threat to electronics and communications systems. Large ejections of solar mass can disturb the Earth's atmosphere, resulting in widespread infrastructure failure. Events of this nature are very rare and impacts are not well understood. Electrical and communication systems may fail, with recovery time unknown. Health consequences are similarly difficult to predict, but patients that rely on certain medical devices may be vulnerable.
Ice Storm / Freezing Rain	Ice storms are prolonged periods of freezing rain. Both events are characterized by temperatures at or below zero degrees, and mixed precipitation consisting of sleet, rain or snow. Ice accumulation may be rapid or gradual, affecting roads, buildings, and any other external surface. Minor injuries to staff, patients, or visitors may occur due to slips and falls outside of the hospital. Buildings can suffer damage due to ice accumulation and water seepage, and interruption of electrical or water infrastructure is common. Access to the sites due to downed trees and obstructed roads is possible.
Infectious Disease – Internal	Hospital-acquired infectious diseases are a common complication of medical care. Causes may include poor hand hygiene, non-sterile equipment, or failure to follow proper quarantine procedures. Even with strict adherence to protocol, however, having a high concentration of infected patients within a small area can lead to rapid spread of disease. Severity will be based on the pathogen; widespread illness is likely, with the possibility of patient deaths as well. Spread of disease within the hospital, particularly if related to negligence, may be devastating to the public reputation of the hospital.
Pandemic / Epidemic – External	A human health emergency caused by infectious disease is a leading public health concern in Ontario. An epidemic represents an illness within a limited region, whereas a pandemic refers to a worldwide event. The disease may be spread by direct or indirect contact, through droplets, airborne, blood-borne, or vector-borne. Health impacts will vary based on the nature of the infecting agent, and effects are more likely to be severe in those with weaker immune systems (such as the elderly, the very young, or those with immune deficiencies). Health care providers are also vulnerable, and there is a high potential for the disease to spread within the hospital. Infrastructure impacts are unlikely, but quarantine measures may cause disruptions to certain hospital processes or departments. Significant impacts on staffing and resources for all NSHN sites that would require assistance from the MOHLTC.
Severe Summer Storm	These severe summer storms are often characterized by lightning, hail or heavy rainfall, and winds above 90 km/hr. Injury to patients within hospital buildings is highly unlikely; however, severe winds can cause damage near windows. Lightning, winds, and precipitation have the ability to damage infrastructure. In rare cases, severe storms can develop into a more damaging tornado.

Severe Winds	Environment Canada issues Wind Alerts in anticipation of sustained winds of 60 km/hr or for gusts up to 90 km/hr in the absence of a tornado or thunderstorm. Injury to patients or staff may occur outside of the hospital or near windows due to high winds or blown objects. Damage to buildings is possible, but the largest concern is damage to municipal electricity infrastructure.

HUMAN-CAUSE HAZARDS	
Bomb Threat	A bomb threat is the reported presence or threat of placement of an explosive device within the facility or on hospital property. In the absence of an actual explosive device there is low risk to patient health or physical property. However, until the Ontario Provincial Police clears the matter, access to certain areas may be lost and some operations may be suspended. In case of evacuation, minor injuries may occur. Depending on how far the event escalates, widespread media coverage and negative public reaction may occur.
Child Abduction	Child abduction is the illegal removal of an infant or child from the facility or department. This is a focused event with little chance of harm to patients or staff beyond the individual victim. Exceptions may exist if the assailant is confronted and turns violent, though this is rare. Infant abductions from Canadian hospitals are featured prominently in national media, with acute negative impacts on hospital reputation.
Civil Disorder	Civil disorder is the breach of law or general rule by a group of people, and may take many different forms. Disorder may be non-violent (e.g. blocked access to particular routes or buildings), or violent (e.g. acts of aggression towards people or physical property. Civil disorder is typically centered in large, dense populations, but may occur in smaller communities. Possible results include minor injuries or property damage.
Computer Virus / Cyber Attack	As the hospital network increasingly integrates technology into daily processes we become more vulnerable to harm through our computer systems. Computer viruses often enter systems and propagate unknown to users. Common sources include external tools such as USB storage devices, malignant e-mail attachments, and downloading from external websites. Viruses may also breach the system as part of a malevolent act aimed at damaging hospital infrastructure. Cyber-attacks in isolation of viruses may include intentional hacking of the system network to obtain or modify sensitive information. These incidents are typically localized, with consequences dependent on the scope of the event. A significant breach may lead to loss of access of critical information, altered function of some systems and medical devices, and damaged reputation in the event of leaked health information.
Hostage Incident	A hostage incident develops when a group or individual holds another group or individual against their will. Motivations may vary and targets may include patients, staff, or visitors. This is a localized event, with high risk of harm to hostages and intervening staff. Loss of access to affected areas will occur, with duration depending on the duration of the event. Hostage events will feature prominently in national media.

Labour Disruption	Labour disruptions are often the result of organized, legal job action. Groups may involve internal hospital staff from various departments and external contract staff. Direct impacts on patients are rare, but staff shortages may lead to reduced capacity to conduct regular hospital operations, and loss to some areas or services may occur. Financial costs may accumulate in prolonged disruptions, and reputation may be impacted if events are isolated to NSHN.
Mass Casualty Incident	A mass casualty incident is any event in which medical resources such as personnel and equipment are overwhelmed by the number and severity of casualties. A mass casualty incident may be medical (e.g. disease, chemical exposure) or traumatic (e.g. explosion, transportation accident) in nature. Mass casualty incidents may be triggered by any number of external hazards, including, but not limited to: HAZMAT events, pandemics, intentional violence, and extreme weather. Likelihood of these events increases with mass gatherings of people, such as during community festivals, sporting events, and concerts. Mass casualty incidents will rarely impact the hospital directly, but NSHN resources may be overwhelmed through patient surge.
Missing Patient	Missing patients are adult patients that have been away from their unit for an excessive or unexpected period of time. Consequences are typically low for this type of event. Exceptions may occur when high-risk or violent patients are missing, or if blame is placed on the hospital in the media.
Serious Adverse Event	Serious adverse events are incidents that result in death, disability, or prolonged hospitalization of existing patients due to errors in healthcare management. Adverse events are common in the healthcare industry. By definition, these events result in great harm towards one or more patients. Associated costs may be high, and reputation may be negatively impacted.
Terrorism	Terrorism is an act conducted with the intention to conduct harm to people, property, businesses, or the environment. Like HAZMAT accidents, terrorist acts are typically of CBRNE nature, with explosive devices the most common. Terrorism may also take the forms of cyber-attacks or intentional sabotage, and can be conducted by a group or individual, including past or current employees. Targeted attacks against the hospital will vary based on the nature of the event, but results likely include severe injuries, extensive damage to hospital property, prolonged loss of services, and loss of public confidence in safety. Fortunately there is no history of this type of event in Canada.
Violent Person – Patient	Violent patients are individuals receiving medical treatment, voluntarily or involuntarily, that are actively displaying physical aggression, or represent a threat of aggression or violence towards themselves, others, or their surroundings. These situations have the potential to lead to injury to those involved (including both the aggressor and those responding to the situation). Damage to infrastructure is common, and temporary loss of access to the isolated area may occur.

Violent Person – Non-Patient	A violent individual (non-patient) may be a past or present employee, a spouse of a patient or employee, or an individual with no connection to the hospital. Whereas violent patients often act due to medical conditions, a violent individual often acts with criminal intent. Due to this focus, these events are typically more severe but less frequent than violent patients. Weapons may be involved, and incidents may lead to injuries and loss of access to affected areas, with a chance to progress to a hostage situation.
Violent Person – Active Shooter	In very rare situations, a violent person or hostage incident may escalate to an active shooter. An active shooter may be a past or present patient, past or present employee, or an individual with no connection to the hospital. Active shooting events are characterized by intent to injure. Due to this focus, these events are typically more severe but less frequent than violent patients. Weapons may be involved, and incidents can lead to injuries and loss of access to affected areas, with a chance to progress to a hostage situation.
War	International conflict involving armed combat has the ability to affect Canada at any time. However, given the political state of the world in the early 21st century, it is extremely unlikely any combat would take place in Northern Ontario. Furthermore, the Geneva Conventions protect hospitals from being targeted by acts of international aggression. Any effects would likely be related to nation-wide business and supply disruptions, with little hospital impact.
Workplace Injury	Due to the nature of healthcare delivery injuries in the workplace may occur to both clinical and non-clinical staff. Serious injuries may occur, resulting in more than one day of lost time as well as associated costs and medical treatment. These events are related to performance of regular duties in isolation of other risk categories such as hazardous materials exposure or violent individuals. Occupational Health and Safety definitions within this category include bodily reaction/exertion, contacts with objects/equipment, and falls.

TECHNOLOGICAL HAZARDS	
Air / Space Object Crash	While exceptionally rare, any location on earth can be struck by an air or space object. This includes air transportation accidents such as malfunctioning planes, natural space objects such as meteorites, and man-made space objects such as satellites. Consequences would be related to the size of the object making impact, but in most cases the event would lead to multiple fatalities and catastrophic damage.
Fire Incident – Minor	Small fire incidents are those that originate within the hospital but are isolated events and can be easily controlled by hospital staff. These fires are commonly started due to failure of small electronics or medical device malfunctions. Occasionally these fires are intentionally started by patients. Human impacts are generally limited to smoke inhalation or patient movement due to residual smells. Damage is typically limited and costs are minimal unless the event progresses to a working fire stage.

Fire / Explosion – Internal	Internal fires or explosions are those that are located within the hospital itself, regardless of whether the fire originated internally or externally. These events are extremely unlikely but much more damaging and harmful than external fires or explosions. The majority of internal fires are small, localized events, but the situation may progress to a working fire where intervention by the fire department is required. Unless a fire is controlled quickly and patients evacuated, there is a significant risk of injury and death to patients and staff. Damage to property will be extensive, with considerable reconstruction required. Access to affected areas may be lost indefinitely. Associated costs of recovery will be significant.
Fire / Explosion – External	Fires are events of destructive burning caused by the ignition of a fuel/material, combined with oxygen, which produces heat and often open flame. Fires lead to or are caused by explosions, which is the sudden, violent release of energy caused by gases under pressure. Triggers of both fires and explosions may include intense heat, electricity, or chemical reactions. The events leading to an external fire or explosion or unpredictable, but events near the hospital may result in damage to hospital infrastructure, injuries to patients and staff, and influx of new patients injured in the event. The most common injuries include burns and complications due to smoke inhalation or carbon monoxide poisoning. Forest fires and smoke drift are common in Northern Ontario.
Hazardous Materials – Internal	The hospital industry is at relatively high risk of HAZMAT accidents due to the high concentration of CBRNE materials on site. The effects of a HAZMAT incident may be immediate or delayed. External HAZMAT events are impossible to predict, and are often the result of transportation or industrial accidents. Events in close proximity to the hospital may lead to evacuation, a shelter-in-place directive, decontamination, or injury/illness to staff, patients, and the public.
Hazardous Materials – External	A hazardous materials (HAZMAT) incident is the unintentional release of material capable of causing harm to humans or the environment. These incidents are often characterized by the acronym CBRNE, which describes the material's properties as one or more of: chemical, biological, radiological, nuclear, or explosive. The effects of a HAZMAT incident may be immediate or delayed. External HAZMAT events are impossible to predict, and are often the result of transportation or industrial accidents. Events in close proximity to the hospital may lead to evacuation, a shelter-in-place directive, decontamination, or injury/illness to staff, patients, and the public.
Structural Collapse	The loss of structural integrity in a building or structure that results in the structure losing shape, caving in, flattened or reduced to debris. Damage leading to collapse may occur gradually over time, or suddenly in a result to a specific triggering incident. A high probability of injury or death exists, with extensive reconstruction and prolonged or indefinite loss of access expected.

Transportation Accident	A transportation accident may result from a large scale collision between vehicles on a roadway, train derailment, or a marine accident. Accidents are more likely during periods of inclement weather but otherwise difficult to predict. Due to the proximity of North Shore Health Network Sites to major highways, waterways, and the proximity to the railway at the Blind River Site, transportation accidents may impact any of the sites. If HAZMAT materials are involved, the event should be considered a hazardous materials incident. Non-HAZMAT transportation accidents may result in secondary fires or explosions, and may cause damage to infrastructure or trigger a mass casualty incident.

INFRASTRUCTURE HAZARDS	
Electrical Failure – Primary	Disruption of electrical supply may affect the entire site or just select locations within some buildings. This can be triggered by external events such as severe weather or municipal power outages, or may stem from internal failure. Consequences should be limited by emergency generator back-ups feeding power to critical life safety equipment. The BR site has a back-up generator for essential equipment with the capacity to run for approximately 5 days. The TH and RL-M sites have back-up generators with the capacity to run for approximately 3 days.
Electrical Failure – Secondary (Generator)	In addition to loss of fuel supply, emergency generators may fail due to improper maintenance or prolonged periods of time without use. Generator failure may go unnoticed without consequence if regular electrical supply is functioning correctly.
Electrical Failure – Total	A worst-case scenario for any hospital is loss of both primary and backup power. If generators fail during a primary electrical failure access will be lost to critical medical equipment. Many interventions may become impossible, and patients relying on devices for life-sustaining therapies may have to be evacuated. Drugs, food, and medical devices that require careful temperature control may have to be replaced, and reputational damage may be extensive.
Fire System Failure	The fire system can fail due to problems with detectors, alarms, fire doors, sprinkler systems, and water supply. Unless systems fail during an active fire, effects on patients will be negligible; however some costs and loss of access may occur during repairs.
Flood – Internal	An internal flood refers to a flood event that originates within the hospital facility itself. Causes may include ruptured pipes, damaged water tanks, or sewage failure. The most probable consequence is damage to physical infrastructure and equipment within the hospital. Extensive cleanup or minor reconstruction may be required, shutting off access to isolated areas. If patient areas are affected and evacuation required, minor injuries may occur.
Fuel Supply Failure	Interruption of supply is often due to problems with fuel transport infrastructure, but may also be a result of regional fuel shortages. Emergency power generators rely on diesel (BR Site), propane (TH & RL-M Sites) to function.

HVAC Failure	Heating, ventilation, and air conditioning systems play a critical role in controlling the environment within the hospital. Limited downtime of some hospital areas may occur depending on the nature of the failure, though HVAC failures are typically brief in duration. The BR Site has radiant heat in addition to forced air supply as well as a diesel fuel alternate. The TH Site has radiant heat in addition to forced air supply as well as a propane fuel alternate. The RL-M Site has radiant heat, supplied by propane only and electric heaters used as an alternate.
IT Failure	Information technology services have become critical to numerous administrative processes within the hospital system, some of which are related to patient care. While direct effects on patient or staff health are unlikely, failure of IT services would disrupt a number of processes and business activities, and have moderate financial impact. Communication and documentation systems may be impacted.
Sewage Failure	Sewage failure is the inability of the sewer system to carry water away from the hospital, either due to internal or external blockage, or external failure or over-capacity. Failure to remove excess water may lead to localized discharge of water into the facility. Depending on the source of this water, it may contain biological or chemical waste that can cause illness, either through direct contact or contamination of food, water, or sterile medical equipment. In severe cases of sewage failure, internal flooding may result, causing further damage.
Supply Chain Disruption	Hospitals are complex institutions that rely on a multitude of products provided by external vendors. NSHN typically stores 5-7 days' supply of most formulary items in the Pharmacy Department; 5-7 days of food stock on hand; and an average of 1 months' supply of medical supplies and equipment. The majority of the supplies are stored at the BR Sit – transportation disruptions may also become a challenge. Prolonged interruption of supply chains that provides medical devices, equipment, or pharmaceuticals can impact patient care and facility functioning.
Telecommunications Failure	Telecommunications include internal and external phone systems, radios, and switchboard. These systems may fail due to operator error, IT failures, extremely high volume, or an external disruption. Without functioning telecommunications systems there is an increased likelihood of medical errors. There may be financial costs related to repair and downtime, and inability for the public to reach the hospital may result in negative publicity.
Water Supply Failure	Water supply is essential for drinking, food preparation, air conditioning, humidification, hygiene, and plumbing. Disruption may occur if the municipal supply is lost or contaminated, or if an internal issue (such as a leak) forces a localized shutdown. Lack of water will also impair response to other hazards, such as HAZMAT decontamination or fire suppression. Bottled water may be used – but may be difficult to be obtained in large events. Fire Department tankers may be used to deliver non-potable water to the sites.

APPENDIX B – Hazard Identification Risk Assessment Form

North Shore Health Network / Réseau Santé Rive Nord	HAZARD IDENTIFICATION RISK ASSESSMENT FORM

HAZARD:		**REVIEW DATE:**	
NSHN SITES:	☐ BR Site ☐ TH Site ☐ RL-M Site ☑ All Sites		
TOTAL SCORE:	_____ (LIKELIHOOD) X _____ (CONSEUQENCE) = _____ (TOTAL)	**RISK CLASSIFICATION:**	☐ High ☐ Moderate ☐ Low

	The ranking scale is from 1-5, with 1 being the lowest possible rank and 5 being the highest.	***TOTAL***
LIKELIHOOD *Likelihood is based on a combination of history and best estimates of future frequency of events.*	☐ 1 – Unlikely (but not impossible) to occur within a 100 year period in the hospital or community. ☐ 2 – May occur every 100 years in the hospital or community. ☐ 3 – May occur every 10 years in the hospital or community. ☐ 4 – May occur every year in the hospital or community. ☐ 5 – Multiple occurrences per year in the hospital or community. COMMENTS:	

	The ranking scale is from 1-5, with 1 being the lowest possible rank and 5 being the highest.	***TOTAL***
CONSEUQENCE *Is defined as the anticipated impact from a given event in a **worst-case scenario**.* *This measure is based upon the logic that it is always preferable to over-respond to an emergency.* *Consequence can be broken down into four components, each of which is of critical concern to a hospital.*	**HUMAN IMPACT:** the cost of a given event in human terms: lives lost and people injured. ☐ 1 – Injury or illness unlikely ☐ 2 – Low probability of injuries or illness ☐ 3 – High probability of injuries or illness ☐ 4 – High probability of injuries or illness and low probability of death ☐ 5 – High probability of injuries or illness and high probability of death COMMENTS:	
	PHYSICAL IMPACT: the cost of a given event in terms of loss of the use of hospital property or equipment, whether destroyed, damaged, or requiring clean up. ☐ 1 – Property damage or loss of access unlikely ☐ 2 – Minor clean-up or recovery time ☐ 3 – Minor damage, temporary loss of access ☐ 4 – Major damage, prolonged loss of access ☐ 5 – Indefinite loss of access to the affected area; complete rebuild COMMENTS:	
	FINANCIAL IMPACT: the cost of the impact of a given event in terms of dollar cost, whether for repair / replacement or for unbudgeted incident response costs. This also includes insurance claims, where appropriate. ☐ 1 – Negligible ☐ 2 – Generates expenditures or an insurance claim under $100,000 ☐ 3 – Generates expenditures or an insurance claim of under $1 Million ☐ 4 – Generates expenditures or an insurance claim under $10 Million ☐ 5 – Generates expenditures or an insurance claim over $10 Million COMMENTS:	
	REPUTATION DAMAGE: the cost of the impact of a given event in terms of damage to corporate or facility reputation. The impacts may affect recruitment, satisfaction and fundraising efforts. ☐ 1 – Reputation unlikely to be affected ☐ 2 – Limited negative local media coverage and/or public stigma ☐ 3 – Negative regional media coverage and strong public stigma ☐ 4 – Negative national media coverage, fundraising and/or recruitment affected ☐ 5 – Permanent association of adverse event with hospital, large effect on fundraising and/or recruitment COMMENTS:	
	CONSEQUENCE TOTAL (HUMAN IMPACT + PHYSICAL IMPACT + FINANCIAL IMPACT + REPUTATION DAMAGE)	

APPENDIX C: RISK SCORES

Risk assessments are not a precise science – rather, they are an estimation of the probability of future events and their impacts. The data in the following tables should be interpreted as best estimates rather than absolutes. Furthermore, as the assessment is based in art on the organization's hazard history, it is often impossible to separate the original risk from the residual risk left after existent mitigation efforts are considered. As a result, some hazards may reflect an already-mitigated risk level while others represent the true, original risk. Similarly, in some cases the consequences may actually be related to response rather than the initial hazard.

LAST REVIEW DATE: October 2021

NATURAL HAZARDS	LIKELIHOOD SCORE	CONSEQUENCE COMPONENTS				TOTAL RISK	RISK CLASS
		Human	Physical	Financial	Reputation		
Blizzard / Snowstorm	5	2	2	2	1	35	High
Contamination – Food	3	3	2	2	2	27	Moderate
Contamination – Water	3	3	2	2	2	27	Moderate
Earthquake	1	3	3	3	1	10	Low
Extreme Cold	4	3	2	2	1	32	Moderate
Extreme Heat	4	3	2	2	1	32	Moderate
Flood – External	3	2	3	3	1	27	Moderate
Geomagnetic Storm	1	2	3	2	2	9	Low
Ice Storm / Freezing Rain	4	2	3	2	1	32	Moderate
Infectious Disease – Internal	4	4	2	2	3	44	High
Pandemic / Epidemic – External	4	5	2	4	4	56	High
Severe Summer Storm	3	2	2	2	1	21	Moderate
Severe Winds	4	2	2	2	1	28	Moderate

HUMAN-CAUSE HAZARDS	LIKELIHOOD SCORE	CONSEQUENCE COMPONENTS				TOTAL RISK	RISK CLASS
		Human	Physical	Financial	Reputation		
Bomb Threat	2	3	4	3	3	26	Moderate
Child Abduction	2	3	2	2	4	22	Moderate
Civil Disorder	2	2	2	2	2	16	Low
Computer Virus / Cyber-Attack	4	1	4	3	3	44	High
Hostage Incident	2	3	3	2	4	24	Moderate
Labour Disruption	2	1	2	3	3	18	Moderate
Mass Casualty Incident	3	5	3	2	3	39	High
Missing Patient	4	4	1	3	3	44	High
Serious Adverse Event	3	3	2	3	3	33	Moderate
Terrorism	2	3	4	3	3	26	Moderate
Violence – Patient	5	3	3	2	2	50	High
Violence – Non-Patient	3	3	3	2	2	30	Moderate
Violence – Active Shooter	2	4	3	2	3	24	Moderate
War	1	4	4	4	2	14	Low
Workplace Injury	5	3	1	2	2	40	High

TECHNOLOGICAL HAZARDS	LIKELIHOOD SCORE	CONSEQUENCE COMPONENTS				TOTAL RISK	RISK CLASS
		Human	Physical	Financial	Reputation		
Air / Space Object Crash	1	3	4	3	2	12	Low

Fire Incident – Minor	4	2	2	2	2	32	Moderate
Fire / Explosion – External	2	4	4	3	3	28	Moderate
Fire / Explosion – Internal	2	4	3	2	2	22	Moderate
Hazardous Materials – Internal	3	3	3	2	2	30	Moderate
Hazardous Materials – External	3	3	2	2	2	27	Moderate
Structural Collapse	3	4	4	4	3	45	High
Transportation Accident	5	4	1	1	2	40	High

INFRASTRUCTURE HAZARDS	LIKELIHOOD SCORE	CONSEQUENCE COMPONENTS				TOTAL RISK	RISK CLASS
		Human	Physical	Financial	Reputation		
Electrical Failure – Primary	4	1	2	2	1	24	Moderate
Electrical Failure – Secondary	3	2	2	2	1	21	Moderate
Electrical Failure – Total	2	2	3	2	2	18	Moderate
Fire System Failure	2	2	2	2	2	16	Low
Flood – Internal	3	2	3	3	2	30	Moderate
Fuel Supply Failure	3	2	2	3	2	27	Moderate
HVAC Failure	3	2	3	2	2	27	Moderate
IT Failure	4	1	2	2	2	28	Moderate
Sewer Failure	3	2	3	3	2	30	Moderate
Supply Chain Disruption	3	1	2	2	1	18	Moderate
Telecommunications Failure	4	1	2	2	2	28	Moderate
Water Supply Disruption	3	1	2	2	2	21	Moderate

Note: Site differences may exist as a function of geography, infrastructure, and equipment.

APPENDIX D – Hazard Mitigation Plans

North Shore Health Network / Réseau Santé Rive Nord	HAZARD MITIGATION PLAN

HAZARD:	**Violent Patient**	**REVIEW DATE:**	**January 2020**
NSHN SITES:	☐ BR Site ☐ TH Site ☐ RL-M Site ☑ All Sites		
TOTAL SCORE:	5 (LIKELIHOOD) X 10 (CONSEUQENCE) = 50 (TOTAL)	**RISK CLASSIFICATION:**	☑ High ☐ Moderate ☐ Low

DESCRIPTION	Violent patients are individuals receiving medical treatment, voluntarily or involuntarily who are actively displaying physical aggression, or represent a threat of aggression or violence towards themselves, others, or their surroundings. These situations have the potential to lead to injury to those involved (including both the aggressor and those responding to the situation). Damage to infrastructure is common, and temporary loss of access to the isolated area may occur.

North Shore Health Network / Réseau Santé Rive Nord	HAZARD MITIGATION PLAN

HAZARD:	**Structural Collapse**	**REVIEW DATE:**	**January 2020**
NSHN SITES:	☐ BR Site ☐ TH Site ☐ RL-M Site ☑ All Sites		
TOTAL SCORE:	____3_____ X ____16_____ = ___48_____ (LIKELIHOOD) (CONSEUQENCE) (TOTAL)	**RISK CLASSIFICATION:**	☑ High ☐ Moderate ☐ Low

DESCRIPTION	The loss of structural integrity in a building or structure that results in the structure losing shape, caving in, flattened or reduced to debris. Damage leading to collapse may occur gradually over time, or suddenly in a result to a specific triggering incident. A high probability of injury or death exists, with extensive reconstruction and prolonged or indefinite loss of access expected.