**Topic 4: Organization of search and rescue operations. Hospital Disaster Preparedness.**

Disaster management aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery. The Disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event. Developmental considerations play a key role in contributing to the mitigation and preparation of a community to effectively confront a disaster. As a disaster occurs, disaster management actors, in particular humanitarian organizations, become involved in the immediate response and long-term recovery phases. The four disaster management phases illustrated here do not always, or even generally, occur in isolation or in this precise order. Often phases of the cycle overlap and the length of each phase greatly depends on the severity of the disaster.

Mitigation - Minimizing the effects of disaster.

Preparedness - Planning how to respond.

Response - Efforts to minimize the hazards created by a disaster.

Recovery - Returning the community to normal.

Mitigation

Mitigation activities actually eliminate or reduce the probability of disaster occurrence, or reduce the effects of unavoidable disasters. Mitigation measures include building codes; vulnerability analyses updates; zoning and land use management; building use regulations and safety codes; preventive health care; and public education.

Mitigation will depend on the incorporation of appropriate measures in national and regional development planning. Its effectiveness will also depend on the availability of information on hazards, emergency risks, and the countermeasures to be taken. The mitigation phase, and indeed the whole disaster management cycle, includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

Preparedness

The goal of emergency preparedness programs is to achieve a satisfactory level of readiness to respond to any emergency situation through programs that strengthen the technical and managerial capacity of governments, organizations, and communities. These measures can be described as logistical readiness to deal with disasters and can be enhanced by having response mechanisms and procedures, rehearsals, developing long-term and short-term strategies, public education and building early warning systems. Preparedness can also take the form of ensuring that strategic reserves of food, equipment, water, medicines and other essentials are maintained in cases of national or local catastrophes.

During the preparedness phase, governments, organizations, and individuals develop plans to save lives, minimize disaster damage, and enhance disaster response operations. Preparedness measures include preparedness plans; emergency exercises/training; warning systems; emergency communications systems; evacuations plans and training; resource inventories; emergency personnel/contact lists; mutual aid agreements; and public information/education. As with mitigations efforts, preparedness actions depend on the incorporation of appropriate measures in national and regional development plans. In addition, their effectiveness depends on the availability of information on hazards, emergency risks and the countermeasures to be taken, and on the degree to which government agencies, non-governmental organizations and the general public are able to make use of this information.

Humanitarian Action

During a disaster, humanitarian agencies are often called upon to deal with immediate response and recovery. To be able to respond effectively, these agencies must have experienced leaders, trained personnel, adequate transport and logistic support, appropriate communications, and guidelines for working in emergencies. If the necessary preparations have not been made, the humanitarian agencies will not be able to meet the immediate needs of the people.

Response

The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population. Such assistance may range from providing specific but limited aid, such as assisting refugees with transport, temporary shelter, and food, to establishing semi-permanent settlement in camps and other locations. It also may involve initial repairs to damaged infrastructure. The focus in the response phase is on meeting the basic needs of the people until more permanent and sustainable solutions can be found. Humanitarian organizations are often strongly present in this phase of the disaster management cycle.

Recovery

As the emergency is brought under control, the affected population is capable of undertaking a growing number of activities aimed at restoring their lives and the infrastructure that supports them. There is no distinct point at which immediate relief changes into recovery and then into long-term sustainable development. There will be many opportunities during the recovery period to enhance prevention and increase preparedness, thus reducing vulnerability. Ideally, there should be a smooth transition from recovery to on-going development.

Recovery activities continue until all systems return to normal or better. Recovery measures, both short and long term, include returning vital life-support systems to minimum operating standards; temporary housing; public information; health and safety education; reconstruction; counseling programs; and economic impact studies. Information resources and services include data collection related to rebuilding, and documentation of lessons learned.

Search and rescue is the search for and provision of aid to people who are in distress or imminent danger. The general field of search and rescue includes many specialty sub-fields, typically determined by the type of terrain the search is conducted over. These include mountain rescue ; ground search and rescue, including the use of search and rescue dogs ; urban search and rescue in cities; combat search and rescue on the battlefield and air-sea rescue over water.

International Search and Rescue Advisory Group (INSARAG) is a UN organization that promotes the exchange of information between national urban search and rescue organizations.

Types of search and rescue

Mountain rescue

Mountain rescue relates to search and rescue operations specifically in rugged and mountainous terrain.

Ground search and rescue

Ground search and rescue is the search for persons who are lost or in distress on land or inland waterways. Traditionally associated with wilderness zones, ground search and rescue services are increasingly required in urban and suburban areas to locate persons with Alzheimer's disease , autism, dementia , or other conditions that lead to wandering behavior. Ground search and rescue missions that occur in urban areas should not be confused with "urban search and rescue", which in many jurisdictions refers to the location and extraction of people from collapsed buildings or other entrapments.

Some ground search teams also employ search and rescue dogs.

Urban search and rescue

Urban search and rescue operations are the location and rescue of persons from collapsed buildings or other urban and industrial entrapments. Due to the specialized nature of the work, most teams are multi-disciplinary and include personnel from police, fire and emergency medical services. Unlike traditional ground search and rescue workers, most responders also have basic training in structural collapse and the dangers associated with live electrical wires, broken natural gas lines and other hazards. While earthquakes have traditionally been the cause of urban search and rescue operations, terrorist attacks and extreme weather such as tornadoes and hurricanes have also resulted in the deployment of these resources.

Combat search and rescue

Combat search and rescue is search and rescue operations that are carried out during war that are within or near combat zones.

Air-sea rescue

Air-sea rescue refers to the combined use of aircraft (such as flying boats, floatplanes , amphibious helicopters and non-amphibious helicopters equipped with hoists) and surface vessels, to search for and recover survivors of aircraft downed at sea as well as sailors and passengers of sea vessels in distress.

If you are the member of **the rescue team**, you have to follow **simple safety precautions**:

At any instant, no part of your body should be below any heavy object. Suppose, you have to lift a heavy object. As soon as its lifted slightly above the ground, put some piece of brick, wooden log, rock etc. directly below the object. The idea is: If for some reason, the object slips through or falls, your hand/legs should have a good clearing from the ground. Use some sturdy stick/pole etc. to place/move bricks/logs etc. below the object being lifted, rather than putting your own hand/leg below the object.

Lifting: If you have to lift a heavy object, don’t bend your body around waist. It could cause back-pain. The right way is to bend your knees, while, keeping your back straight. Hold the object firmly, and, now, straighten your legs/knee.

Instead of using your force, use the concept of levers to lift heavy objects. A lever is a sturdy pole. Place one end of this pole below the object to be lifted. Place some strong, solid piece of material below this pole, not very far (say: at approximately 1/3rd the total length of the pole – from the object to be lifted). Go to the other end of the pole. Now, you can pull the other end down, and, the object would get lifted. The effort that you would require to lift would be too less, compared to the object being lifted. The other advantage is: your limbs are nowhere directly below the object being lifted.

One of the concerns could be: when there is so much destruction all-around, where would we get such sophisticated tools. Well, the tools would be found in the debris itself.

*Personal Protective Equipment*

• Hand Protection. Don’t forget to wear gloves, when you are dealing with debris, and, a pair of good shoes. There might be glass-shards, sharp edges, and, what not.

When handling potentially infectious materials, use appropriate barrierprotection including latex and nitrile gloves (powder-free latex gloves with reduced latex protein content can help avoid reaction to latex allergies). These gloves can be worn under heavy-duty gloves which will, in turn, protect the wearer from cuts, puncture wounds, or other injuries that break the skin (caused by sharp environmental debris or bone fragments). A combination of a cut-proof inner layer glove and a latex or similar outer layer is preferable.

• Foot Protection. Footwear should similarly protect against sharp debris.

• Respiratory Protection. Use respiratory protection to combat effects from breathing dust and hazardous atmospheres which might contain some, or all, of the following: freon, carbon monoxide, hydrogen sulfide, asbestos, carbon dioxide, ammonia, and welding gases.

 • Hearing protection. Hearing protection is extremely important, particularly around saws, earth-moving equipment and hydraulic tools.

• Eye Protection. Protective eyewear (safety glasses with side shields, at a minimum), is necessary personal protective equipment.

• Fall Protection Equipment. Use fall protection equipment, with lifelines tied off to suitable anchorage points (e.g., bucket trucks), whenever possible. Other Considerations

• Be aware of electrical and gas hazards, e.g., downed wires and cables or broken gas lines. Incident commanders should be notified before continuing.

If working in confined spaces, ensure that at least one person remains outside the space to monitor operations and assist in an evacuation, if necessary. Reliable communications and rescue equipment, along with functioning alarm systems, are imperative.

• Watch for heavy equipment operation, including the swing radius for cranes and other equipment with arms. Each piece of heavy equipment should have a spotter when operating near emergency responders and skilled support workers.

**Sanitation and Hygiene In An Emergency**

The lack of sanitation facilities following major disaster can quickly create secondary problems unless basic guidelines are followed.

If the water lines are damaged or if damage is suspected, do not flush the toilet. Avoid digging holes in the ground and using these. Untreated raw sewage can pollute fresh ground water supplies. It also attracts flies and promotes the spread of diseases.

* Store a large supply of heavy-duty plastic bags, twist ties, disinfectant, and toilet paper
* A good disinfectant that is easy to use is a solution of 1 part liquid bleach to 10 parts water. Dry bleach is caustic and not safe for this type of use.
* If the toilet is NOT able to be flushed, it can still be used. This is less stressful for most people than using some other container. Remove all the bowl water. Line it with a heavy-duty plastic bag. When finished, add a small amount of deodorant or disinfectant, securely tie the bag, and dispose of it in a large trash can with a tight fitting lid. This large trash can should also be lined with a sturdy trash bag. Eventually, the city will provide a means to dispose of these bags.
* Portable camp toilets, small trash cans or sturdy buckets lined with heavy-duty plastic bags can also be used. Thosewithtightfittinglidsarebest.

**Tips for Staying Clean in an EmergencySituation**

As much as possible, continue regular hygiene habits such as brushing your teeth, washing your face, combing your hair and even washing your body with a wet washcloth. This will help prevent the spread of disease and irritation as well as help relieve stress.

* Keep your fingers out of your mouth. Avoid handling food with your hands.
* Purify your drinking water. Use chlorine bleach, purification tablets (check bottle for expiration dates), or by boiling for 10 minutes.
* Sterilize your eating utensils by heat. You can also rinse dishes in purified water that has additional chlorine bleach added to it. (Use 2 1/2 teaspoonsbleachpergallonofpurified water.)
* Keep your clothing as clean and dry as possible, especially under-clothing and socks.

If, during an emergency situation, you develop vomiting or diarrhea, rest and stop eating solid foods until the symptoms ease up. Take fluids, particularly water, in small amounts at frequent intervals. As soon as can be tolerated, resume eating semi-solid foods. Normal salt intake should be maintained.

**Sanitation**

When disasters occur, there is an urgent need for technical information on emergency procedures for water supply, disposal of excreta and other wastes, food and milk sanitation, disinfection and disinfestation, and the rapid control of flies, mosquitos, rats, and other insect and rodent pests. In the early stages of a disaster, much confusion and delay can be avoided if the staff in charge of sanitation relief know exactly what to do to remedy the most serious damage promptly and efficiently. It is clear that these needs cannot be met without careful planning and long preparation by the health authorities. Relief workers need to be given simple and practical instructions on how to perform their tasks under the abnormal and hazardous conditions created by a catastrophe. As each disaster has its own characteristics, and as each country has varying means and resources at its disposal, it is impossible to recommend specific measures that are applicable to all emergencies everywhere. Nevertheless, certain elements of emergency sanitation are common to most natural disasters.

Sanitation is the hygienic means of promoting health through prevention of human contact with the hazards of wastes as well as the treatment and proper disposal of sewage or wastewater. Hazards can be either physical, microbiological, biological or chemical agents of disease. Wastes that can cause health problems include human and animal excreta, solid wastes, domestic wastewater (sewage or greywater) industrial wastes and agricultural wastes. Hygienic means of prevention can be by using engineering solutions (e.g., sanitary sewers, sewage treatment, surface runoff management, solid waste management, excreta management), simple technologies (e.g., pit latrines, dry toilets, urine-diverting dry toilets, septic tanks), or even simply by behavior changes in personal hygiene practices, such as hand washing with soap.

Providing sanitation to people requires a systems approach, rather than only focusing on the toilet or wastewater treatment plant itself. The experience of the user, excreta and wastewater collection methods, transportation or conveyance of waste, treatment, and reuse or disposal all need to be thoroughly considered.

The main objective of a sanitation system is to protect and promote human health by providing a clean environment and breaking the cycle of disease

**Hospital Disaster Preparedness**

Hospitals play a critical role in providing communities with essential medical care during all types of disaster. Depending on their scope and nature, disasters can lead to a rapidly increasing service demand that can overwhelm the functional capacity and safety of hospitals and the health-care system at large. The World Health Organization Regional Office for Europe has developed the Hospital emergency response checklist to assist hospital administrators and emergency managers in responding effectively to the most likely disaster scenarios. This tool comprises current hospital-based emergency management principles and best practices and integrates priority action required for rapid, effective response to a critical event based on an all-hazards approach

During times of disaster, hospitals play an integral role within the health-care system by providing essential medical care to their communities. Any incident that causes loss of infrastructure or patient surge, such as a natural disaster, terrorist act, or chemical, biological, radiological, nuclear, or explosive hazard, often requires a multijurisdictional and multifunctional response and recovery effort, which must include the provision of health care. Without appropriate emergency planning, local health systems can easily become overwhelmed in attempting to provide care during a critical event. Limited resources, a surge in demand for medical services, and the disruption of communication and supply lines create a significant barrier to the provision of health care. To enhance the readiness of health facilities to cope with the challenges of a disaster, hospitals need to be prepared to initiate fundamental priority action. This document provides an all-hazards list of key actions to be considered by hospitals in responding to any disaster event. Hospitals are complex and potentially vulnerable institutions, dependent on external support and supply lines. In addition, with the current emphasis on cost-containment and efficiency, hospitals frequently operate at near capacity. During a disaster, an interruption of standard communications, external support services, or supply delivery can disrupt essential hospital operations and even a modest unanticipated rise in admission volume can overwhelm a hospital beyond its functional reserve. Employee attrition and shortage of critical equipment and supplies can reduce access to needed care and occupational safety. Even for a well-prepared hospital, coping with the consequences of a disaster is a complex challenge. Amid these challenges and demands, the systematic implementation of priority actions can help facilitate a timely and effective hospital-based response.

**Hospitals must be prepared to respond to natural and manmade mass casualty incidents that may cause sudden demand on services.**

Risk is a measure of the expected losses (deaths, injuries, property, economic losses etc.) due to a hazard of a particular magnitude striking in a given area. There are the four factors that contributes to risk. They are:

* Hazards (natural such as earthquake, floods, landslides,cyclones etc. or manmade such as exposure to hazardous material, explosion etc.)
* Location of hazard relative to the community at risk.
* Exposure (the effect of hazard on infrastructure and lifeline systems serving the population such as water supply, communication, transportation network etc.)
* Vulnerability of the exposed society, structure and systems to the hazard

Risk reduction can be done in two ways:

A. Preparedness: Preparedness encompasses all those measures taken before a disaster event which are aimed at minimizing loss of life, disruption of critical services and damage when the disaster occurs. Thus, preparedness is a protective process which enables governments, communities and individuals to respond rapidly to disaster situation and cope with them effectively. Preparedness includes development of emergency response plans, effective warning systems, maintenance of inventories, training of manpower etc.

B. Mitigation: Mitigation encompasses all measures taken to reduce both the effect of hazards itself and the vulnerable conditions in order to reduce the losses in a future disaster. Examples of mitigation measures include, making earthquake resistant buildings, water management in drought prone areas, management of rivers to prevent floods etc

Disaster management can be defined as the body of policy and administrative decisions and operational activities which pertain to the various stages of a disaster at various levels. Broadly disaster management can be divided into pre-disaster and post-disaster contexts.

Hospitals play a critical role in health care infrastructure. Hospitals have a primary responsibility of saving lives, they also provide 24x7 emergency care service and hence public perceive it as a vital resource for diagnosis, treatment and follow-up for both physical and psychological care. Hospitals are central to provide emergency care and hence when a disaster strike the society falls back upon the hospitals to provide immediate succor in the form of emergency medical care.

Whenever a hospital or a health care facility is confronted by a situation where it has to provide care to a large number of patients in limited time, which is beyond its normal capacity, constitute a disaster for the said hospital. In others words when the resources of the hospitals (infrastructure, trained manpower and organization) are over-whelmed beyond its normal capacity and additional contingency measure are required to control the event, the hospital can be said to be in a disaster situation. This implies that a same event may have a disaster potential for a smaller hospital and not so for a bigger hospital. Therefore disaster for a hospital is “a temporary lack of resources which is caused due to sudden influx of unexpected patient load”. In order to find out what constitutes a disaster or unmanageable incident for the hospital, the hospital needs to calculate its normal capacity, beyond which it has to act according to the Disaster Plan.

According to WHO the Mass Casualty Emergencies can be categorized in one of the following ways.

**Based on the Number of Casualties**:

Here the categorization is based on the number of casualties coming to a hospital at a time and the ability of the hospital to cope with those casualties. Categorization will differ from hospital to hospital and depend on several factors, such as the number of doctors and nurses available and the availability of supplies and support services. Assessment of the capacity of a hospital to respond to a given emergency situation can be assessed by the following two ways.

Hospital Treatment Capacity (HTC), is defined as the number of casualties that can be treated in the ), hospital in an hour and is usually calculated as 3% of total number of beds

Hospital Surgical Capacity (HSC) is the number of seriously injured patients that can be operated upon within a 12-hour period i.e. HSC= Number of operation rooms x 7x 0.25 operations/12 hrs.

 Category 1: Up to thirty patients belonging to a single accident or any other emergency, coming to a hospital y 1: casualty at one time.

Category 2: Thirty to fifty patients belonging to a single accident or any other emergency, coming to a y 2: hospital casualty at one time. Category 3: Category 3: More than fifty patients belonging to a single accident or emergency coming to the hospital Category 3: casualty at one time

 **Based on type of casualties**:

Category Category A: Patients in critical condition: : Include cases of polytrauma with head injuries, thoracic injuries, abdominal injuries, fractures of major bones with profuse bleeding etc. These patients require immediate resuscitation and supportive measures. About 10% of these are beyond salvage.

Category B: Patients in serious but not life threatening condition: : Include polytrauma cases of a less serious nature, for example, fractures and crush injuries of limbs with out major blood loss, facial injuries, spinal injuries, etc.

Category C: Walking wounded: : These patients may have minor injuries requiring wound toileting and dressing and / or limb fractures requiring closed reduction and immobilization.

**Based on the categorization**, it is advisable to further classify by the contingency plan into three classes: into three classes: into three classes:

Class A: The plan can be put into practice without any disruption to the normal and routine work of the institution.

Class B: The plan can be put into practice with minor disruption to the day to day functioning of the hospital and with some readjustments. The plan may be upgraded to C if the numbers of casualties increase

Class C: There would be definite disruption of routine work: Major readjustments would be required in hospital functioning, inpatient treatment, duty arrangements, laboratory and operation theatre scheduling, and increased demand on stores, pharmacy etc.

A Hospital Emergency Plan is unique to each hospital as it depends upon its bed strength, staff and other resources. and other resources.

Hospital disaster management provides the opportunity to plan, prepare and when needed enables a rational response in case of disasters/ mass casualty incidents (MCI). Disasters and mass casualties can cause great confusion and inefficiency in the hospitals. They can overwhelm the hospitals resources, staffs, space and or supplies. Lack of any tangible plan to fall back upon in times of disaster leads to a situation where there are many sources of command, many leaders, and no concerted effort to solve the problem. Everyone does his/ her own work without effectively contributing to solving the larger problem of the hospital. Therefore, it is essential that all Hospital Emergency Plans have the primary feature of defining the command structure in their hospital, and to extrapolate it to disaster scenario with clear cut job definitions once the disaster button is pushed. Chaos cannot be prevented during the first minutes of a major accident or disaster. But the main aim of Hospital Emergency Plan should be to keep this time as short as possible.

All hospitals should also have a realization that in a sudden mass casualty incident their hospital is actually running on full capacity. Due to greater number of patients coming in there is a tendency and pressure to practice disaster medicine and thereby reducing the quality of medical care in the interest of greater number of surviving persons. But under all circumstances, even in a disaster planning should be done in a way that the quality of care to the serious / critical patients is not compromised. The plan should aim at :

The survival and recuperation of as many patients as possible

 A proportional distribution of patients to other health care facilities

Hospitals which provide full time emergency services on a 24hour-per-day, 7 days a week basis meet the standard requirements of receiving mass casualty incident patients at all times

 Hospital has sufficient number of personnel, including doctors and paramedical staff to meet the patient needs for emergency care.

The Services are appropriate to patient needs.

The emergency services provided are integrated with other departments of the hospital.

Therefore it is imperative for these facilities to make a Hospital Emergency Plan.

One of the important roles of the district medical authority would be to organize the overall health delivery system of the district according to the plan. The mass casualty medical preparedness plans should be dovetailed into the existing district disaster management plans. Health delivery system management plays an important role in reducing morbidities and mortalities. In times of disasters the health delivery systems, all of a sudden, have to provide medical facilities to an unusually large number of patients out of which many would require the first-aid treatment only. In order to provide medical facilities to the, needy in time, it is necessary to screen out large number of minor injuries from the serious ones. With the above intention, mass casualty management at the district level should be planned in two stages: -

I) Pre-Hospital Management Pre-Hospital Management

a) First aid Parties

b) First Aid Posts(static and mobile)

c) Ambulance service

d) Mobile Surgical Units.

II) Emergency Hospital Organization

a) Emergency Hospital Services (including critical care facilities)

b) Emergency Surgical Services

c) Emergency Transfusion Services

d) Emergency investigation facilities

**Evacuation of the hospital**

A pre-event evacuation may be carried out in anticipation of an impending event, when the hospital structure and surrounding environment have not yet been compromised. A pre-event evacuation is appropriate when decision teams believe the effects of the impending disaster may either place patients and staff at unacceptable risk, or when an evacuation after the event is likely to be extremely dangerous or impossible.

Pre-event evacuations are an option in Advanced Warning Events—disasters that decision teams and emergency officials can anticipate and track, as they assess the possible consequences of the disaster on their hospital and the surrounding community. Hurricanes are the most common example of Advanced Warning Events, and decision teams may decide to evacuate prior to hurricane landfall. Wildfires, rising rivers, and bomb or other terrorist threats can also force decision teams to decide to preemptively evacuate their hospital. If decision teams elect not to preemptively evacuate—deciding instead to shelter-in-place—a post-event evacuation may become necessary, depending on the impact of the event on the hospital and surrounding area. Thus, an Advanced Warning Event frequently requires two evacuation decisions: one pre-event and another post-event. By contrast, an event with no advanced warning involves only the post-event decision.

This process begins with an initial consideration of the decision to order a pre-event evacuation. Typically, this would occur as soon as a disaster is identified that could potentially threaten a hospital. This is often days before the disaster "hits," such as when a hospital is inside a 3-day projected hurricane path. In this way highlights the three possible outcomes of this decision: wait and reassess, start an evacuation, or make an explicit decision to shelter-in-place during the event.

The wait-and-reassess option defers the decision of whether to start a pre-event evacuation and is typically the preferred option early in the tracking period, when the disaster is not yet an immediate threat. The wait-and-reassess option is predicated on decision teams' belief that after reassessment, there will still be ample time remaining for an evacuation, if it is needed. In this option, disaster tracking meetings are held regularly, and decision teams cycle through the flowchart loop of "Order Pre-Event Evacuation?" and "Wait and Reassess," possibly several times .

Decision teams rely on emergency management officials for accurate information about both the expected time and magnitude of the event, as well as explicit quantification of the uncertainty of estimates. Of course in some situations, such as a verified bomb threat, there may be no time to "wait and reassess."

In the wait-and-reassess option, the expected time until the event occurs should be compared to the time required to evacuate patients from the building and safely transport them to other facilities to determine if the decision to evacuate can be deferred. The evacuation time assumptions generated as part of the Pre-Disaster Self-Assessment provide estimates for the time required to safely evacuate. These assumptions should be revisited based on current conditions in the hospital and the expected impact of the event.

Specific items to consider in the reassessment of the time required to evacuate patients include the following:

Current patient census and mix. How does the current patient census differ from the assumptions used to estimate evacuation time and resource needs in the self-assessment?

Availability of ambulances, wheelchair vans, and buses. Are previous assumptions about the availability of transportation resources still valid? Are alternative sources of transportation resources available? Are other hospitals currently evacuating or planning to evacuate patients?

Location of facilities able to receive your hospital's patients. Are the intended receiving care sites still able to accept patients? What alternative receiving care sites are available to accept patients?

When there is time—particularly in the days prior to a hurricane—decision teams usually discharge any patients who can safely be released to their families and stop admitting new patients. This is called census reduction, and it reduces the demands on the hospital as the focus turns to evacuating patients who require ongoing care. Census reduction may take place before an official pre-event evacuation order is given, as in advance of hurricane; early discharges may also occur after a No Advanced Warning Event, such as an earthquake. Census reduction is a deliberate strategy to reduce the number of patients a hospital is responsible for transferring to other facilities.

Evacuation Sequence in a Pre-Event Evacuation

If the decision is made to begin a pre-event evacuation, decision teams must also decide in what sequence to evacuate patients. While this is an operational issue, it is included in this Guide because decision teams that have considered this issue a part of evacuation planning and have trained staff according to the plan may be better prepared to carry out an evacuation.

Many hospital evacuation plans focus on keeping patients together with the staff who know them best, and evacuating entire floors or units together. This is more difficult if many hospital personnel are absent, as may happen when staff evacuate a city with their families in advance of a hurricane, flood, or fire Safe transportation must be arranged for non-ambulatory patients, and it may not be possible to evacuate all ICU patients together with their staff when there are insufficient ambulances available, or when air evacuation is necessary.  ICU and NICU patients will likely require more staff assistance and equipment during evacuation, and decision teams must decide whether to send out these precious resources with the first wave of evacuees (leaving fewer behind for the remaining patients) or wait to move the most resource-intensive patients last.  Finally, in the hours before a hurricane, flood, or wildfire, decision teams must decide whether the most fragile patients are at more risk from an evacuation than from sheltering-in-place.

Every hospital has an evacuation plan, and although most acknowledge that specific circumstances may alter evacuation decisions, some plans/protocols do not acknowledge this need for flexibility.  A one-size-fits-all evacuation plan may become obsolete in the midst of a disaster, especially in responding to a No Advanced Warning Event, such as an earthquake. Lessons learned from the experience of others in many different and challenging disaster scenarios will help decision teams adjust their plans to suit specific disaster circumstances.

After census reduction has occurred and a pre-event evacuation has been ordered prior to an Advanced Warning Event, decision teams must decide whether to evacuate their most medically unstable patients (e.g., those requiring powered life-support equipment) or keep these patients in the threatened hospital and hope that essential services will not be disrupted.  The risks of moving medically unstable patients are high, and physicians and decision teams must weigh the risks of moving these patients against the risks of sheltering-in-place.

The deliberate strategy of evacuating the most resource-intensive patients first in a pre-event evacuation emerged following Hurricane Katrina. The experience of waiting too long, and then being stranded in hospitals without water or power, was a powerful lesson for decision teams and staff. Those who went through this ordeal advise that it is preferable to preemptively evacuate resource-intensive patients, so as to avoid having to evacuate them in even more treacherous conditions after the storm hits.

This advice was followed by several decision teams a few weeks after Hurricane Katrina, as Hurricane Rita approached the Gulf Coast. At eight hospitals that were evacuated (partially or fully) prior to landfall of Hurricane Rita, decision teams chose to evacuate their most medically unstable patients first, as soon as appropriate transportation teams and equipment were available. For example, the University of Texas Medical Branch evacuated critically-ill patients first because this was deemed safer than having them shelter-in-place.  Seven other hospitals within one medical system first evacuated the NICU and then ICU patients, as appropriate transportation became available.

Staff and transportation shortages, or fear of them, may also prompt pre-event evacuations and affect the sequence of patient transfers.  In the case of a community-wide evacuation order, hospital workers may be dispersed, leaving hospitals with insufficient staff to shelter-in-place or without enough able bodied people to assist during an evacuation.  The evacuation process drastically reduces the number of staff available to stay in the hospital and care for patients, as some staff must join transport teams. Medically unstable patients are particularly resource-intensive and may need to be transferred with several care givers (to provide manual ventilation, monitor cardiac status, and provide other services in the absence of electricity) on specialized vehicles. Evacuating resource-intensive patients well before disaster strikes allows at least some opportunity for transport staff to return to the hospital to care for those sheltering-in-place or to evacuate additional patients. In addition, an early pre-emptive evacuation may allow time for more staff to arrive as replacements for the departing transport teams.This strategy also prevents patients from potentially being transferred in post-event conditions, such as a flood, which may preclude the use of ambulances and other specialized transport equipment.

**Post-Event Evacuation**

Pre-event evacuations, which are possible with Advanced Warning Events. Post-event evacuations have occurred either following Advanced Warning Events (i.e., if the decision was made to shelter-in-place during the event, but subsequent damage was sufficient to necessitate evacuation) or during . No Advanced Warning Events include, most notably, earthquakes, building fires, tornadoes, and explosions (both accidental and terrorist acts).

As soon as possible after the event occurs, building integrity, critical infrastructure, and other environmental factors must be assessed to determine whether the hospital can continue to provide appropriate medical care to patients or should instead be evacuated. It’s assumes that hospitals will be in one of three conditions following the event:

**No threat to patient/staff safety.** In this situation, it is immediately clear that the hospital did not suffer any significant damage that would cause decision teams to order an evacuation. This is the usual outcome for hospitals that experience minor earthquakes or that shelter-in-place throughout a hurricane and suffer little or no significant damage.

**Immediate threat to patient/staff safety.** At the other extreme are situations in which the event clearly causes an immediate life-threatening risk to patients and staff, and the hospital must be rapidly evacuated.

**Potential/evolving threat to patient/staff safety.** Between these two extremes are situations when it is not immediately obvious whether or not the hospital should be evacuated

Faced with a potential/evolving threat to patient and staff safety, decision teams must consider whether to evacuate. It’s known, this decision has two possible outcomes:

**Wait and reassess.** Absent a compelling reason to evacuate, the decision should be deferred and reconsidered at a later point, at which time the situation could significantly improve (i.e., no threat to patient/staff safety), significantly worsen (i.e., immediate threat to patient/staff safety), or not change significantly and require further careful assessment.

**Start evacuation.** The factors that should be considered in the pre-event evacuation decision are the same for post-event evacuations. Actual post-event evacuations are often delayed as long as possible and are sometimes unavoidable due to loss of critical resources.

**Evacuation Sequence in a Post-Event Evacuation**

If the decision is made to begin an evacuation after the event has occurred, a subsequent judgment must be made regarding the sequence in which to evacuate patients. As was the case with the sequence in pre-event evacuations, with many post-event evacuations the most resource-intensive patients were evacuated first.