Disaster Management in Hospitals: Shifting Strategy Towards Systems Approach

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Abstract

The risks and vulnerability of hospitals to different disasters require a modified strategy to plan for adequate preparedness towards mitigating the impacts and sustain functionality of services during emergency situations. The systems approach is a purposive viewpoint that addresses holistically and comprehensively the various concerns and gaps in the disaster management cycle. The approach necessarily focuses on the underlying causes of disasters, the pre-conditions of disaster risks and the vulnerability of the community. This article recommends integrating structure, process and outcome measures with disaster risk management strategy into a systems approach model for disaster management in hospitals.

Key Words: Disaster Management, Disaster Rsk Management , Systems approach, Structure, Process and Outcome

Introduction

A large number of natural and man-made disasters have been witnessed globally that resulted in enormous loss of precious lives and massive destruction of property. India due to its unique geo-climatic and topographic conditions remains vulnerable to a variety of hazards. About 59% of our landmass is prone to earthquakes, 40 million hectare of land is prone to floods, about 7500 km of coastline is prone to cyclones and almost 68% of total geographical area is vulnerable to droughts. The heavy toll, caused by such hazards, of precious lives and infrastructure including health care establishments has led to significant setbacks to the economy of the nation. For instance, the Gujarat earthquake in 2001, with Bhuj at its epicentre, killed more than 17,00 people and destroyed nearly 3812 health care institutions (WHO, 2009). These incidents exposed the poor state of preparedness of our hospitals. The frequent episodes of disaster events in the country have accentuated the need to adopt a multi-dimensional endeavour involving diverse scientific, engineering, financial and social processes.

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Some Historical Data...

- **Gujarat Earthquake (2001) : 3812 health care facilities destroyed**
- **Indonesia Tsunami (26 Dec 2004) : 30 health facilities destroyed and 77 damaged seriously**
- **Sri Lanka Tsunami : 92 facilities including 35 hospitals destroyed**
- **Muzaffarabad (2005) : 49% health facilities destroyed**
- **China (Sichuan) earthquake (2008): 11,000 medical institutions destroyed**

(Source: WHO, FAQ on WHO Day, 2009)

Shifting Strategy from Traditional to Modern Approach

Hospitals, like any other establishments are vulnerable to both natural (Earthquake, Floods, Tsunamis, Cyclones) and human-made disasters (Accidents, Fires, Terror attacks). Traditionally, the approach to disaster management has been focussed on anticipating and responding to natural or man-made hazards and responses have been mainly directed towards relief and rescue operations and rehabilitation. Government of India have brought about paradigm shift in the approach to disaster management that helped in gaining better understanding of the variables determining the intensity and extent of disaster impacts and thus aim at designing and implementing a mechanism to either eliminate the actual causes or at least mitigate the impact of disasters. Hospitals are vulnerable to damages, both structural and non-structural, when exposed to disasters of various kinds. In case of hospitals, implementing quality improvement programme along with an 'All-Hazard' approach to emergency preparedness is considered ideal.

Need for a Modified Approach

The enactment of Disaster Management Act in 2005 provided a great impetus to the institutionalisation of the mechanism of disaster management at the national, state as well as district levels in India. Further, the modern day disaster in form of terrorism related events have also necessitated authorities to frame steps for better action plans and strategies for hospital preparedness to such events. The new disaster management policy also emanates from the belief that investments in preparedness and mitigation are much more cost effective than expenditure on relief and rehabilitation.

Historically, the approach was directed towards providing post-disaster relief and rehabilitation. The changed policy/approach, however, mandates a priority to all

aspects of disaster viz. mitigation, prevention and preparedness. Typically, the disaster management system should address three distinct phases viz. pre-disaster planning (early warning), activities during the disaster (response) and post-disaster (includes relief, rescue and rehabilitation). This new approach can easily be translated into a road map covering an institutional mechanism along with risk reduction and disaster prevention strategy, early warning system, disaster mitigation, preparedness and response, and human resource development (Guzman, 2003)

Systems Approach

Systems are dynamic architectures of interactions and synergies among various sub-systems and processes. Systems approach includes identifying, understanding and managing interrelated activities or processes within the system that contributes to effectiveness and efficiency in achieving desired objectives. While considering the hospital as a system, a thorough assessment of various interrelated and interdependent components with respect to all aspects of safety and security is crucial. The systems approach is a purposive viewpoint that addresses holistically and comprehensively the various concerns and gaps in the disaster management cycle encompassing all aspects related to hospital system. In this regard, it necessarily focuses on the underlying causes of disasters affecting the hospitals as well as the risks and vulnerability of the hospitals to various disaster situations. It further emphasises multilevel, multidimensional and multidisciplinary cooperation and collaboration for effective disaster reduction and response (Simonovic, 2012).

Systems thinking, in disaster management, aims at enhancing the ability to make better decisions in developing preparedness and response mechanism keeping in view the overall aspects of risks and vulnerability. It encompasses building a sound framework for risk reduction while using existing resources, selecting scientifically designed buildings, safe transportation systems, effective communication networks, adequate & competent educational and medical facilities, appropriate processes, suitable waste-disposal techniques, better crime prevention methods, etc.

Disasters cannot be seen as isolated random acts of nature. Rather, they are consequential evidence of poor risk management and inadequately handled interconnected social and physical processes; that can increase risk and vulnerability to even modest threats. Hence, a systems approach that integrates a multi-dimensional concept of disaster risk management and the structure, process and output directed interventions need to be adopted and further nurtured for a robust disaster management strategy.

Not Every Hazard is a Disaster !

Hazards have always been an integral part of our environment. Any phenomenon, event or occurrence which has varying degree of potential to cause loss or injury to life or damage to property or the environment can turn into a hazard whetherdue to naturally occurring causes e.g. flood, tornado, volcano eruption, earthquake, landslide or human-induced e.g. terror attacks, bomb blasts, CBRN (Chemical, Biological, Radiological and Nuclear) hazards. However, a mere exposure to a hazard does not necessarily mean disaster. Hospitals are very sensitive and important public places. It is vital to anticipate and assess the consequences of exposure to a hazard in terms of magnitude of the phenomenon, the probability of its occurrence, and the extent and severity of its impact.

Risk and Vulerability

Risk, in disaster management refers to the probability of loss or injury to life and property as a consequence to exposure to a potential disaster event. UNDHA (1992) refers risk as a product of social vulnerability and hazard. Let us illustrate by taking the example of two persons crossing the ocean-one in an ocean liner, the other in a rowing boat. It is clear that although in both cases, the main hazard i.e. exposure to deep ocean waters and waves remains the same, the risk is far greater in case of the person rowing the boat as the rowing boat is more vulnerable to the impact of the waves. Vulnerability refers to the susceptibility of a community to any hazard and the prevailing conditions, including physical, socio-economic and political factors that adversely affect its ability to respond to such events. Vulnerabilities can be manifested as physical, social, or attitudinal vulnerability.

Systems Approach Model for Disaster Risk Management

Risks occur if we cannot control the relations within this system and if we don't know the impacts of changes in the environment. Hence integrated risk analysis and risk reduction techniques should be in place for achieving the desired objectives. The starting point of an integral risk management concept is the relation between hazard, vulnerability, risk and risk management. World Institute for Disaster Risk Management (DRM) is a network for applied research, implementation and dissemination in the field of disaster risk management and provides the framework for major contributions towards an integrated risk management and a sustainable risk prevention culture. Systems approach requires

of tools for an overall risk mitigation by developing methods and measures to support

prevention and intervention activities such as monitoring, forecasting, early warning and decision-supporting tools for frontline decisions (Bieri (n.d)).

Risk management is the systematic application of management policies, procedures and practices to the tasks of identifying, analysing, assessing, treating and monitoring risk. As a process, it includes analysing the risk, estimating its potential effects, and determining its importance in the scheme of things. It includes an evaluation of all the elements that are relevant to an understanding of existing or probable hazards and their effects on a specific community or environment. When considered in socio-economic and political terms, such evaluation enables the determination of appropriate vulnerability reduction, prevention and mitigation, as well as preparedness and response strategies.

Risk and Vulnerability Analysis

Risk or vulnerability analysis is a technical evaluation process for identifying hazards and estimating the probability of their occurrence and consequences under certain given conditions. A facility audit, at the initiation of the process, to identify structural or non-structural damages would aid immensely in progressing further. The WHO has created Hospital Safety Index (HSI) that can be used to evaluate how safe a health facility is. These assessments then can be further compared with a standard or pre-defined criterion in order to decide whether or not some interventions are essential to protect people, property, or environment from a potential hazard.

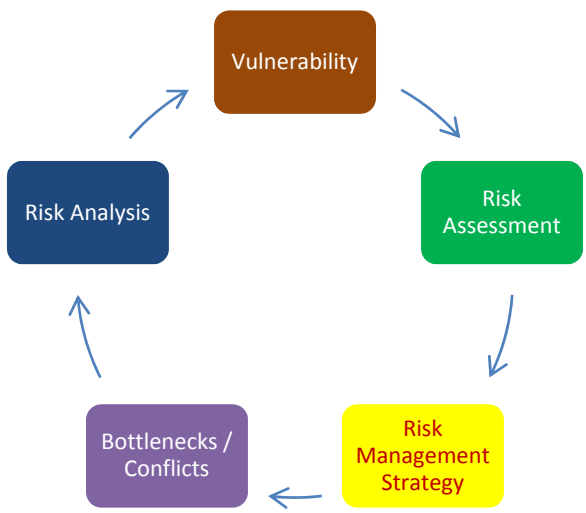

Figure 1: Risk and Vulnerability Analysis

Risk analysis and risk management as a process

Risk analysis is the systematic use of available information to determine the likelihood of occurrence of certain events and the magnitude of their impact. It includes the following activities:-

- identifying the nature, extent, and risk of threat;
- determining the existence and degree of vulnerabilities;
- identifying the capabilities and availability of resources;
- determining acceptable levels of risk, cost-benefit considerations;
- setting priorities relative to time, resource allocation, effectiveness of results;
- developing methods to protect people and key resources and reduce overall losses; and
- designing effective and appropriate management systems to implement and control.

An ideal model of systems approach as adopted by DRM links together the elements of risk analysis, vulnerability, and risk assessment.

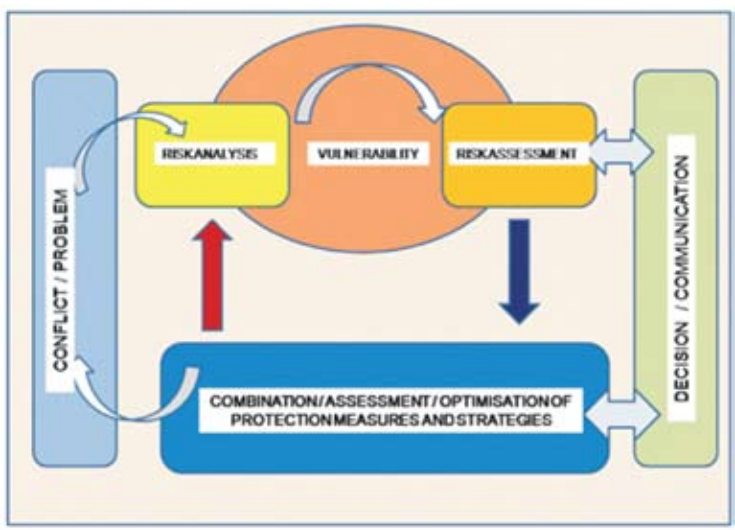

Figure 2: Systems Approach model for Disaster Risk Management

Quality Concept and Hospital Disaster Management

Hospitals bear a distinct threat and vulnerability to hazards. It is not only the precious lives of patients and others in the hospital that are at risk, but also the costly

infrastructure including sophisticated latest medical devices and professionally competent human resource are equally vulnerable to loss / damage. The dependency of community on a hospital during the time of a disaster further adds to its uniqueness in the need for a more secure mechanism of maintaining safety from potential disasters.

The popular saying in Armed Forces "The more we stress in peace, the less we bleed in war", clearly applies here. It really matters how much care was taken in anticipating each aspect separately and how much of effort was put in for rectifying defects before re-implementing process. The more attention given for structural safety, process safety and implementation aspects, the lesser is the risk and vulnerability to hazards.

Structure, Process & Outcome Model

The recent developments in the field of quality in health care and accreditation standards for hospitals have established new scope for safety and security. The interrelatedness and interdependency between structure, process and outcome aspects of hospital system, as described by Donabedian, brings new horizons in systems thinking towards disaster management for hospitals.

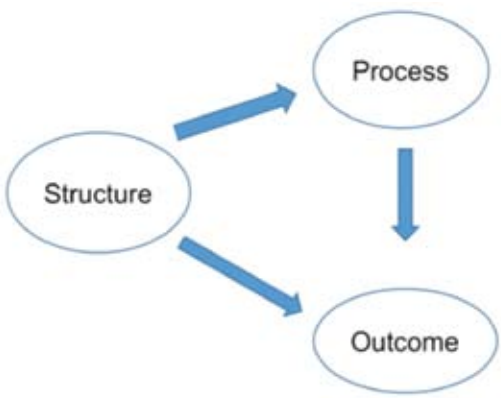

Figure 3: Structure, Process and Outcome Concept

If we closely analyse the adoption of systems approach emphasises on each element of the Donabedian model discretely, some important interventions would include appropriate measures and activities directed towards minimising the magnitude of vulnerability in each aspect i.e., structure or design activities, process driven and implementation activities and outcome or evaluation activities coupled with definite corrective steps wherever necessary.

Structural Measures	Process Measures	Outcome Measures
• Site plan & Design of the building as per local safety norms/safe building codes. • Provision of safety mechanism e.g. seismic proofing, flood proofing, fire proofing, etc. • Equipment and installations adhering to safety standards and secured safely (fall proof). • Trained and competent staff. • Effective communication network system with emergency backup facility. • Mobile field hospitals • Capacity building among civil defence and healthcare workers. • Hospital Safety Index and facility audit	• Comprehensive operational & preventive maintenance plan. • Fire fighting drills, Periodic checks for functionality of fire safety devices. • Regular mock drills with and without involving patients. • Mitigation measures such as Early Warning system, etc. • Capacity development programmes e.g. regular training for Medical First responders.	• Performance indicators to assess implementation strategies and initiate appropriate & timely intervention. • Rehabilitation activities to contain further loss of lives and restoration of working population. • Media Management to encourage relief and rehab activities rather than ndulge in unnecessary political vandalism. • Evaluation Mechanism including Feedback systems for continuous improvement in all activities. including feedback systems

A systems approach model involving various activities and interventions addressing each aspect i.e. structural safety, process safety and safety during their implementation which can be applicable to hospitals, is depicted in the figure below.

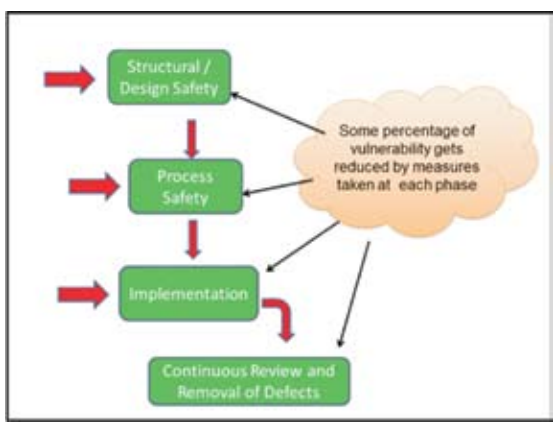

Figure 4: Systems thinking and reduced vulnerability to disasters

Govt Initiatives and Role of Multiple Agencies

In today's fast changing global environment, the detrimental consequences of disasters on society, economy, natural environment, and even politics, cannot be overemphasized. Moreover, socio-economic studies have revealed that the secondary effects and indirect costs of damages to hospitals due to disasters have long-term effects on societies, regardless of their level of development.

The pre-hospital care in the country is grossly deficient. The on-ground experience and constraints during various disaster situations have necessitated the requirement for ambulatory services by way of ambulances and standby containerised or modular field hospitals for an early deployment and immediate treatment in the eventuality of hospital themselves becoming victims of internal or external disasters.

The JPN Apex Trauma Centre, New Delhi has been identified as the nodal agency by National Disaster Management Authority to create a pool of skilled first responders by organising capacity development programmes and pre-hospital Trauma life support training. These trained personnel will contribute not only by applying their knowledge and skill during an emergency, but also disseminate their experience to others at their respective areas of working. Similar initiatives have also been taken at state level e.g. establishment of Shushruta Trauma Centre at LNJP Hospital in Delhi, schemes for establishing Trauma care centres at most of the National Highways such as Mumbai-Pune Highway, a centre with Sassoon Hospital Pune, etc. Such measures would minimise the consequences of hazards, although with limited effect on the risk and vulnerability.

Conclusion

The vulnerability to different types of disasters require an assessment of the potential risks and possible hazards that can affect the hospital system. The multi-dimensional role of hospitals and its long term economic and socio-political impact further necessitates a shift in the approach to preparedness. Systems approach is one of the several essential tools for restructuring the relationships within the health system. The approach intends to integrate, complement, and enhance the existing disaster reduction and response strategies along with adoption of quality concept for disaster management in hospitals. With leadership, conviction and commitment, systems thinking can open powerful pathways to identify and resolve health system challenges.

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