



MAINSTREAMING DISASTER RISK REDUCTION INTO HEALTH: STRATEGIES, METHODOLOGIES & TOOLS



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SECTION-I

OVERVIEW OF DRR IN HEALTH SECTOR IN INDIA

1.1 Background

The Regional Consultative Committee (RCC, 2006), comprising of 26 Asian Countries, on Disaster Management under its program on Mainstreaming Disaster Risk Reduction into development (MDRD) has identified Housing, Health, Infrastructure, Agriculture and Education as priority sectors to initiate mainstreaming disaster risk reduction (DRR). Mainstreaming DRR by the development and implementation of disaster preparedness planning for hospitals and health facilities was dealt in Theme 7.2. Overall, it was recommended that mainstreaming of disaster risk management into specific sectors should ensure that both policies and plans are in place with appropriate goals and objectives that demonstrate due consideration of risk issues and be based on disaster risk assessment. Improved resistance and hazard resilience of health facilities, analysis of their internal and external vulnerability during emergencies, and increased hazard of these hospitals, and the construction of resilient and functional hospitals, as well as the increased preparedness (with a mandatory Hospital Preparedness Plan for all) of health facilities to maintain operations during disasters were specific steps that were identified under the health sector. Prior to RCC in 2006, MDGs were a major conceptual reference for mainstreaming activities into the sustainable development perspective. The Declaration, endorsed by 189 countries, was translated into a roadmap setting out goals to be reached by 2015. The eight MDGs build on agreements made at United Nations conferences in the 1990s represent the commitments to reduce poverty and hunger and to tackle ill-health, gender inequality, lack of education, lack of access to clean water and environmental degradation.

Three out of eight goals, eight of the 16 targets and 18 of the 48 indicators are related directly to health. Health is also an important contributor to several other goals (education and empowerment of women). The significance of the MDGs lies in the linkages between them: they are a mutually reinforcing

framework to improve overall human development. All these 18 indicators endorsed there are very much connected to and dependent on how health sector plan addresses these indicators during disasters.

1.2 Problem Statement (Impacts Of Disasters On Health)

The effects of a disaster vary according to the nature of the event itself and the characteristics of the communities and objects affected: the population, their natural environment, their housing, the public services on which they depend, and the physical structures and assets of industry, commerce, and other economic activities that provide goods and livelihoods. Common epidemics and the other major diseases are disasters in themselves but these diseases are also hazard factors that can interact with vulnerability conditions to engender disaster. In turn, disasters from natural hazards, climatic conditions and other shocks can create favorable environmental conditions which, together with mass population movements, can lead to epidemics. Hence, any effort to reduce disaster risk from disease epidemics has to be comprehensive and must reflect the complex interactions among climatic, vector-specific, political, demographic and development-based factors that worsen health risks. Enhancing the limited capacity to effectively manage infectious disease epidemics in India requires comprehensive assessment of health risks associated with these hazards. For the most part, health services are provided by a variety of health care establishments such as hospitals, health centers, health posts, and clinics. They may be managed by the government or the private sector. Hospitals normally offer emergency services and secondary or tertiary medical care, while health care centers offer primary care and some first aid or basic care.

A hospital is a complex system that demands uninterrupted power and potable water, continual communications services, solid and liquid waste disposal, and a steady supply of pharmaceutical products, medical and surgical supplies, specialized gases, chemicals and fuels. At the same time, each of these necessities also represents a hazard if improperly stored, handled, or maintained, and can become a hazard during an earthquake, fire, explosion or other disaster. Hospitals are essential to disaster response, but they also tend to

be highly vulnerable because of some of the characteristics such as complexity, higher occupancy (especially in Indian context), critical supplies, basic facilities, hazardous materials, heavy object/equipments, and the man power available 24 hours.

A hospital's capacity for effective disaster response depends on systematic organization and easy mobilization of personnel, equipment and supplies in a safe environment. Procedures, buildings and equipment are all critical and interdependent. A weakness in any element of a hospital's functional system could cause a crisis throughout the institution. The following issues must be taken into consideration:

Thus, there are three main elements to a hospital disaster preparedness planning:

1. Treatment of patients must continue during and after a disaster or emergency.
2. The safety of all occupants must be assured. A vulnerability assessment of the facilities should be conducted. If necessary, the building should be retrofitted according to current design and construction standards. If this is not immediately possible, emergency plans should be adapted in the meantime to take the existing vulnerability factors into account.
3. At some point during an emergency or disaster, it may be necessary to evacuate ambulatory and non-ambulatory patients. This will be more complex if the disaster occurs suddenly and at a time when there are many visitors who are generally unfamiliar with evacuation procedures.

Hospitals play such a vital role in the recovery of a community after a disaster, many factors must be taken into account when selecting the location of a health facility, as well as when designing, building, maintaining and operating it. These considerations range from structural resistance requirements to disaster response planning to the installation of a range of nonstructural elements and equipment. As a result, special considerations for risk prevention and mitigation must be made from the moment a hospital building is conceived.

When we talk of hospital we primarily refer to how the hospitals and the entire health sector is prepared to manage the emergency. And any emergency preparedness does not exist in a vacuum but it has to be contextual. This context will vary from place to place depending upon the hazard vulnerability, existing health sector preparedness and resource allocation. There is a need to develop conceptual strategic framework aimed at providing a sound basis for the health sector to develop strategies, mechanisms, systems, plans and procedures.

1.3 Health Sector in India

Seventh Schedule of the Indian Constitution describes three exhaustive lists of items, namely, Union list, State list and Concurrent list. Though some items like Public Health, hospitals, sanitation, etc. fall in the State list, the items having wider ramifications at the national level like population control and family welfare, medical education, prevention of food adulteration, quality control in manufacture of drugs etc. have been included in the Concurrent list.

The Ministry of Health & Family Welfare is instrumental and responsible for implementation of various programmes on a national scale in the areas of Health & Family Welfare, prevention and control of major communicable diseases and promotion of traditional and indigenous systems of medicines. Apart from these, the Ministry also assists States in preventing and controlling the spread of seasonal disease outbreaks and epidemics through technical assistance. In addition the Ministry is also responsible for emergency medical response during any disaster.

Ministry of Health & Family Welfare incurs expenditure either directly under Central Schemes or by way of grants-in-aids to the autonomous/ statutory bodies etc. and NGOs. In addition to the 100% centrally sponsored family welfare programme, the Ministry is implementing several World Bank assisted programmes for control of AIDS, Malaria, Leprosy, Tuberculosis and Blindness in designated areas. Besides, State Health Systems Development Projects with World Bank assistance are under implementation in various states. The projects are implemented by the respective State Governments and the Department of

Health & Family Welfare only facilitates the States in availing of external assistance. All these schemes aim at fulfilling the national commitment to improve access to Primary Health Care facilities keeping in view the needs of rural areas where the incidence of disease is high.

The country has a well structured **3-tier public health infrastructure**, comprising Community Health Centres, Primary Health Centres and Sub-Centres spread across rural and semi-urban areas and tertiary medical care providing multi-Specialty hospitals and medical colleges located almost exclusively in the urban areas. Improvements in health indicators can be attributed, in part to this network of health infrastructure. However, the progress has been quite uneven across the regions (large scale inter-State variations), gender (male/female differences) as well as across space (with significant rural-urban differences). Conscious and vigorous efforts continue to be made during the current year to step up funding of the health sector as part of MoHFW's endeavor to ensure that allocations for health in the public domain reach 3 per cent of the GDP by 2012. The major thrusts in this direction are the **National Rural Health Mission (NRHM)** and **National Urban Health Mission (NUHM, yet to be fully operated)**, which aim at major qualitative improvements in standards of public health and health care in the rural and urban areas through strengthening of institutions, community participation, decentralization and innovative methods of reaching all habitations.

The National Rural Health Mission, April 2005 was an attempt to provide accessible, affordable and accountable quality health services to the poorest households in the remotest rural regions. The detailed framework for implementation that facilitated a large range of interventions under NRHM was approved by the Union Cabinet in July 2006. Under the NRHM, the difficult areas with unsatisfactory health indicators were classified as special focus States to ensure greater attention where needed. The thrust of the Mission is on establishing a fully functional, community owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure simultaneous action on a wide range of determinants of health like water, sanitation, education, nutrition, social and gender equality. Institutional integration within the

fragmented health sector was expected to provide a focus on outcomes, measured against Indian Public Health Standards for all health facilities. From narrowly defined schemes, the NRHM is shifting the focus to a functional health system at all levels, from the village to the district. The Ministry of Health & Family Welfare to address the health care needs of urban poor in a dedicated and focused manner proposed to launch the National Urban Health Mission (NUHM). The aim of the Mission was to improve the health status of the urban poor particularly the slum dwellers and other disadvantaged sections by facilitating equitable access to quality health care with the active involvement of the Urban Local Bodies (ULBs).

1.4 Definitions, Concepts and Operationalization of Definitions

1.4.1 Critical Facilities

As per UNISDR definition, critical facilities are the primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency. They include such things as transport systems, air and sea ports, electricity, water and communications systems, hospitals and health clinics, and centres for fire, police and public administration services.

1.4.2 Health

Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, 1946 defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

1.4.3 Hospital

A hospital is defined as a public or private or a charity institution that provides medical, surgical, or psychiatric care and treatment for the sick or the injured. In an elaborative form it refers to a building in which the sick, injured, or infirm are received and treated; a public or private institution founded for reception and cure, or for the refuge, of persons diseased in body or mind, or disabled, infirm, or dependent, and in which they are treated either at their own expense, or more often by charity in whole or in part; a tent, building, or other place where the sick or wounded of an army cared for.

1.4.4 Public health

Public health is "the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals." (1920, C.E.A. Winslow). It is concerned with threats to the overall health of a community based on population health analysis. The population in question can be as small as a handful of people or as large as all the inhabitants of several continents (for instance, in the case of a pandemic). Public health is typically divided into epidemiology, biostatistics and health services. Environmental, social, behavioral, and occupational health are other important subfields. The goal of public health is to improve lives through the prevention and treatment of disease. The focus of public health intervention is to prevent rather than treat a disease through surveillance of cases and the promotion of healthy behaviors.

Public health is community health. It has been said that: "Health care is vital to all of us some of the time, but public health is vital to all of us at all time." Public health is comprised of many professional disciplines such as medicine, dentistry, nursing optometry, nutrition, mental health, social work, environmental sciences, health education, health services administration, and the behavioral sciences, and its activities focus on entire populations rather than on individual patients.

The three core public health functions are:

1. The assessment and monitoring of the health of communities and populations at risk to identify health problems and priorities;
2. The formulation of public policies designed to solve identified local and national health problems and priorities;
3. To assure that all populations have access to appropriate and cost-effective care, including health promotion and disease prevention services, and evaluation of the effectiveness of that care.

Clinical doctors usually treat individual patients one-on-one for a specific disease or injury. Public health professionals monitor and diagnose the health concerns of entire communities and promote healthy practices and behaviors to assure our populations stay healthy.

1.4.5 Mental health & Psychosocial support

According to National Guidelines on Psychosocial Care and Mental Health Services in Disasters (NDMA, 2010), psycho-social support in the context of disasters refers to comprehensive interventions aimed at addressing a wide range of psycho-social problems arising in the aftermath of a disaster. Psycho-Social Support and Mental Health Services (PSSMHS) should be considered as a continuum of the interventions in disaster situations. Psycho-social support will comprise of general interventions related to the larger issues of relief work needs, social relationships and harmony to promote or protect psychosocial well-being of the survivors. Mental health services will comprise of interventions aimed at prevention or treatment of psychological symptoms or disorders. These interventions help individuals, families and groups to restore social cohesion and infrastructure along with maintaining their independence and dignity.

1.4.6 Reproductive & Child health

UNFPA defines Reproductive Health (RH) as a state of complete physical, mental and social well being and not merely the absence of disease and infirmity, in all matters relating to the reproductive system and to its functions and processes. RH therefore implies that people are able to have safe and satisfying sexual practices and that they have the capability to reproduce and the freedom

to decide if, when and how to do so. Implicit is the right of men and women to be informed and have access to safe, effective, affordable and acceptable methods of family planning of their choice, as well as other methods of their choice for regulation of fertility which are not against the law, and the right of access to appropriate health care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chances of having a healthy infant. The 1994 International Conference on Population and Development (ICPD) recognized the importance of addressing basic health care needs, including reproductive health (RH) and family planning in disasters. The RH concept typically covers pregnancy and motherhood, gynecological care, family planning, sexually transmitted infections and HIV/AIDS, and adolescent reproductive health. Other issues that merit consideration are gender based violence, psychosocial care and poor access to quality health care services. Family planning and maternal and newborn health services have substantial measurable impacts on the health of women and families, especially in situations like natural disaster. Such services save lives, improve long-term prospects for good health and enhance individuals and families productivity and well-being. These services should be seen as a part of the continuum of care that women need during their reproductive years and as essential components of a comprehensive package of sexual and reproductive health services that need to be provided also in times following floods.

1.4.7 Public Health Infrastructure

World Health Organization defines public health infrastructures as formal and enduring structures that support public health and these are comprised of institutions and capacity, knowledge (of public and professional), and commodities (physical infrastructure).

In other words, these are the formal and enduring structures that support public health, having both tangible and intangible aspects and which exist both inside and outside the government sector. They may be directly protective of health - as

in public sanitation systems - or they may support other activities that protect and enhance health.

1.4.8 Public Health Engineering

The main function of the Public Health Engineering Department is to plan, implement & maintain Rural and Urban Water Supply Schemes, rural sanitation schemes. The District Level administration of the Public Health Engineering Department undertakes field investigation, survey, data collection, preparation, execution & maintenance of schemes. The salient objective and functions of the Public health Engineering Department are

1. To plan & execute water supply schemes for adequate safe drinking Water Supply to Rural and Urban population including schools & Anganwadi centers.
2. To provide sanitary facilities to the rural areas including rural schools by using appropriate Low-cost technologies.

1.4.9 Health Education

Health education is defined as various methods used to inform people about health issues and to persuade and enable them to adopt lifestyles that will improve overall health condition and to reject habits regarded as harmful to health. More precisely, health education is the process by which people learn about their health and more specifically, how to improve their health.

It encompasses not only the information on what behaviors are healthy, but also how to achieve those behaviors with skills development and can sometimes include motivation to change. For example, in addition to knowing what foods are healthy, it is also necessary to know how to prepare those foods, and easy ways to incorporate them into your diet. All these aspects together are more likely to result in behavior changes that lead to improved health.

1.4.10 Community capacity building

Community capacity is defined as “the combined influence of a community’s commitment, resources, and skills that can be deployed to build on community strengths and address community problems.”

Mainstreaming

The concept of inclusion is akin to that of ‘mainstreaming’. Mainstreaming is defined as the systematic consideration of the differences between the different conditions, situations and needs of disadvantaged groups in all policies, at the point of planning, implementation and evaluation. It should aim to ensure that opportunities are genuinely available and accessible to the spectrum of potential service users and that current initiatives do not have a negative impact on disaster affected groups. Integration means providing certain features and arrangements that allow some people to access and participate in their environment in limited circumstances and in reaction to a stated need. It is a reactive, non-anticipatory approach, which provides for a limited degree of independence.

1.5 Mainstreaming DRR into Health Sector

Mainstreaming disaster risk reduction in health sector implies to develop or to strengthen (or to extend the existing capacity) a systematic strategy for risks reduction (arising from possible disease epidemics and hospital/pre hospital based management of non epidemic medical conditions after disasters) measures for promotive or curative health care services in health sector at all levels (the planning, implementation, monitoring and evaluation stages). It can also be defined as development of a robust public and clinical health care service provision institutional mechanism to reduce the mortality and morbidity risks induced by any disaster.

A basic principle of DRR mainstreaming into health sector is the systematic consideration of the differences between non-disaster and disaster conditions, situations, and needs of affected population in health policies, programmes and

activities. As it is a holistic approach, it is only possible to outline briefly the main principles to be followed. However, these principles may vary with the context.

There could be seven steps that represent the main milestones within the mainstreaming process.

1. Analysis of a given situation
2. Creating awareness on DRR issues within the given context
 - a. Legislative level
 - b. Institution level
 - c. Community level
3. Identification of feasible measures which consider and reduce health impacts of disasters -----3 levels
4. Identification of indicators and pre conditions which reflect the success of DRR mainstreaming efforts (while indicators reflect the degree to which an activity leads to the desired objective, pre conditions have to be defined, under which the activities can be performed)
5. Defining and prioritizing feasible measures
6. Implementation by identified stakeholders
7. Monitoring the impact of these measures and adapting to the demand

Apart from the disasters caused by natural hazards; epidemics of swine flu, dengue, SARS, HIV/AIDS, malaria and the other major diseases constitute disasters themselves. The risk characteristics of various epidemic diseases differ. However, some generic issues of risk reduction can be applied to a variety of disease situations. Consequently, issues pertaining to disaster and health reflect a complex interaction of climatic, vector-specific, political, demographic and development-based factors. Population movement and existing health care facilities do play a major role in health care service provisions during epidemic outbreaks.

In line of the above-mentioned seven steps, the following are among measures that can be implemented to mainstream disaster reduction activities in public health issues management:

- Adopting a multi-hazard approach to disaster risk management that includes epidemics and other biological hazards;
- Re-orienting the current focus on post-epidemic response towards the culture of prevention in managing health effects of disasters;
- Integrating health concerns in hazard control measures, such as health implications of large open flood control water channels;
- Developing strategies for epidemic preparedness and emergency action;
- Developing integrated monitoring systems that include early detection of epidemics based on epidemiological data, early warning system based on meteorological data, and long-range forecasting;
- Integrating health information collection and monitoring in general vulnerability information systems, such as environmental information systems;
- Monitoring and addressing long-term factors of vulnerability to epidemics, such as health care entitlement, immunity status, nutrition level, sexual behaviour, land use patterns, population movement, and status of routine control.

1.5.1 Rationale of mainstreaming

The increasing recognition of the fact that “the development process does not necessarily reduce vulnerability to natural hazards; instead it can create new forms of vulnerabilities or exacerbate existing ones” resulted in a paradigm shift in development thinking to find ‘win win solutions’ for securing sustainable development. One such solution is the proposition to integrate disaster risk reduction strategies and measures within the overall development framework; considering disaster risk as an integral component of the development process. Following this recognition there had been many efforts to “mainstream” DRR into “development” by the global partners of development since the 1990s. This entailed considering and addressing risks emanating from natural hazards in the

development policies, plans, strategies and programs, including the institutional structures of the countries, particularly those that are prone to natural disasters. Thus, mainstreaming DRR envisages analyzing how potential natural hazards and disasters could affect the performances of those policies, plans, strategies and programs and also how the same policies, plans and programs impact on vulnerabilities to natural disasters. The following explanations could be banked upon to understand the need of mainstreaming DRR into health sector:

Firstly, health problems due to communicable diseases in a non-disaster time often threaten the public health and account for millions of preventable deaths each year. The risk of this has a potentiality to be compounded during the post-disaster time resulting from socio-environmental conditions prevail in that time. Secondly, health problems arising from lack of hospital disaster preparedness is nevertheless a key issue at the community level. All health care establishments, be it a hospital or primary health care centre, are at the interface between the health sector delivery systems and the community. And hospitals have a pivotal role as the potential link between these various actors in daily emergencies as well as in disaster situations. While the treatment of injured victims in disasters is one of the major aspects, the role of the public health sector is to also contribute to the environmental health such as water, sanitation, and vector control. Psychosocial support and disaster mental health activities are also given more and more importance in public health and here hospitals also have a major role to play. Therefore study of disasters should be brought into the scope of mass-trauma, violence and emergency medical services to make sense in term of priorities for the health sector and which could be the entry point for disaster management. The development and strengthening of the capacity to adequately manage daily trauma situations will serve as a platform to develop the capacity to manage mass casualty situations, which will in turn serve as a platform to further develop the capacity in order to manage disaster situations more effectively and professionally.

Hence, DRR activities are to be made as part of a regular and emergency health care practices/services where public health, emergency health services and

hospitals have to work together very closely in a more methodical manner. Fortunately, India has a reasonably good health care delivery system up to the community level and what needs to be done is to augment the system with massive DRR pertaining health education and capacity building at all levels so that these DRR activities become complementary to the existing health care delivery system in the country. It is to say that whereas an aware community reduces 30-40% of public health risks, an educated community reduces more than 60% of public health risks resulting from natural disasters.

The argument for disaster risk reduction (DRR) is unequivocal: it can save lives, livelihoods, and infrastructure, and reduce disruption to communities when a natural hazard event occurs. Additionally, DRR can prevent a natural hazard event from actually becoming a disaster and allow countries which are at risk from natural hazards to develop in a sustainable way. Development and the Millennium Development Goals (MDGs) are limited by disasters and many studies have shown the benefits of DRR measures both in economic and social terms. Therefore, mainstreaming DRR issues into health sector is beneficial not only in terms of ensuring less mortality and morbidity and more quality of healthy living during these eventualities, but also in terms of numerous tangible and intangible economic and social benefits. And without the integration of DRR into all aspects of development, sustainable development will be more of a challenge, if not impossible, in many countries.

1.5.2 Aim and objectives of mainstreaming

The aim of mainstreaming DRR in to Health Sector is to create a culture of healthy living at individual, community, hospital, and care givers level in disaster/mass casualty situations by reducing the risks of mortality, morbidity and epidemics.

The broad objectives are to:

- ❖ Review the current Acts, Policies, and Programmes/Schemes related to health and then to integrate health related DRR issues into these.
- ❖ Evolve with and development of a framework of community based health risk management with its two broad components (hospital disaster

- preparedness/management and public health risk management at community level).
- To assess vulnerability and strengthen the capacity of hospitals/health care establishments/public health infrastructures comprising of:
 - Commodities (Physical structures)
 - Institutions and capacities (facilities and non-structural elements)
 - Knowledge and skills (health care service providers across levels)
 - Linkages (formalizing hospital networking)
 - To assess the status of community health education and awareness for common public health problems prevention and to augment the knowledge and healthy living practices in the community so as to bring a culture of collective sensitivity towards disaster specific public health risks
 - ❖ Suggest a suitable methodology to formalize coordination and network with related line departments having a bearing on health of the survivors
 - To undertake joint activities/projects/programmes/forum interaction with:
 - Public health engineering
 - Food and civil supply
 - District administration
 - NGOs/INGOs in the health field
 - To conduct joint capacity building programmes on the subject.
 - ❖ To suggest a monitoring and evaluation mechanism to ensure the progress in mainstreaming.

Basic Principles of Mainstreaming

Responsibility for implementing the mainstreaming strategy is system-wide, and rests at the highest levels within agencies.

- Adequate accountability mechanisms for monitoring progress need to be established.
- The initial identification of issues and problems across all area(s) of activity should be such that gaps in effective health delivery system can be diagnosed.
- Assumptions that issues or problems are neutral from a community perspective should never be made.
- Vulnerability and capacity analysis (for hospitals and health professionals) should always be carried out.
- Clear political will and allocation of adequate resources for mainstreaming, including additional financial and human resources if necessary, are important for translation of the concept into practice.
- DRR mainstreaming into health requires that efforts be made to broaden community participation.
- Mainstreaming DRR into health sector should always consider the broad definition of health not its parts, hence has to inclusive of different sub disciplines in health.

1.5.3 Methodology of mainstreaming

Mainstreaming a DRR perspective into health sector is a process of assessing implications for overall health of community at large in disaster/mass causality situations in any planned action, including legislation, policies or programmes, in any area and at all levels. It is a strategy for making the concerns and experiences of disaster affected population an integral part of the design, implementation, monitoring and evaluation of health policies and programmes. These are necessary measures designed to combat the direct and indirect health consequences of past disasters. The key mainstreaming methodology would primarily be comprised of:

- ✓ Document review & the integration of Health related DRR issues appropriately and adequately

- ✓ Consultation with various officials in the Ministry, Public health and Hospital Sectors, etc.
- ✓ Vulnerability & Capacity Assessment
- ✓ Structural and non-structural capacity building of present health care facilities
- ✓ Integration with the large scale community health education
- ✓ Integration with national programmes/schemes
- ✓ Capacity development activities for various professionals
- ✓ An overall framework development for all mainstreaming issues in this sector
- ✓ Proposition of an evaluation & monitoring framework

Thus in a nutshell, mainstreaming DRR into development planning and sectoral policies such as health and others, should be reflected in the creation or adaptation of legislation and regulation, codes and standards, resource mobilization and allocation, and implementing and coordinating bodies. In summary DRR should be considered at all levels (national to local) and by all implementing bodies (organizations and government departments) for it to be effective. It may entail identifying the need for changes in that agenda. It may require changes in goals, strategies, and actions so that risk reduction happens at its maximum at public health as well as hospital level.

1.5.4 Expected outcomes of mainstreaming

Any mainstreaming aims to result in multiple ways in terms of short term and long-term outcomes. It is important to visualize the same at the beginning of the entire exercise.

The Ministry of Health should also ideally propose a national disaster/emergency plan/strategic framework for the health sector with the overall national disaster plan and accordingly all states should have state specific health sector plan. The strategic framework set by the health authorities/ministry will serve as a platform to promote health sector disaster preparedness at all levels, which will produce:

- A command system organizational roles and responsibilities in response and recovery, especially the role of the hospitals
- Robust and safe hospitals with hospital damage assessment method
- Strengthening public health management in post-disaster period
- Quick and robust public health engineering facilities in the affected areas
- Strengthening of hospital and laboratory networks during disasters, which ultimately results in resource strengthening, mobilization and redistribution
- Enhanced community awareness, health education and participation in community health interventions
- Efficient and effective need assessment and corresponding response and recovery strategies and systems (logistics management-equipment, trained professional, medicines, ambulances, surgical items, mobile hospitals, logistics for medical management of CBRN group of disasters, etc)
- Mandatory simple and flexible written plans at district and hospital level
- Massive orientation and other capacity building training for health professionals
- Maximized utilization of AYUSH/indigenous and alternative medicine branches
- Community recovery planning and health preparedness thereafter

Short term outcomes could be:

- Reviewing the relevant documents would result in identifying the appropriate place for mainstreaming DRR issues
- In addition, this would also result in identifying appropriate DRR issues (that may occur) in national health programmes/schemes/missions
- Knowledge building through various capacity building programmes for different levels of health professionals, mainly resulting in the sensitization of people at the policy and planning level.
- Dissemination of appropriate and adequate knowledge to district level hospitals situated at multi-hazard prone places.

Long-term outcomes could be:

- Drastic reduction of post-disaster mortality and morbidity
- Efficient and effective pre-hospital and post-hospital medical services to disaster affected population
- Total control of water borne and vector borne diseases in a post-disaster period
- Efficient and quick lab confirmation of epidemic diseases at a disaster side.
- Readiness of medical management of CBRN disaster survivors at the professional and hospital level.
- Regular and effective psychosocial and mental health service provision to the affected population
- Skill up-gradation and capacity enhancement of the human resources in the health sector
- Community capacity building in terms preventive and promotive health and to develop a culture of health safety and health risk reduction at community level
- Structural and non-structural safety of the hospital would be ensured
- The Accident & Trauma/Emergency units/department of all the hospitals in the would be geared up to meet the challenges of mass casualty management issues
- Capacity/skill building on essentials of disaster health care/medical preparedness/mass casualty management would begin from the MBBS/other professional health courses/nursing/paramedics, etc
- Effective and efficient field and hospital care in multi-hazard prone states/UTs.

1.5.5 Challenges in mainstreaming

The range of tools, frameworks and methodologies for mainstreaming DRR reflect the diversity of the process. Tools might include cost-benefit analyses (CBA) as a way to encourage policy-makers to advocate DRR mainstreaming;

frameworks could include templates for including DRR in policies and/or development initiatives; and methodologies may include guides to integrating DRR into every sector. These tools, frameworks and methodologies are aimed at policy-makers, development organizations, civil society, charities and local governments.

Different approaches & perspectives

1.5.6 International

Amongst the SAARC countries, Bangladesh has come up with its guidelines for mainstreaming DRR into planning, designing and construction of health facilities in 2008-09. In the first phase they undertook the following items:

- Reviewed the process of planning, design and construction of Health Facilities and provided recommendation for integration of DRR in each stage for each stakeholder agency
- Reviewed the process of undertaking assessment of health facilities in post disaster situation, undertook assessment of selected hospitals to come up with recommendations for setting up a national system for undertaking assessment of health facilities.
- Provided recommendations for the next step of the PIP to attain the objective of mainstreaming DRR in the Health sector in Bangladesh.

1.5.7 National: Constitutional Commitments on Health

Commitments to MDGs have already been mentioned in the introduction part. More constitutional commitments have been included in the policy analysis in the next section.

As the National Health Policy is committed for a robust health care delivery mechanism during disasters, it is highly required to review all Acts, Policies, Projects, Programmes, Plans, Schemes of the Government to find appropriate mechanism to mainstream DRR issues.

SECTION-II

GAP ANALYSIS: REVIEW OF EXISTING MECHANISMS, SCHEMES & FACILITIES

2. Existing Health Act/Policies/ Bill/Mission

2.1 Health policies in India (Sokhey Committee of 1938, Bhore Committee of 1946, Mudaliar Committee of 1962)

Maternal emergency and adverse impact of large scale epidemics formed the core of discussion in the Sokhey Committee, which submitted its report in 1948. Later on, Bhore committee was constituted in 1943 to investigate and recommend improvement to the Indian Public Health Systems and the final report was submitted in 1946. It said "If it were possible to evaluate the loss, which this country annually suffers through the avoidable waste of valuable human material and the lowering of human efficiency through malnutrition and preventable morbidity, we feel that the result would be so startling that the whole country would be aroused and would not rest until a radical change had been brought about". Thus, the main recommendation was on prevention and mitigation of human suffering, mortality and morbidity at all administrative levels. Subsequently Lakshmanswami Mudaliar Committee was constituted in 1959 (1962) towards the end of second five-year plan to assess the state of health care filed and to measure the progress achieved by implementing the suggestions of the Bhore Committee of 1946. Mudaliar committee discussed issues such as medical care, public health, communicable diseases, professional education, research, drugs and medical supplies, role of international organizations, indigenous systems of medicines and health administrations, etc, were discussed at length. *Interestingly, the committee has recognized the emergency aids to mothers in times of earthquake, famine, etc. by UNICEF as government's supportive agency and concerns on accident related casualty management.* Another significant point it highlighted was to train the civilian doctors in military medical operation style and organizational capabilities for a certain period (3 years) to bring in the expertise of armed forces command and

control and effective emergency operations during any such civil emergencies like famine, pestilence and epidemic diseases.

2.1.1 National Health Policy-1983 & 2002

Although the National Health Policy of 1983 has no mention of emergency, disaster, famine, floods, etc, it has highlighted problems requiring urgent attention. Under this, community involvement and exploitation of the services of private medical practitioners, especially those of the traditional and the other system; involvement and utilization of the services of the voluntary agencies active in the health field; and formation of a nation-wide health information management system were referred to.

Such information system is required not only for assisting in planning and decision making, but to also provide timely warnings about emerging health problems and for reviewing, monitoring, and evaluating the various on-going programmes.

Subsequently the *National Health Policy of 2002 finally, although inadequately, mentioned that there has to be an adequately robust disaster management plan in place to effectively cope with situations arising from natural and manmade calamities.*

2.1.2 National Mental Health Policy, 1982 & National Mental Health Act, 1987

As per the National Mental Health Policy of 1982, the estimated burden of mental health disorders is 6-7% of the population and an analysis of trend indicates it will increase to 15% by 2020. 1 in 4 families is likely to have at least one member with a behavioral or mental disorder. The present day scenario can be speculated from this estimation and the additional burden of disaster induced mental trauma can have compounding effect on this burden.

The Mental Health Act of 1987 repealed Indian Lunacy Act 1912 and Lunacy Act, 1977 (Jammu & Kashmir) and was extended to whole of India. The Mental Health Act is one of the good legislations. It came into force in 1993 although it was enacted in 1987 itself which shows that the Act was given low priority. *Thus,*

neither the mental health policy nor the act mentioned the issue of mental health burden due to disasters and the mechanism to provide mental health services.

2.1.3 National Rural Health Mission (NRHM) & Bill

Unfortunately, in the entire NRHM framework document, reference to disaster and disaster preparedness is mentioned only in Annexure VII “Facility survey format for CHCs” – 7.3 (on Quality control) and proforma 9.3. “Facility survey format for PHCs”. However, the document is a well thought plan of action document emphasizing on manpower planning and infrastructure strengthening, by adopting five main approaches as mentioned below:

a) Communitize-hospital management committees/PRIs at all levels; unified grants to community/PRI bodies; funds, functions, and functionaries to local community organizations; decentralize planning, village health, and sanitation committee

b) Improved management to capacity-block & district health office with management skills; NGOs capacity building; continuous skill development support

c) Innovation in human resource management –more nurse; 24 x7 emergencies at PHCs & AYUSH; multi skilling

d) Flexible financing-untied grant to institutions; NGO sector for public health goals; NGOs as implementers;

e) Monitor progress against standards-setting standards; facility surveys; independent monitoring committees at various levels

In NRHM, it is mentioned that District Health Plans are to be prepared by an aggregation and consolidation of Village Health Plans. Block Plans will be the basis for the District Plan. This is exactly in the line of thought for disaster management plan at village, block, and district level. However, we may need to piggyback our methodologies and tools of mainstreaming DRR into health plans at all levels in the manner it is already planned in NRHM.

2.1.4 National Urban Health Mission (NUHM)

It is important to mention here the important lines in NUHM from the point of view of disaster risks at urban areas. It is mentioned that for promoting public health and cleanliness in urban slums, the Eleventh Five Year Plan will also encompass experiences of civil society organizations (CSO) working in urban slum clusters and it will seek to build a bridge of NGO–GO partnership and **develop community level monitoring of resources and their rightful use**. There is massive opportunity for man power and infrastructure building. This can be extrapolated to mainstream DRR issues into health in urban areas.

2.1.5 National Policy on HIV/AIDS & the World of Work

The National Policy on HIV/AIDS & the World of Work by Ministry of Labour and Employment emphasizes the role of Civil society Organizations in reducing the vulnerability and negative consequences of HIV the context of natural disasters, conflict situations by extending skill development/livelihood and other social security schemes to them. This is an important vision in context of situation of HIV/AIDS in disaster affected areas.

2.1.6 National Council for Human Resources in Health

To overcome the acute shortage and uneven distribution of human resources in public health delivery system, the Ministry of Health & Family Welfare aims at overhauling the current regulatory framework. Towards this end, it is proposed to set up a National Council for Human Resources in Health in 2009 as an overarching regulatory body to achieve the objective of enhancing the supply of skilled personnel in the health sector. *However, surprisingly in spite of being the latest and extremely crucial document for future of human resource creation and planning in health, it does not even mention any thing about the planning of emergency medicine or disaster medicine education or capacity building of existing health professionals for effective management of post-disaster mortality and morbidity.*

2.2 Others Acts having strong bearing on Health e.g.

2.2.1 Food Safety & Standard Act, 2006

Food Safety and Standard Act, 2006 does mention about food safety and nutrition during disaster or emergency situations, hence it seems no institutional mechanism is presently available to ensure food safety, quality and nutritional value of food items supplied during such situations. *Therefore, it may be conclusive that no safety and nutrition standard is prescribed for pregnant & lactating mothers, neonates/children below 5 years, aged with chronic illness, and people dependent on critical medical facilities.*

2.2.2 National Alcohol Policy and Drug-de-addiction Prog.

Apart from its regular health related damages, substance abuse and drug addiction has linkages with HIV/AIDS and community mental health during disasters. The availability of spurious and adulterated alcohol during disasters/emergencies also becomes higher, therefore, national alcohol and drug-de-addiction policy should have a plan to monitor the magnitude of the problem during disasters and devise specific community-based programmes for disaster affected population.

2.2.3 Summary: Disaster Management & Health – Gaps

As per the National Guidelines for Medical Preparedness and Mass Casualty Management of Govt. of India, 2007, the key salient gaps in the Indian Health Care Delivery and Management Systems are:

- Preparedness for emergency medical response in terms of incident command system, on site mass casualty management, accreditation of ambulances, mechanism for evacuation services for more vulnerable groups, risk analyses in hospitals, structural and non-structural aspects of hospital safety, full operationalization of IDSP in all districts with major components of up gradation of laboratories and computer aided information dissemination, and communication networks between hospitals.

- Inadequate human resources and management of available human resources, lack of district level quick response teams, lack of highly skilled paramedics, insufficient system of medical inventory and supply chain management, information technology enabled networks of medical stores and laboratories, absence of standardized model for development of multi-hazard medical plans at district and hospital level, and unavailability of standardized training modules for different medical responders/community members.
- No specific mechanism exist for management of various activities, such as physical health problems and acute psychosocial trauma, resource mobilization, and inadequate community participation and involvement of the planning and execution of such rehabilitation and recovery programmes pertaining to these health activities.
- Unavailability of focused plans for large-scale population movements and its impact on public health and health infrastructure available.
- Insufficient importance on Public – Private Partnership for mass casualty management

2.4 Existing National Health Yojana, Programs & Projects

2.4.1 Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)

The major thrust areas of PMSSY are the setting up of six AIIMS like institutions and up gradation of 13 existing medical colleges. Since, the projects have been initiated recently and they have not proceeded far, all the structural (design & architecture, retrofitting, demolition of building in vulnerable condition, structural vulnerability assessment, etc) as well as non-structural (all other items within the hospital which can increase the vulnerability and hinder hospital services) safety aspects and mass casualty management plan must be considered. Some of these institutes in more vulnerable states may also consider initiating a centre for disaster management in health with direct linkages with community.

2.4.2 Reproductive & Child Health (within RCH-II -NRHM)

2.4.2.1 Janani Suraksha Yojana

Since Janani Suraksha Yojana is a safe motherhood intervention under the NRHM, it has an objective of reducing maternal and neonatal mortality among poor pregnant women in ten low- performing states in health indicators and north east states. Most of these states have a multi-hazard disaster vulnerability profile, hence must include DRR aspects into their capacity building and service provision.

2.4.3 Naav jat Shishu Suraksha Karyakarm (NSSK)

2.4.3.1 Integrated Management of Neonatal & Childhood Illness (IMNCI)

Since 23% of neonatal death occurs due to asphyxia at birth, the chance of its increase could be raised during emergencies and disasters. Skill development of ASHA and skilled birth attendants must be pursued urgently for home based new born and child care and special precautions should be taken during any disasters to continue service provision in an uninterrupted way.

2.4.4 Universal Immunization Prog, 1985-6

Supply chain management for universal immunization programmes should include DRR component by aggressive monitoring of the institutional and operational mechanism for continued service delivery. Cold chain equipment is the backbone of immunization programme and should have about 52,000 freezer refrigerators and about 140 walk-in-coolers (WICs) and freezers (WIF). The brake down rate (currently it is 1.1%) of these equipment should at no cost deteriorate even during disasters.

2.4.5 School Health Prog

Today schools present an extraordinary opportunity to help millions of young people acquire health supportive knowledge, values, attitudes and behavioural patterns. The students and school setting can serve as a means of promoting health of other children, their families and community members. Although the present national school health programme does not specifically mention any

thing about disaster preparedness, a line of caution for prevention related to communicable diseases and hygiene and regular orientation on these issues should be considered. The chain of community health risk management during disasters may actually target school children for a successful operation at a grass root level. However, the tools and methodology for school disaster preparedness such as school safety audits, school disaster management plan, etc. need to also include health risk reduction during disasters for a complete safety package.

2.5 National Cancer Control Programme: No mention of disaster specific service provision

2.6 National Tobacco Control Programme: No mention of disaster specific service provision

2.7 National AIDS Control Programme.

The activities under these programmes such as primary prevention, early detection, and strengthening of existing treatment facilities and palliative care in terminal stages should include a plan of withstanding the disaster induced disturbances and post disaster rehabilitation of these people, especially in rural areas. Data base of such kind of people requiring special attention should be maintained for easier identification and service continuation in a better way. Blood safety at the time of mass casualty and operations of field based hospitals should be ensured.

2.8 National STD Control Programme

Recognizing STD as one of the major factors for transmission of HIV infection, the programme has been merged with National AIDS control programme. Although presently there is no disaster related health statistics which supports or discard the possibility of increase in the incidences of sexually transmitted diseases and/or HIV incidences in the post math of any natural or human made disaster, it cannot be certainly ruled out in a disaster situation if not in the immediate phase but in long-stretched relief and rehabilitation phase. Since there is a social stigma attached to either HIV/AIDS or STDcommunity disaster health risk reduction should focus on prevention and occupation health safety for the care givers.

2.9 National Mental Health Programme

Subsequently the National Mental Health Programme mentioned about the World Bank report (1993) which revealed that the Disability Adjusted Life Year (DALY) loss due to neuro-psychiatric disorder is much higher than diarrhea, malaria, worm infestations and tuberculosis if taken individually. According to the estimates DALYs loss due to mental disorders are expected to represent 15% of the global burden of diseases by 2020. During the last two decades, many epidemiological studies have been conducted in India, which show that the prevalence of major psychiatric disorder is about the same all over the world. The prevalence reported from these studies range from the population of 18 to 207 per 1000 with the median 65.4 per 1000 and at any given time, about 2 -3 % of the population, suffer from seriously, incapacitating mental disorders or epilepsy. Most of these patients live in rural areas remote from any modern mental health facilities. A large number of adult patients (10.4 - 53%) coming to the general OPD are diagnosed mentally ill. However, these patients are usually missed because either medical officer or general practitioner at the primary health care unit does not asked detailed mental health history. Due to the under-diagnosis of these patients, unnecessary investigations and treatments are offered which heavily cost to the health providers.

National Mental Health Programme paid special attention on victims of natural or man-made disasters, such as cyclones, earthquakes, famines, war, communal/ethnic strike with special attention to the specific needs to children orphaned by these disasters.

2.10 National Programme for Prevention and Control of Diabetes, Cardiovascular Disease & Stroke,2008

Skill building of doctors and paramedics working at all levels on BLS and ATSL must be considered as an essential requisite before manning CHC, PHC, district hospitals and referral hospitals. Strengthening the linkages to a nearest referral hospital also plays an important role in reducing mortality and morbidity during disasters.

2.11 National Prog. for Health for the Elderly

As a part of National Policy on Older Persons (MSJE, 1999), the national programme for health for the elderly focuses mainly on the health and nutrition, and mental health services components of geriatric care. Elderly group is one of the most vulnerable groups during disasters and it needs special training in tackling health and mental health issues of the elderly. Separate tools need to be developed to monitor the health and safety of the affected elderly people in a post-disaster phase

2.12 National Disease Control Programme

2.12.1 National Vector Borne Disease Control Programme (NVBDCP)

2.12.1.1 Various Projects

2.12.1.2 Integrated Disease Surveillance Project

This is a very crucial set of national diseases control programmes, which have tremendous potentiality to be reviewed to integrate DRR activities during disasters, especially caused by natural hazards. All IDSP and CBHI activities for all types of specific disease/condition based programmes should create strong linkages with the concepts of DRR as per the mandate given to National Disaster management Authority.

- National TB Control Prog (NTCP)
- National Leprosy Eradication Prog (NLEP)
- National Iodine Deficiency Disorders Control Prog (NIDDCP)
- National Prog. for Control of Blindness (NPCB)
- National Drug-De-addiction Control Prog (NDDPC)
- National Prog. for Prevention & Control of Deafness
- National Prog. for Prevention & Control of Fluorosis (NPPCF)

2.13 Emergency Medical Relief (EMR)

Emergency medical relief is a need after any situation which demands such an action, but considering DRR mainstreaming into development, fresh look should be created at the MHFW towards integrating DRR in all endeavours of the

ministry activities. Such a step will go a long way not only establishing linkages with emergency public health issues, but also with all essential dimensions and indicators (as identified earlier) of DRR mainstreaming into health sector.

2.14 Health Education, Training & Capacity Building

114 govt. and 171 private medical colleges; 307 dental colleges, approximately 400 nursing colleges are there excluding other paramedical and pharmaceutical sciences institutions and universities floating course on mental health/social work/community medicine/behavioral sciences. Creating a cadre of (like NSS/NCC, NDRF, etc.) students, faculty members and staff on disaster health safety and resilience is essential for creating a culture of prevention, safety and resilience. However, tools for identification, selection, induction, capacity building, incentive for retention, and list of responsibilities for spreading the safety message should be done in the next section. This would ensure the capacity building of human resources and health infrastructure in a long and cost effective way.

2.15 AYUSH

AYUSH should be brought into the realm of DRR in Health by the following strategies to begin with:

- Including an AYUSH representative in district health plan and at all other level of health planning for DRR
- Selection and creation of a cadre of trained people
- Life skills training on BLS, ATLS, specialized psychotherapeutic techniques, etc should be imparted to this cadre
- Since these people are deep rooted into community, they can be a part of community health risk management education at the community level.

SECTION-III

HOSPITAL SAFETY

"A functional design can promote skill, economy, conveniences, and comforts; a non-functional design can impede activities of all types, detract from quality of care, and raise costs to intolerable levels." ... Hardy and Lammers

The importance of hospitals and all types of health facilities extends beyond the direct life-saving role they play (ISDR, 2008-09). Globally there are countless examples of health infrastructures — from sophisticated hospitals to small- but vital health centres have not been operational and have failed to sustain the loss of lives and infrastructure during various disasters in past. Therefore, special attention must be given to their robust physical and functional integrity in emergency conditions. It would be appropriate to say that it is the responsibility of all citizens of a country to demand safety (from disasters in this document) from the government and contribute to maintain and support initiatives in this regard in health facilities to maintain a healthy life.

3.1. What is a safe hospital/health facility in a disaster context?

Safe health care facilities in the disaster context refer to hospitals/health clinics in all shapes and sizes. All health facilities irrespective of size (large or small), location (urban or rural), ownership (pubic./private/trust etc), type (referral or non-referral), and facilities or specialities available are the point of reference in this context. And any health facility which provides some service and functional during the non-disaster period is expected to be accessible and functioning, at maximum capacity, immediately after a disaster or an emergency.

Therefore, the objectives of a safe hospital/health care facility comprise of the facts mentioned below:

- 1) Shall sustain any structural damage or collapse in disasters, which will result loss of life and limb inside it;
- 2) Can remain functional to serve the disaster affected critical mass;
- 3) Is systematically prepared not only with trained staff but also with a proper hospital disaster management plan and hospital network plan.

3.2. Is it Practical and Feasible to have Safe Hospitals/Health Facilities?

The basic form of a hospital is, ideally, based on its functions such as:

- Inpatient functions
- Outpatient functions
- Medical diagnostic and treatment functions
- Administrative support functions
- Service functions (diet, linen supply, cleaning, waste disposal, etc)
- Research and teaching functions

Physical relationships between these functions determine the configuration of the hospital. And the physical configuration of a hospital and its transportation and logistics systems are inextricably intertwined. The transportation systems are influenced by the building configuration, and the configuration is heavily dependent on the transportation systems. The hospital configuration is also influenced by site restraints and opportunities, climate, surrounding facilities, budget, and available technology. New alternatives are also generated by new medical needs and new technology from time to time.

It is actually possible and practical to have a safe hospital, if the safety issues (structural and non-structural) vulnerability & risk assessment, hospital designing, hospital disaster management plan for internal and external disasters, hospital networking plan for mass casualty management and management of special medical victims, etc. is taken care of.

Hospital safety addresses the issue of optimum functions of all these functions at any point of time, including the time of a disaster. Again it differentiates the issue of ensuring hospital safety in existing hospitals/health care facilities and safety for new health care facilities. Therefore, the principles and strategies for these two types of set-ups would be differently dealt with in terms of risk-vulnerability assessment, life cycle cost of integrating strengthening features, and cost-benefit analysis. Thus a safe hospital ensures regular functioning of hospitals and no/minimal injury and loss due the structural and non-structural elements of hospital building during the time of any disaster.

Disaster Risk Reduction in health facilities and hospitals is possible by including prescribed risk reduction measures in the design and construction of all new health facilities, and by reducing vulnerability in existing health facilities through measures such as demolishing the highly risky buildings, retrofitting and strengthening the important critical facilities.

3.3 Who are instrumental in ensuring Safety in Hospital/Health Facility?

Involvement of all health disciplines (as health effects of various disasters vary in nature of effects/injury, treatment modalities, special equipment and space requirements, etc.) engineers, architects, managers, maintenance staff and more is required to identify and assess potential risks; maintain the quality of work; arrange budget, plan for preparedness for any disaster; and to act in the most efficient way when a disaster strikes.

This part of the document would provide two templates, one for structural safety (for the new hospitals and for the existing hospitals) and another for non-structural safety, applicable to health care facilities.

A. Principles & Strategies For Ensuring Structural Safety In New Hospitals/Health Facilities

The principles and strategies of design and construction of safe hospitals are applied in a systematic approach that matches an appropriate response to specific conditions through the following major steps: Notwithstanding major earthquakes and tsunamis, landslides, flash floods, etc are few major hazards which can absolutely paralyse the “life safety” condition and also can result in complete structural collapse in case these principles and strategies are not followed. Hence, the document would deliberate more on seismic safety for hospital at some places during the elaboration.

1. Analyze Site Conditions

The location and physical properties of the site are the primary influences the entire design process. The following questions can serve as a “Checklist” to identify multi-hazard safe design objectives.

- i. What is the history of natural and industrial/chemical/technical disasters in this area?
- ii. Whether District Disaster Management Plan (DDMP) and Village Disaster Management Plan (VDMP) are already developed?
- iii. Where is the location of the nearest fault? Or what is the seismic zone of the place? Or on a river bed or recurrent flood affect area? Or on the way of flash floods?
- iv. Are there unconsolidated natural or man-made fills present?
- v. Is there a potential for landslide or liquefaction on or near the site?
- vi. Are there vulnerable transportation, communication, and utilities connections?
- vii. Are there any hazardous materials on the site to be protected?
- viii. Is there potential for battering by adjacent buildings?
- ix. Is there exposure to potential flood from tsunami, flash floods, cyclonic storm or dam failure?
- x. What are the other hospitals in this locality?
- xi. What is the distance from the sea?
- xii. What is soil quality?

In other words, the decisions regarding the land; acquisition, size etc. are carried out following standard procedures exist for any organisation and the final site is provided to the respective department for undertaking the construction. The checklist/guiding questions for site selection of health facilities mentioned above is mainly remind the inspection/selection/approval team to consider the following broad aspects:

- Geographical location
- Physical orientation
- Topography
- Catchment area
- Soil condition (Conduct subsurface investigations to discover loose soils or uncontrolled fill that could increase ground motion. Hard

dense soils remain more stable, while solid dense rock is the most predictable and seismically safe building base).

- Protection against land slide / soil erosion
- Environment friendly (Reactive) / site and building
- Vegetation / landscape
- Land and sea breeze.
- Law and order
- Transportation and communication
- Availability of support services (gas, water supply, electricity, sewerage, postal/telephone, others)
- Flood level
- Nearby habitat conditions
- Seismic threats (Consider threats of seismicity on adjacent sites or elsewhere in the vicinity that may render the project site inaccessible or causes the loss of utilities, threat of fire, or the release of toxic materials to the site).

There are two **key stages to complete the process of analysing site conditions** and these are indicators and tools for pre selection and post selection of the site. **See the template for details.**

2. Establish Multi-hazard Design Objectives

A threat/vulnerability assessment and risk analysis can be used to define the level of performance desired for the building project. Some suggested seismic and other design performance goals are:

- Conform to local building codes providing "Life Safety," meaning that the building may collapse eventually but not during the earthquake.
- Design for repairable structural damage, required evacuation of the building, and acceptable loss of business for stipulated number of days.
- Design for repairable nonstructural damage, partial or full evacuation, and acceptable loss of business for stipulated number of days due to repair.
- Design for repairable structural damage, no evacuation required, and acceptable loss of business for stipulated number of days due to repair.

- No structural damage, repairable nonstructural damage, no evacuation, and acceptable loss of business for stipulated number of days due to repair.
- No structural or nonstructural damage, and no loss of business caused by either (excluding damage to tenants' own equipment such as file cabinets, bookshelves, furniture, office equipment etc. if not properly anchored).

3. Select/Design Appropriate Structural Systems

Seismic design objectives can greatly influence the selection of the most appropriate structural system and related building systems for the project. Some construction type options, and corresponding seismic properties, are:

- Wood or timber frame (good energy absorption, light weight, framing connections are critical).
- Reinforced masonry walls (good energy absorption if walls and floors are well integrated; proportion of spandrels and piers are critical to avoid cracking)
- Reinforced concrete walls (good energy absorption if walls and floors well integrated; proportion of spandrels and piers are critical to avoid cracking)
- Steel frame with masonry fill-in walls (good energy absorption if bay sizes are small and building plan is uniform)
- Steel frame, braced (extensive bracing, detailing, and proportions are important)
- Steel frame, moment-resisting (good energy absorption, connections are critical)
- Steel frame, eccentrically braced (excellent energy absorption, connections are critical)
- Pre-cast concrete frame (poor performer without special energy absorbing connections)

Structural and architectural detailing and construction quality control is very important to ensure ductility and natural damping and to keep damages to a limited and repairable range. The prospect of structural and non-structural

damage is not likely to be eliminated without the prudent use of energy-dissipating devices.

4. Follow Relevant Codes and Standards

Many building codes and governmental standards exist pertaining to design and construction for hazard mitigation in hospitals. As previously mentioned, building code requirements are primarily prescriptive and define not only the hazard zone of a particular locality/area/region but also the minimum safety factors to "design structurally safe. Codes pertaining to seismic requirements may be local, state, or regional building codes or amendments and should be researched thoroughly by the design professional. In India the engineering and architecture wing of Ministry of Health & Family Welfare and Bureau of Indian Standards should be consulted in this regard.

5. Financial Implications

Low cost design safety

The cost of a disaster-safe hospital or health facility is negligible when included in early design considerations. For the vast majority of new health facilities, incorporating comprehensive disaster protection from earthquake and weather events into designs from the beginning will only add 4% to the cost. Planning processes for new hospitals can be easily targeted by advocacy, and should be a priority.

Low cost retrofitting: targeted protection

The cost of retrofitting existing health facilities can vary greatly depending on context, but prioritizing the protection of critical care and hospital functionality reduces potential costs and provides excellent examples of cost-effectiveness. For example, non-structural elements – the contents, rather than the building – represent most of the value of hospitals. Damage to non-structural elements is also what most often renders a hospital inoperable during a natural disaster. Retrofitting non-structural elements costs only about 1% (Gibb as in ISDR, 2008-09) while protecting up to 90% of the value of a hospital (WHO & NSET, 2004).

Adding energy-dissipating devices

The cost of adding energy-dissipating devices is in the range of 1-2% of the total structural cost. This is not a large number, particularly when related to the life-cycle cost of the building. Within a 30-50 year life cycle the cost is negligible.

B. Principles & Strategies For Ensuring Structural Safety In Existing Hospitals/Health Facilities

Making existing hospitals and health care facilities safe is the most challenging task in India because of multifarious reasons. The most significant reasons are the gigantic task of undertaking hazard-risk-vulnerability assessment of all facilities in the country, limiting the population load on each health care facility, uneven (or lack of) budgetary allocation to these facilities, and moreover lack of knowledge of key role players/stakeholders on hospital safety.

1) Develop a System for the HRV Assessment of the Existing Health Care Facility/Hospital

It is of utmost importance to carry out a detailed assessment (structural, non structural and functional) of the structures before any up-gradation of structures is carried out in the existing health facility. And such assessment needs to be carried out at a large scale which is time consuming; hence a decentralised system needs to be put in place for carrying out such assessment of health facilities across the country. However, the health facilities located in the highly vulnerable multi-hazard prone areas may be targeted in the first phase.

Keeping the vastness and population of India in view, India can opt for a top down approach to begin the process of mainstreaming DRR into health sector, especially undertaking any activity on hospital safety. **Knowledge, attitudes and budget are three major hindrances in beginning the process** and overcoming this would be perhaps easier and less time taking at the state level. The assumption is that when people at the top are sensitized and knowledgeable then it becomes easier for the district hospitals to sail through. Building disaster-safe hospitals or protecting existing hospitals is surprisingly cheap (UNISDR,

2008-9). The small investments required are nothing compared to the risk of partial or complete destruction during a disaster, the death of patients and staff, and the equally high health, economic and development impacts in the aftermath. The approach involves various steps for developing a system for DRR in health facilities/hospitals and this is presented in the proposed Table given below. The approach can be pilot tested and then modified as per requirements. This approach could be the base for developing the national methodology / guideline for carrying out assessments of health facilities in the future by various interested stakeholders. The primary task of the technical committee was to detail out the steps for developing the proposed approach for carrying out the assessment of health facilities.

Hazard threats	State/District level Hospitals	Activity	Duration	Responsibility	Budget arrangement
EQ/L Zone IV & V	A representative sample of State-run hospitals	R&V Assess.: Visual screening	6-8 months	State Health Minister, DGHS, CDMO, MS & technical team	Internal
C/T	Coastal district hospitals	R&V Assess.: Visual screening	6-8 months	State Health Minister, DGHS, CDMO, MS, DC/DM, & technical team	Internal
F/Chemical disasters	District Hospitals	R&V Assess.: Visual screening	6 months	State Health Minister, DGHS, CDMO, MS, Industry/chemical plan Head & technical team	Internal

*EQ=Earthquake, L=Landslide, C=Cyclone, T=Tsunami, F=Floods/flash floods, R=Risk, V=Vulnerability, Assess- Assessment (structural, non-structural, functional)

Screening & Detail Assessment of potential Risks and Vulnerabilities in the Building

Rapid visual screening is a procedure for conducting a “sidewalk survey” intended to quickly identify inventory and rank buildings considered potentially hazardous in earthquakes without the high cost of detailed analysis. Engineers, facility managers and owners developed the procedure in the United States. It is an inexpensive method to evaluate numerous buildings, identify those most likely to be hazardous during earthquakes, and compare their relative vulnerability for setting priorities for mitigating those hazards. The buildings are observed from the exterior to determine the building’s features and probable lateral force resisting system. The basic screening procedure is readily adaptable to local conditions, regulatory needs, and building types in a particular location or country. The assessment team can use the rapid visual screening procedure described in a document of Federal Emergency Management Agency (FEMA 154, *Rapid Visual Screening of Buildings: A Handbook*) along with their design and evaluation experience, thus would be better than a typical sidewalk survey. However, the task of assessment would have to be finalised through an extensive process of consultation and consideration of existing methodology prevalent in India for detail structural/engineering assessment of buildings. The detail assessment could also be assessed through the application of global guidelines such as the ***Hospital Safety Index of WHO/PAHO***. Technical support from NSET (National Society for EQ Technology, Nepal) can also be taken for initial few hospitals in EQ Zone IV & V for assessment. In order to have a better understanding of the scope, methodology and limitations of the assessment, a representative sample of hospitals from different locations should be considered. It would be good if a separate technical team assess the detail non-structural (non-load bearing elements in the building) risks in the hospital. The technical team

2. Cost-Benefit Analysis of Risks

A detail cost-benefit analysis of the strengthening procedures and fault repair/rectifications should be done after the initial HRV assessment report is tabled. Phase-wise plan with definite budget allocation can be a good beginning.

C. Principles & Strategies For Non Structural Safety In Hospitals/Health Facilities

Hospitals house a large number of objects/elements/equipments that are required for operational and functional purposes and damage to these elements have serious implications to the routine functions of the hospitals. These objects and elements can be referred as “non-structural” components because these are not part of the building structure that resists forces or bear the load. Falling objects and damage to building systems and equipment have caused deaths, injuries, building functional loss, and economic loss in past earthquakes, even in cases where the building structure was essentially undamaged (GHI, 2010). In many cases, facilities were unusable for weeks or even months, due to earthquake damage to objects and building utility systems. Even smaller earthquakes that do not damage the building itself can break water pipes and damage equipment. This document will help the stakeholders to develop and carry out a plan to reduce the hazards posed by the major groups of objects found in hospital buildings: medical equipment and supplies, architectural elements, furnishings, and building utility systems and equipments.

Apart from that, all items, which are not part of the structural system, are considered as "non-structural", and include such building elements as:

- Exterior cladding and curtain walls
- Parapet walls
- Canopies and marquees
- Chimneys and stacks
- Partitions, doors, windows
- Suspended ceilings
- Routes of exit and entrance
- Mechanical, Plumbing, Electrical and Communications equipment
- Elevators
- Furniture and equipment

These items must be stabilized with bracing to prevent their damage or total destruction. Building machinery and equipment can be outfitted with seismic isolating devices, which are modified versions of the standard Vibration Isolators.

Loss arising from non-structural damage can be a multiple of the structural losses. Loss of business and failure of entire businesses was very high in the Loma Prieta, Northridge, and Kobe earthquakes due to both structural and non-structural seismic damages.

1. Identifying Non-Structural Risks & Determining their Impacts

The *non-structural risk assessment and mitigation* plan task has to be ideally a part of the larger Hospital Disaster Management Plan (HDMP). However, in case HDMP does not exist and the hospital is included within the sample representative hospitals undergoing through HRV analysis as a national or state initiative (earlier mentioned as the approach to begin the movement at a national level), this has to be part of the HRV assessment. Identifying risks and determining their possible consequences, in terms of loss of life, injury, hindrance in life support and hospital functionality, is the key objective of this assessment.

2. Cost -Estimation & Prioritization of Mitigation Measures

The cost of fixing hazards varies significantly. The cost depends mainly on the level of expertise needed and the specific device to be used to fix the hazard, and the cost of materials and hardware in the area. Depending upon the budget availability non-structural risk reduction activities can be undertaken keeping the following 4 points in mind (GHI, 2010):

- i. Objects and systems most critical to life safety: This includes securing objects that might fall and kill/injure people, objects whose failure would interrupt life support, and objects that might obstruct exits.
- ii. Objects and systems in critical care/emergency area: This includes securing all equipments, records, machines, labs, piped oxygen, and essential service materials used in the accident and emergency trauma care area

- iii. Objects and elements required for the continuous and optimal level of performance in case of a disaster
- iv. Certain types of equipments are not very vulnerable to earthquake damage or must be moved often for functional reasons. It is not recommend anchoring this equipment, which includes: roller mounted suction machines, operating tables, or roller mounted equipment with a height to base ratio of less than 1.5. Equipment anchorage should take into account each piece of equipment's necessary functions. Equipment that must be moved often cannot be anchored in the same way that stationary equipment can, and it may not be able to be anchored at all.
- v. Achieving a non-structurally safe hospital is a gradual process and not very expensive as well. Minor to moderate disruptions, depending upon the functionality of the equipment/element, may also become an indicator to decide where to start from. Therefore, planning risk reduction activities as mentioned above could be a better solution. Nevertheless, the hospital should take up the non-structural risk reduction activities after the structural mitigation measures (if any) are completed.

3.4. Guidelines to Complete the Template:

- **Classification of Items in the Hospital:** All hospitals are different in size, design, capacity, resources, services & facilities, annual budget/financial condition, and vulnerable location. Depending upon these 8 factors/differences, the concerned division/department responsible for ensuring and installing safety features should categorize/classify all non-structural items into essential, necessary, required and delayed category of should fill in the template.
- **Classification of Items as per the HRV assessment profile:**

This is very important to do the classification of items as per the HRV analysis. For example, a hospital which is located in a low seismic zone area but faces cyclones or floods often, the items under each classification may change.

- **Consulting an Appropriate Agency:** The items under essential and necessary category can be considered for non-structural safety intervention in the first phase. Then an appropriate agency should be considered for *estimation of cost, time, level of disruption, and tools and then decide accordingly*. Fill in the column and row appropriately given in the Template below. This would serve as a master plan to give a bird's eye view of the hospital planning and expenditure.
- **Progress Monitoring & Quality control:** This is an important feature of safety intervention as it is essential to limit the duration of disruption in a hospital. Quality of the tools used for safety intervention must be ensured. Under no circumstances a hospital should do any compromise in time, level of disruption, and tools.
- **Sharing & Display of Template:** A hospital which has already gone for non-structural safety measures should complete the template in all respect and share it with other hospitals. Display the enlarged template in the hospital notice board and website for larger knowledge networking.

TEMPLATE FOR STRUCTURAL SAFETY IN HOSPITALS

Table-1: Hospital Safety: Structural

Sl. No	Components	Indicators	Methodology	Tools	Other Considerations	Checklist/ Matrix/Template
1	Old Buildings	Life of building	<ul style="list-style-type: none"> ➤ Seismic/other hazard vulnerability assessment ➤ Risk assessment: Risk of block/partial/total collapse ➤ Cost-benefit analysis (see other considerations) 	Primary Assessment: Natural & Technological hazard risk resistance condition & sustainability time span Rapid visual screening/side walk survey Foundation study, Masonry or RCC type Detail Assessment: WHO-PAHO Hospital Safety Index strengthening/retrofitting/demolishing and new building planning	<ul style="list-style-type: none"> ▪ Time taken for functional recovery ▪ Life of the repaired/strengthened building/block (whether it would be resistant to more than one earthquake) ▪ Cost analysis ▪ Less/Non visible inconveniences to people in the hospital ▪ Elements at risk* 	PAHO Hospital Safety Index Checklist-1 Checklist-4 Checklist-5
		Type of construction				
		Physical look				
		Functionality				
2.	New Buildings	Site/Area Pre-Selection	<ul style="list-style-type: none"> ➤ Hazard-risk Assessment Analysis <ul style="list-style-type: none"> ○ History of disasters ○ Vulnerability profile 	<ul style="list-style-type: none"> • HRV with nearby community or referring to VDMP • Multi-hazard (natural) Vulnerability Atlas of India • Topography & Geotechnical Analysis 	<ul style="list-style-type: none"> ▪ Landuse Management Plan ▪ Local zoning laws & regulations ▪ Relevant characteristics of human settlements 	Checklist -6
		Site Selection	Assessment of site advantages	<ul style="list-style-type: none"> • On-site inspection • Compilation of background data • Site/Area pre-selection assessment report 	<ul style="list-style-type: none"> ▪ Location & accessibility ▪ Common risks (such as noise, dust, vibration, climate, etc.) (proximity to industrial/chemical facilities, military facilities, landfills, mining plants, airports, route used for 	Existing standards & Codes with methodology

					<p>transport of hazardous materials, catchment area, soil erosion, potential for landslide or liquefaction,etc) classification & prioritization</p> <ul style="list-style-type: none"> ▪ Other hospitals/health networks in the locality 	
		Design Planning	<p>Seismic design Planning:</p> <ul style="list-style-type: none"> • Good structural configuration • Lateral stiffness • Adequate stiffness • Good ductility 	<ul style="list-style-type: none"> ▪ National Building code 2005 (IS 15902, IS15903,etc), ▪ NABH Standards ▪ WHO/PAHO standards 	<ul style="list-style-type: none"> ▪ Fire safety ▪ Seismic design structural safety 	
		Operation & Function	<ul style="list-style-type: none"> • Hospital MCM Planning 	<ul style="list-style-type: none"> ▪ Hospital Disaster Management Plan Template ▪ Periodic evaluation (after mass casualty incident) report and rectifying actions 	<ul style="list-style-type: none"> ▪ Dedicated area for triage ▪ Dedicated area for police, media and psychosocial team posts ▪ A vacant small hall near mortuary/triage area in case of no mortuary ▪ Waiting hall with property counter 	HDMP Template

TEMPLATE FOR NON-STRUCTURAL SAFETY IN HOSPITALS

Table-2: Hospital Safety: Non-Structural

Sl. No	Element Category	Type of element	Items	Method & Tools to secure	Level of Disruption H M Low	Cost H M Low
1	Critical elements	Medical Equipment	<ul style="list-style-type: none"> ➤ Refer Checklistfor essential item list ➤ Refer PAHO-list of Basic services, support services and systems in Hospitals-Guidelines for Vulnerability Reduction in the Design of New Health Facilities-2004 	<ul style="list-style-type: none"> • Consult appropriate agency Check with FEMA Field Manual-2005 • Checklist-2 & 3 	To be filled in after the disaster to plan further	As per the Damage and Loss assessment
2	Essential elements	Furnishings and Administrative Systems				
3	Functional to an optimum level	Hospital				
4	Budget	Supplies				
5	Expertise needed	Mechanical and Electrical Equipment				
5	Disruption	Pipes, Ducts, and Conduits				
6	Must moving items	Tanks and Medical Gas Storage				To be filled in after that
7.	Other general	Architectural & System	<ul style="list-style-type: none"> •Exterior cladding and curtain walls •Parapet walls •Canopies and marquees •Chimneys and stacks •Partitions, doors, windows •Suspended ceilings •Routes of exit and entrance •Mechanical, Plumbing, Electrical and Communications equipment •Elevators •Furniture and equipment\ 	<ul style="list-style-type: none"> • Design new building as per prevailing code • Retrofit the old structures/other items as per the experts. It may vary from one hospital to other 		

SECTION-IV

4.0 Hospital Disaster Management Plan Template

STRUCTURE OF THE HDMP PLAN TEMPLATE

An Introduction to Hospital Disaster Management Plan

Disaster Management Provisions for Health Facilities/Hospitals

I. GENERAL INFORMATION: A-I

- ❖ An Introduction to the Hospital
- ❖ Brief Structural and Non-Structural Element Details
- ❖ Contact Address of nearest Police Station, Fire Station, CATS point & Blood Bank
- ❖ Departments: Clinical and Non-Clinical
- ❖ Emergency Control Room
- ❖ Facilities Available
- ❖ Hospital Networking Details
- ❖ Identified Disaster Risks & Vulnerability Profile

II. COMMITTEES & TEAMS IN HDMP FOR MANPOWER & MATERIAL RESOURCE MOBILISATION

- ❖ Hospital Disaster Management Committees & Teams
- ❖ Command Nucleus & Incident Commander
- ❖ Hospital Disaster Management Teams
- ❖ Emergency/Control Room: Display of Information
- ❖ Surge Capacity & Bed/Resource Mobilization

III. SALIENT FEATURES OF HOSPITAL DISASTER MANAGEMENT PLAN ACTIVATION

- ❖ Triage Protocol
- ❖ Protocol for Fire Disasters
- ❖ Protocol for Public Health Emergencies
- ❖ Protocol for NBC Disasters
- ❖ Hospital Evacuation Plan
- ❖ Role & Function of Officers
- ❖ Activation of Plan

IV. POST DISASTER MANAGEMENT ACTIVITIES

- ❖ Termination of Alert & Debriefing
- ❖ Documentation
- ❖ Review Report & Lessons Learnt
- ❖ Mock Drill Schedule
- ❖ CapacityBuilding Schedule of DM Teams

List of Annexure

Fire Safety & Safety in Internal Disasters

A. Evacuation Plan

An Introduction to Hospital Disaster Management Plan

A Hospital Disaster Management Plan is a simple, comprehensive and well defined hospital disaster/emergency/crisis management activities framework prepared by a particular hospital to handle disasters/emergencies to minimize the loss of human beings and limbs, to prevent deterioration of injuries and sufferings of the survivors and to function as a life line service centre during the disasters. It considers the management protocol for both internal and external disasters, which may affect the functioning of the hospital.

The type of disaster/emergency/crisis situations hospitals may have to face are mainly

1. Mass Casualty incidents due to natural or man made causes;
2. Public Health Emergencies: Such emergencies may primarily be outbreak of infectious diseases or an after effect of natural disaster with its after effects on the Public health; and
3. Crisis situation related to Nuclear, Biological, Chemical and Radiological attacks.
4. Any disaster happens internally in the hospital itself, such as a fire accident or stampede due to panic of earthquake/bomb threat, etc.

The prime objective of Hospital Disaster Management Plan is to ensure mitigation and preparedness measures that have to be taken up by hospitals (irrespective of bed strength, locality, human & material resources) for prompt and well coordinated effective response framework for either internal or external disasters faced by the hospitals.

All health care facilities may follow the HDMP template, however, may modify the plan keeping its own organizational structure, human and material resources and equipments, facilities available and moreover, risk profile in view. However, this is mandatory for each hospital to have

- A written plan clearly mentioning the step by step approach to be followed by the hospital in case of disaster/emergency/crisis situations.
- A written plan regarding hospital safety mitigation measures, such as structural and non-structural mitigation measures that can be done to ensure safe hospital.
- A written plan for people/teams/committees responsible for management of disasters, their roles, functions and chain of command.
- A written plan for communication channels and methods of dissemination of information to the hospital staff and to the public.
- A written framework for plan activation protocol for different disasters/emergency situations
- A written plan for hospital's protocol for capacity building (training & retraining) of hospital staff in various aspects of disaster health care management

The above mentioned features highlight the composition of a hospital disaster management plan. This is also important to note that the plan prepared by the hospital needs to be tested at regular intervals through Mock Drills (Table Top and Field Level) and the schedule for the same is to be made explicit in the document.

The document should have the following components and must be made available to all sections of the hospital staff working in outpatient/clinical/support services, and to the regulatory authorities.

HOSPITAL DISASTER MANAGEMENT PLAN TEMPLATE

I. General Information About The Hospital

An Introduction to the Hospital

- Name & Postal Address of the Hospital:
- Type of Hospital:
- Number of Beds:
- Daily OPD attendees:
- Possible crisis expansion of beds (Surge Capacity):
- Internal Alert System:
- Public address system if available and where installed:

Contact Details (Approximate distance, address, telephone/fax of nearest

- Police Station:
- Fire Station
- CATS Point
- Other Ambulance Providers
- Blood Bank/Red Cross Blood Bank
- Railway Station
- Air port

Brief Description about Hospital Planning & Architecture:

- Year of Establishment/construction of Building No. 1, 2, 3,
- Whether Earthquake Resistance/Proof
- Frequency of Regular repair/strengthening of buildings
- Any unsafe/dilapidated building where patient care services are provided
- Whether Structural Retrofitting is done
- Whether Non-Structural safety measures have been done
- Hospital lay out plan is to placed/attached with the HDMP

Emergency Control Room

- Designation of the Officer on 24hr. duty:
- Telephone No/Fax No.
- Paging No.

Departments with Telephone Numbers:

- Clinical
- Non-Clinical
- No. of Ambulances
- No. of Ambulances with BLS equipped machines & trained staff

Facilities Available

- Casualty/Emergency Services
- OPD
- OT services
- Burn Wards/ Treatment
- Blood Bank
- Post mortems
- Mortuary/Morgue
- Laboratory Services
- Support Services, such as laundry, hospital gas, manifold, diet, engineering, social work, organ bank, record keeping, ICT, etc.

Hospital Networking Details

- Name & Contact details of the networked hospitals
- Distance in km.
- Nature of Networking- whether negotiated verbally or through MOUs
- Bed strength of networked hospitals
- Specific Resources/facilities which can be available (e.g. ambulances, patient transfer, OT, Ventilator, etc)

Identified Hazard Risks & Vulnerabilities

- Natural Hazards such as Earthquake, Floods (regular & due to cloud burst), etc
- Mass Casualty Incidents such as mass gathering incidents; bomb blasts; air, rail and road accidents; communal riots, etc
- Public Health Emergencies such as epidemics
- Internal Disasters such as fire incidents, building collapse, etc
- NBC Disasters
- Detail of Factory/Industrial Establishments around the Hospital

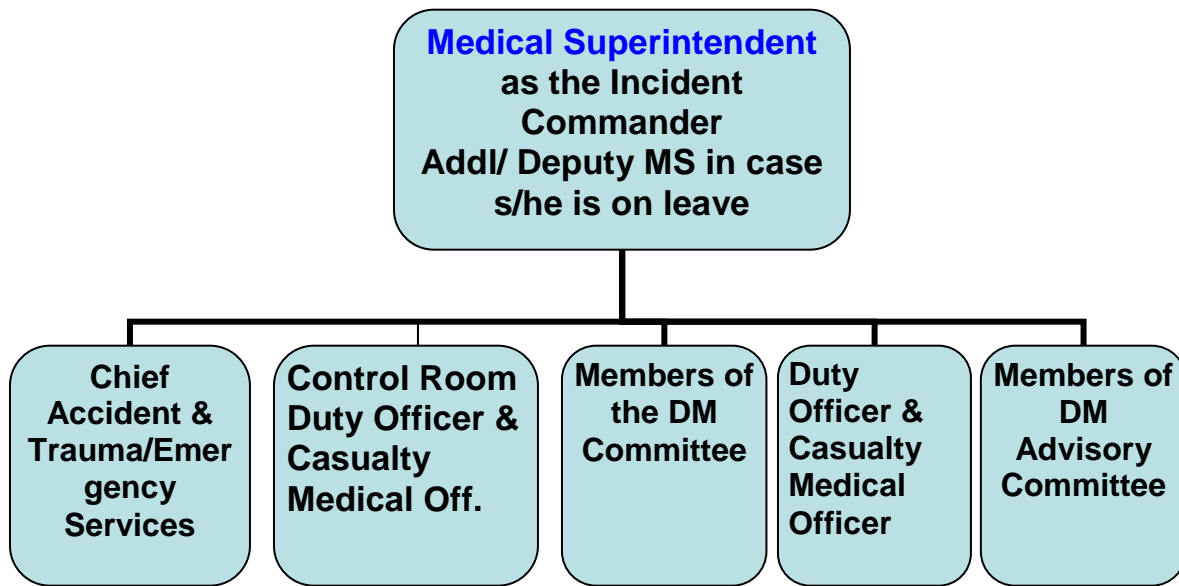
II Committees & Teams In Hdmp For Manpower & Material Resource Mobilisation

Management Committees

- **Disaster Management Committee** should be broad based and include all stakeholders from relevant clinical departments to support services. However, it depends on the size, type and capacity of the hospital which is preparing the plan. Nevertheless, every hospital must form its Disaster Management Committee (DMC), comprising of the following suggested people (Minimum :Maximum = 15:30):
 - Medical Superintendent – Chairman
 - Additional MS/Deputy MS
 - Head of all Clinical Departments (mainly such as Anesthesia, Surgery, Orthopedics, Medicine, Pediatrics, Gynecology, etc.) including Psychiatry/Clinical Psychology
 - Chief Medical Officer-Accident & Trauma/Emergency or suitable officer nominated by the MS
 - Dept of Forensic Medicine
 - Laboratory In-charge
 - Nursing Superintendent
 - Blood Bank Officer
 - Casualty Medical Officer
 - Chief Dietician
 - OIC of Mortuary Services, Medical store/General store, Manifold, Sanitary / Sanitary Officer, Transport
 - Security Officer
 - Executive Engineer PWD & Electricity
 - OIC IT/Communication
 - Media Spokesperson, Medical Social Worker, Public Relation Officer
- **Hospital Disaster Advisory Committee** should comprise of members from:
 - The hospital itself and its networking hospitals
 - The near by community/RWAs
 - CATS, Police station, Fire services, Civil Defense
 - Voluntary Organizations (one/two)
 - UG & PG Medical Student Volunteers

Note: Both the committees should meet at regular interval (Quarterly or half yearly) for assessment of readiness and also to incorporate any suitable measures for better operationalisation of the plan. The member in each committee is responsible for dissemination of the requisite information within the sphere of action.

Command Nucleus



Note: Although the MS as the Incident Commander and Chief Accident & Trauma/Emergency Services as the Second in Command would be the main people in the management of a well defined disaster as per the HDMP of that particular hospital, the involvement of other committees depends on the MS in the disaster management activities of that hospital.

The Control Room & the Emergency Operation Room in Dept. of Accident & emergency Services/Casualty Services should **Display** the followings **Visually** :

- Landline Telephone (Office & Residence), Intercom, Mobile, Pager, Fax Number of all Members of the two Committees
- Public Address System
- Surge Capacity & Triage Place
- Evacuation Root Map
- Organizational Hierarchy Chart of DM Committees

DM Teams

A. Quick Response Team

The quick response teams will be updated on monthly basis and will be in the emergency room as well as with Medical Superintendents.

- Department of Medicine-One (JR/SR)
- Department of Surgery-One (JR/SR)
- Department of Orthopedics One (JR/SR)
- Two Staff Nurse
- Two Nursing Orderly
- Two BLS trained doctors
- Two BLS trained paramedics

B. Triage Team

- Triage Officer
- Anesthetist
- Orthopedician
- Medicine specialist
- Pediatrician
- Two Nurses
- Two paramedics

C. Psychosocial Response Team

- Clinical psychologist
- Medical Social worker
- Trained Psychosocial Care Giver from the hospital- Five

D. Support Services Team

E. Crowd & Media Management Team

F. Structural & non-structural Vulnerability Assessment Team

All teams should be well informed about each other & their functions as mentioned in the plan

Emergency Room will have designated area in HDMP for:

- Reception & Triage Area
- Specific area for Bed expansion if needed
- Patient/Relative Information Area
- Area for Psychosocial Team
- Disaster Cupboard with last checked date with signature

III. Salient Features Of Hospital Disaster Mngement Plan Activation

Every hospital should define its triage protocol as suggested below.

Triage Protocol

- Signage of Patient receive area, Triage area, Triage team

Priority –I: For immediate resuscitation, if need arises will taken to the ICU

Priority–II: Serious and need of immediate intervention: Provide support and transfer to the OT (Casualty OT or Major OT)

Priority–III: Injured, in need of first-aid and may require surgery. Put in trolley bed and admit if surged bed available otherwise transferred to other hospitals

Priority–IV: Needing only first aid. Will be discharged after giving first aid. If need psychological help may be referred to the psychosocial team

Brought in Dead: Segregate the bodies and keep in a predetermined area (Temporary Morgue). The officer in-charge will arrange for necessary identification and other formalities (if post-mortems or embalming are required) and handing over of bodies to the relatives/administration after necessary procedures. Accepted colour codes should be followed.

Protocol for Fire Safety

The details of fire safety are to be in the plan and step by step actions to be followed in time of crisis is to be in the Plan.

- Information on the position of fire extinguishers
- Information on functionality of fire extinguishers/fire alarm box when last checked
- Name, Designation, Department and Contact Details of staff trained in fire safety in the hospital
- If the hospital does not have a burn ward/treatment facility for burn patients then the name and address of networked hospital/s

Protocol for Public Health Emergencies

- Name the Diseases the area is prone to
- Information on previous outbreaks in Delhi
- Existence of BLS-I/II/III type of laboratory
- Sample collection and testing procedure to be followed
- Treatment protocol
- Patient transfer condition and protocol of the hospital for the diseases mentioned above.

Protocol for CBRN Disasters

The information about National Disaster Response Force should be in the Plan NDRF Battalion (Four) trained in Chemical, Biological, Radiological and Nuclear Disasters

- Information on the existence of decontamination room
- Information on existence of decontamination equipments
- Information on existence of personal protective devices
- Information on the waste disposal system for contaminated waste & location of water tank
- Name, Designation, Department and Contact Details of staff trained in CBRN disasters
- Nearest Place of HAZMAT Van to be contacted
- Signage of Decontamination room and treatment rooms

Evacuation Plan

For Internal Disasters Only

- Display of entry and exit routes at as many places as it can be
- Information posts and information dissemination system (e.g. alarm or announcements, public address system)
- Evacuation route maps in Eergency/Control room, notice board of all department, OPDs and other strategic places (name to be mentioned)

Role & Functions of Officers

The role and functions of various officers will have to spell out clearly in the written plan to avoid confusion during crisis situation. The suggested way is placed below.

Officer In Charge OT

1. Arrange for the operation theatres and their smooth functioning to treat the cases
2. Availability of Staff
3. Supervise adequate supply of consumables
4. Keep blood banking services ready
5. All records of patient treated / taken out of OT
6. Ensure CSSD is fully functional and adequate staff is available
7. Ensure functioning of Manifold room and staff strength in full numbers

8. Keep the Incident Commander informed in regular intervals

Officer In Charge of Administration/Duty Officer

1. Co-ordination of the activities with all the response members
2. Supervision of the arrangement (Receiving Casualties) and Triage
3. Making the control room functional
4. Deployment of manpower in all departments
5. Mortuary arrangement to be made functional and the officer in charge is to be positioned, Important contact numbers (Referee hospital, Police , and local vendor for ice / coffin arrangements is to be with the officer concerned and also displayed in the mortuary.
6. Arrangement of refreshments for the staff who are on non stop duty if felt necessary
7. Coordination with the Security Officer for cordoning of the area around triage area and avoiding undue assembly of crowd near the emergency and stray movement of people into the hospital area
8. Arrange adequate number of trolley , consumables and staff in casualty
9. Keeping the details of the nearby ice factory and arrangement of required amount of ice if needed
10. Keep the Incident Commander informed every one hour

Nursing Superintendent

1. In charge of Accident and Emergency will assist the CMO In-charge in management of cases, triage and making available all the consumables and non consumables and requisition for more staff nurses
2. Superintendent in charge of Disaster Management
3. Deployment of adequate nursing staff (Those residing in the campus)
4. Informing staff outside the campus (Contact details of all staff in the office)
5. Maintenance of Store
6. Supervision of patient care in the Emergency and the Triage area
7. Designating staff for counseling of the relatives / those of deceased
8. Keep the Incident Commander informed every one hour

Designated Offices of Various departments

1. Detail of activities have to be worked out and placed in their office and the office of Medical Superintendent
2. Details of Manpower

Chief of Engineering Services

1. Ensure availability of all maintenance staff (Electrician, Plumber, Mason, Pump operator etc during the entire period of disaster till the announcement of cessation of alert
2. Ensure uninterrupted supply of water / electricity and gas (from gas manifold room)
3. Inventory of essential fixtures to be maintained in stores

Chief Security Officer

1. All entry points except one is to kept open as soon as the disaster alert is announced
2. Security cordon is to be thrown around the emergency / Triage area without hampering the activity
3. Control sudden rush of traffic
4. Direct visitors /attendants to the waiting area
5. Keep watch on the untoward elements moving into the hospital premises
6. Assist the emergency staff in unloading patients and during shifting of patients from the hospital
7. Information to MS/PWD/Local Fire Dept. / Hospital Welfare Committee
8. Stabilization of all equipments

Activation of the Plan

Once the information of getting a large number of patients reaches to at the department of Accidents & Emergency or Casualty of a particular hospital, the HDMP plan should be activated to ensure the smooth following of the plan activation protocol. The followings are the checklists which should be taken into consideration:

1. Immediate arrangement to follow the patient reception protocol, i.e. open/close of appropriate exits, history taking of the incident and/or the patient to be given treatment, arrangement of consumable items from disaster cupboard or from hospital general and surgical stores, communicating different disaster teams/committees,
2. Depending on the surge capacity, bed mobilization through shifting patients to identified places, shifting patients to disaster wards, contacting the networked hospitals, discharging the regular stable patients for surgery, etc.
3. Emergency/control room should be alerted. Quick response and triage team along with the psychosocial teams should be ready to attend the patients once they arrive in the hospital.
4. Functioning of Emergency OT should be ensured
5. Isolation ward, contacting BLS II laboratory, occupational safety measures, personal protective measures and following standard protocol for treatment should be ensured in case of infectious public health emergency
6. Fire department should be immediately contacted for fire disaster within the hospital.
7. Crowd management should be managed by the hospital security people.

There are various ways to **start the alarm system** and the same should be in the Plan and is to be displayed in prominent locations.

- **MCP** – Manual Call Point also called as Fire Alarm Box is a square metal plate (red in color) fixed on the walls at various locations having a small lever in the center. The lever needs to be pulled down to alert the fire control room automatically.
- **Public Announcement System** – devices for this are installed in all common congregation places and announcement goes from the Emergency Room or Control Room

- **CODE RED** – is a group paging system upon calling the telephone operator whereby the message will be flashed to concerned people.
- **Group SMS** through mobile (GSM facility) to all staff of the hospital
- **Any other available in the hospital**

IV. POST DISASTER MANAGEMENT & CAPACITY BUILDING ACTIVITIES

❖ Termination of Alert & Debriefing

The disaster alert is to be terminated after normalcy returns. CMO In charge Accident and Emergency or the representative of Incident Commander in the hospital will notify the Head of the departments and Medical Officer in charges when the plan has been terminated.

After the termination of plan, hospital activities will return to normal.

❖ Documentation & Review Report

Every eventuality faced by the hospital needs to be documented so that corrective action can be taken subsequently. The personnel in charge for documenting the events are to be clearly mentioned in the plan. All disaster situation needs to be documented for future references. Each ward or department head involved in the plan should give a written report to the disaster committee on the activities carried out, indicating positive and negative aspects within seven days of termination of plan.

Subsequently, in the meeting of the disaster committee, the responses of the hospital should be critically analyzed for improvement in future response.

❖ Lessons Learned

Experience of few past disaster (either external or internal or both) should be mentioned in form of bullet points under the heading of

- Where the plan was successful or how the event was managed?
- Where did the plan failed (and why it failed)?
- Few urgent remedial measures need to be taken up for

❖ **Mock Drill**

Detail information on any mock drill on HDMP that was practiced or IS proposed to be practiced

- Place of mock drill organized
- How many people from the hospital participated?
- In what way the hospital participated in the entire mock drill?
- What was the duration?

❖ **Capacity Building of DM Teams**

After forming different teams as per the HDMP, the hospital is responsible for the capacity building and training of the teams in one hand and sensitization of all staff of hospital on HDMP on the other.

Hospital capacity building in terms of undertaking structural as well as non-structural mitigation measures should also be an essential part of the plan

4.1 Hospital Networking During Disasters

Hospital networking as part of pre-disaster hospital preparedness may be defined as a systematic approach for a formal understanding between and among hospitals to augment and optimize the utilization of existing available resources - materials, manpower and information so as to minimise the loss of life and limb.

Objective

The key objective of hospital networking in disasters is to share the treatment burden and respective resources so as to facilitate quick, appropriate, adequate, and effective medical intervention to disaster affected population.

Salient Features of Hospital Networking

- It is a part of Hospital Disaster Management Plan.
- The extent of networking plan implementation depends largely upon the type and severity of the disaster and formal understanding between/among the hospitals.
- It needs intra and inter-sectoral coordination within the hospitals and between/among the hospitals, and between/among the hospitals and other agencies such as police, fire brigade, district administration, private and government hospitals, Red Cross and blood banks and other specialised medical centres and emergency services for more effective implementation of the networking plan.
- It can operate at various levels such as PHC, CHC, district hospitals, and tertiary care hospitals at state or national level.

Components of Networking

Effective hospital networking in the eventuality of a disaster mainly consists of five major components, namely, **communication/information sharing, transport, manpower and facility, inter-agency or inter-sectoral coordination, and cost sharing.**

- Implementation of formal understanding between hospitals begins with uninterrupted communication mechanisms -mobile phones, fax,

- email,wireless, LAN, HAM radio, etc- available in these hospitals even in the case where only one hospital is affected. This also enhances the speed of emergency referral system the hospital follows.
- Thereafter, the process and mechanism of transporting survivors from the affected area to the hospital and/or from one hospital to another depends upon
 - The condition of the survivors after field triage,
 - Specific facility available in the concerned hospital,
 - Mode of transport: Could be ambulances with or without BLS facilities, general vehicle, rail or air transport.
 - Orientation of the staff: Many a times the staff may constitute the ambulance or general vehicle drivers only who are responsible for transporting the patient.
 - In the meanwhile, as a part of Hospital Disaster Management Plan Activation, the networked hospitals should be ready with manpower and materials resource reallocation in the respective hospitals. Chain of command and quick mobilisation of required staff are key factor to receiving the survivors for immediate medical attention.
 - Orientation to effectively and timely share information with other important agencies like police, district administration, fire station and the media play a significant role in successful hospital networking during any disaster. Pre-disaster orientation, sensitisation, training, mock drills, etc are integral part of intra and inter-sectoral command, coordination, and cooperation.
 - Cost-sharing of the entire anticipated health care services to be provided should be ideally worked out in the networking agreement.

Pre-Networking essentials

- **Hospital Entity:** Organisational set up, ownership, type of hospital (general, speciality or multi speciality), bed and staff strength, facilities available, financial capacity, location, etc need to be considered while networking with other hospitals. This would help in identification of

hospital to be networked with and also in deciding the level and type of networking between hospitals.

- **Hospital Disaster Management Plan:** Hospital networking should be a part of the existing hospital disaster management plan of any hospital. This would make easier the process of plan activation, facilitate a clear chain of networking and resource mobilisation
- **Situation entity:** Taking into account the population density of an area and neighbouring areas and common public health problems would help to build the hospital capacity to meet an emergency in a better way.
- **Inventory Analysis:** This will aid in planning, assigning duties and responsibilities, patient referrals, updating and in mobilization of resources
- **Cost Sharing:** Before opting for a formal networking, a formal understanding on the sharing of the cost of service, manpower, material, facility, etc between hospitals having different ownership should be looked into and mentioned in the formal agreement. This would help in resolving conflict of interests and smoothen the process of networking.

Essentials of Networking Activation:

- **Networking Agreement**
 - *Administrative approval:* It is always ideal to opt for a formal agreement between hospitals regarding the modalities of networking. The agreement may contain the modalities of network operation on various components of hospital networking for the parties involved. The time period for which the agreement would be valid or the number of events for which networking would operate must be mentioned in the agreement.
 - *Financial approval:* Budget sanction for meeting expenses during such emergency situations should be availed once the formal agreement is done.

- **Operating Procedures**

The following sequence of activities could be considered for an effective network operation.

- Authority/Incident Command to activate networking
- Communicating with other agencies
- Deciding time to activate networking
- Resource mobilisation and reallocation
- Separate budget provision for emergency expenses
- Debriefing on duties and responsibilities to the staff
- Ready with mobile and stationary teams of care givers
- Communicate with other key agencies
- Strengthening the referral system
- Supervising the dynamics of networking operation

- **Record Keeping & Lessons learnt**

Records of facts and figures pertaining to all components of hospital networking have to be regularly updated to monitor the success of plan activation. This would help in reviewing of the plan implementation so as to enlist the lessons learnt and further modifications in the agreement and operation modalities.

SECTION-V

5.0 A Perspective On Medical Preparedness & Response For Specific Health Issues

5.1 Public Health Emergency Preparedness

Preamble

Health emergencies may occur in two ways - first, health events subsequent to a disaster (medical emergencies, Public Health Emergencies), second, health events leading to disaster (Outbreaks, Epidemics, Biological warfare/ Bio-Terrorism). There are some health issues which if not addressed timely, adequately and appropriately may convert into '*Health Disaster*' / *Public Health Emergencies* such as unchecked outbreaks, epidemics, natural disasters, biological disasters which could be potential danger to the affected community. Since preparedness is the essential component of disaster management, this chapter focuses on preparedness for public health emergencies such as outbreaks of communicable diseases following natural disasters and biological disaster.

5.1.1 Definitions

i. Outbreak

An outbreak is the occurrence of cases of an illness (specific health related behavior) or other health related event, clearly in excess of normal expectancy in a community with the period in which cases occur are specified precisely. An outbreak is limited or localized in a village, town or closed institution. However, the magnitude could involve wider geographic areas, even beyond one district, thus called an epidemic (Source: A dictionary of Epidemiology, 4th Edition, 2001, John M Last).

ii. Disaster

Any occurrence that causes damage, ecological disruption, loss of human life, deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community.

iii. Biological Disaster

Bio-terrorism can be defined as the use of biological agents to cause death, disability or damage mainly to human beings.

This chapter is divided into following two parts:

Part-A Describe the public health preparedness for prevention and control of outbreaks of epidemic-prone communicable diseases following natural disasters

Part-B Describe the steps of public health preparedness for bio-terrorism.

PART-A

Preparedness for Public Health Emergency Following Natural Disasters

5.2 Background

Natural disasters such as floods, earthquakes, cyclones, storms, wild fires, volcanoes, landslides, droughts and famine occur frequently in different parts of the country affecting a large population. This has always been a major concern to cope up with such public health emergencies in particular communicable disease outbreaks following such disasters.

There is an increasing trend for both natural and manmade disasters worldwide. Due to the characteristic geological and geographical characteristics 60 percent of major world disasters occur in Asia pacific Region. The global concern has also been reflected in declaring the decade 1990-2000 as the '**International Decade for Natural Disaster Reduction**'. During this decade on an average 30 million people were affected by disasters and 4344 people lost their lives in each year. During the decade 2000-2010 over 300 million people had been affected and about 4560 people lost their lives.

5.3 Public Health Impacts

During natural disasters health care and public health infrastructure are disrupted, and this problem is compounded by displacement of population / overcrowding in camps, lack of safe drinking water and insanitary conditions etc. Disasters create an immediate obstacle to response by disrupting vital public

services as well as communication and transport systems in addition to sudden impact of killing and injuring people and causing extensive environmental social and economic damage.

All these prevailing conditions pose health risks and potentially increase the transmission of the following epidemic-prone communicable diseases:

Mode of Transmission of Epidemic-Prone Diseases

Mode of Transmission	Diseases
Water-borne	Acute Diarrhoeal Diseases(ADD), Cholera, Bacillary Dysentery (Shigellosis), Viral hepatitis A & E, Typhoid fever
Vector-Borne	Malaria, Dengue and Dengue Hemorrhagic Fever, Japanese Encephalitis
Zoonotic Diseases	Anthrax Fever, Leptospirosis, Plague, Scrub Typhus
Air-Borne	Acute Respiratory Infections(ARI), Meningococcal Disease, Measles, Influenza, Avian Flu
Others	Sexually Transmitted Infection (STI), HIV Snake bite, Malnutrition, Post traumatic stress disorder, Sleep disorder etc.

5.4 Principles to Control Communicable Diseases after disasters

The fundamental principles to prevent and control impending outbreaks of epidemic-prone communicable diseases after disasters are as follows:

- i. Rapid Health Assessment
- ii. Prevent Communicable Diseases
 - a. Establish Disease Surveillance System
- iii. Control Outbreaks
 - a. Constitute Rapid Response Teams (RRTs)
 - b. Laboratory support
 - c. Entomology Support
 - d. Stockpiles
- iv. Disease Management
 - a. Early Diagnose and Treatment of Cases
 - b. Standard Treatment Protocols

Part-A is further divided into following three sections:

Section - A1 Prevention of Outbreaks of Epidemic- Prone Diseases after
Disaster

Section- A2 Preparedness for Prevention and Control of Public Health
Emergencies

Section- A3 National Programs for mitigation of disasters

Section-A1

5.5 Prevention of Outbreaks of Epidemic- Prone Diseases after Disaster

To prevent occurrence of outbreaks, there is a need to operationalise quickly the public health surveillance system for early detection of outbreaks and rapid response to control them.

Natural disasters cause negative impact on the overall health of the community. After the disaster the survival of the victims is essential and crucial for initial one to three days and the main concern is the management of injuries, shelter, food and water. Within next three to five days it is likely to be followed by increased morbidity and mortality due to epidemic-prone communicable diseases which may be due to:

- i. Disruption of human ecology and environment
- ii. Damage to sanitation and sewage facilities
- iii. Population displacement, overcrowding in temporary shelters
- iv. Limited or no access to safe drinking water and food
- v. Prevailing unhygienic sanitary conditions etc.
- vi. Emergence of vector breeding sites

Since the displaced population is at risk of acquiring infections the first step is to measure health and health related present and potential health impacts of disasters and conducting a rapid health risk assessment. Collect information during or immediately aftermath of an emergency to identify basic needs of the affected population that require immediate response.

5.6 Early Detection of Impending Outbreaks

The steps to detect impending outbreaks are as follows:

5.6.1 Set up Command and Control Room

Identify a place in the field to set up a 'Command and Control Room' to coordinate the day-to-day activities that should work round the clock.

5.6.2 Constitute Rapid Response Teams

Rapid Response Teams (RRTs) are multifaceted teams comprising of epidemiologists, and clinicians (Physician or Pediatrician), microbiologists, entomologists and health assistant (to assist the team in the community to do surveys, make community contacts, and mobilize the community and to organize logistics).

5.6.3 Action Plan and Mobilization of Resources

To respond quickly to outbreak situations, a detailed Action Plan should be prepared. Some of the important components of the plan are as follows:

- i. Stockpiling of essential drugs and other medicines like antibiotics, oral rehydration solution (ORS) intravenous fluids, vaccines, Halogen tablets, Bleaching powder, insecticides etc.
- ii. Identify trained manpower availability
- iii. Identify clear guidelines, for collection, transport and storage of clinical material and bio-safety and waste management measures
- iv. Identify competent laboratories for a etiological diagnosis confirmation
- v. Keep ready outbreak investigation kits
- vi. Documented clear job responsibilities of individuals at all levels be available
- vii. Identify blood banks in the vicinity
- viii. Provision of functional vehicles
- ix. Develop mechanism of collaboration between health and other related sectors
- x. Development of working link between Non Governmental Organizations (NGOs)

- xi. Collect area-specific other important information

5.7 Establish Early Warning Disease Surveillance System

The objective of surveillance in disasters is to reduce morbidity and mortality of the survivors from preventable diseases.

The regular surveillance activities / mechanisms are the same but there are some special features of surveillance during disasters, which are as follows:

- i. Different diseases may need to be targeted
- ii. Data collection and transmission may have to be modified
- iii. Need to involve other stake holders
- iv. Need to shift from regular system to emergency system
- v. Problem of logistics
- vi. Management of media

To establish effective disease surveillance system for early detection, prevention and control of impending outbreaks, following steps are to be followed:

5.7.1 Working Case Definition of Epidemic Prone Diseases

Since many workers are involved in the surveillance activities at various levels, data collected should be uniform. To ensure uniformity in reporting one must have 'Case Definition' of epidemic-prone diseases. The benefits of the adaptation of 'Case Definition' are early case detection, reporting, investigation and confirmation of suspected outbreaks.

5.7.2 Identify Surveyors

Select a team of health workers to carry out active surveillance to find out morbidity and mortality by visiting the camps / affected areas.

5.7.3 Daily Reporting

Report the total number of cases including their details such as name, age, sex, location / camp number, date of onset of illness etc. to health coordinator.

5.7.4 Set up Laboratory Support

Rapid identification of the causative agent and the likely source or mode of transmission is essential. Therefore, set up a laboratory in the field for surveillance / outbreak investigation following a disaster. Identify tests to be performed as per the possible etiology /causative agents of impending epidemic-prone communicable diseases

5.7.5 Set Criteria for Trigger Events, Epidemic Alerts and Response

It is important to define the threshold level for alert and response for various diseases, for which the base line information about the prevalence of that particular disease in that area is critical to know. The base line information can be collected by looking in to the reported data of previous 3-4 weeks. If the reliable information is not available, some of the trigger events and epidemic alerts of communicable diseases and their threshold levels for local areas which need immediate attention and response to control further spread are as follows:

Syndrome and Alert Threshold Level for Immediate Response

Syndrome	Threshold level
Acute watery diarrhoea (suspect Cholera)	5 cases age group 5 years and above
Bloody diarrhoea (suspect Shigellosis)	5 cases or 1.5 times the baseline*
High vector density(Malaria, Dengue)	1.5 times the base line
Fever and Rash (Suspect Measles)	One case each
Acute hemorrhagic fever (Suspect Dengue Hemorrhagic Fever)	
Acute fever with altered sensorium (Suspect Japanese Encephalitis)	
Acute fever with renal involvement (Suspect Leptospirosis)	
Acute fever with painful lymph nodes (Plague)	
Acute Jaundice (suspect Hepatitis A & E)	
Acute flaccid paralysis in a child (suspect Poliomyelitis)	
Neonatal tetanus	
Meningitis	
Meningitis	2 cases of similar illness
Fever of unknown origin	1.5 times the base line
Other communicable diseases	1.5 times the base line

Severe malnutrition	3 cases
Communicable disease/ New disease	Clustering or unusual increase of cases of similar illness or deaths
Case Fatality Ratio (CFR)	>2.8 /1000 /month (>1/10.000/day)
Under five mortality Rate(U5MR)	>5.6 /1000 /month (>1/10.000/day)
*Baseline = average weekly number of cases of the disease calculated over the last 3 weeks	

5.7.8 Rapid Response to Trigger Events of Outbreaks

Daily analyze surveillance reports and look for clustering of cases, any trigger events for epidemic alert and monitor disease trends. If cases cross the limit of thresholds as stated above or any outbreak is detected, mobilize RRTs and initiate response activities to:

- i. Confirm the existence of an outbreak
- ii. Confirm the diagnosis
- iii. Identify all cases
- iv. Detect pattern of its spread
- v. Institute control measures

5.7.9. Role of Health Personnel and Community in Prevention and Control of Outbreaks following Disaster

Health personnel and community have crucial role to play for prevention and control of impending outbreaks of epidemic-prone diseases in the disaster affected community/ areas. The specific public health actions to be taken by health personnel and community to prevent post-disaster outbreaks of water-borne, vector-borne and vaccine –preventable diseases (particularly measles) are given below:

5.7.10 Prevention of Water- Borne Diseases

I. Role of Health Personnel

- Conduct survey for Rapid Health Assessment
- Active surveillance for acute diarrheal diseases (ADD)
- Daily reporting of diarrhoea cases
- Distribution of ORS (Oral Rehydrated Salt) with instructions to use it
- Assure chlorination of source(s) of drinking water

- Water Quality Monitoring by checking residual chlorine in water by Orthotolidine (OT) Kit
- Distribution of Chlorine releasing tablets for chlorination of water at household level
- Ensure proper excreta and solid waste disposal
- IEC (Information, Education and Communication) activities to increase awareness in the community about personal hygiene, sanitation, importance of hand washing, early reporting of cases, correct preparation of ORS solution etc.

II. Role of Community

No major public health activity can be undertaken without active participation and co operation of the community. In this context, community must be informed, educated and encouraged to participate in the following activities:

- Proper storage of drinking water in clean, covered and narrow mouthed containers at household level
- Use of tap or ladle to draw water if stored in a wide- mouthed containers
- Avoid raw and uncooked food
- Cook food properly , keep covered and reheat it thoroughly before consuming
- Hand washing with soap after defecation and before preparation or eating food.
- Aware of danger signals of dehydration and when to seek immediate medical care

5.7.11 Prevention of Vector- Borne Diseases

I. Role of Health Personnel

- Active surveillance of acute fever cases
- Examination of peripheral blood smears for malaria parasites and to provide radical treatment to malaria positive cases
- Conduct vector surveillance to search breeding sites, adult vector mosquitoes, identify species and vector density
- Carry out insecticidal spray to minimize the potential risk of outbreaks

II. Role of Community

Community must be informed, educated and encouraged to participate in the following activities

- To protect themselves from mosquitoes by eliminating mosquito breeding sites
- Use bed nets, mosquito repellents etc. for personal protection.

5.7.12 Vaccine Preventable Diseases

I. Role of Health Personnel

- Conduct active survey to detect cases of fever with rash (suspect measles, chicken pox)
- Continue routine immunization of children
- Mass measles immunization to children aged 6 months to 5 years (once the measles cases started occurring ,stop measles mass immunization but to continue routine immunization)

II. Role of Community

- Early reporting of cases (fever with rash)
- Continue the routine immunization schedule of children (if any dose is due)
- Bring children (6 months to 5 years) for measles vaccination

5.8. Strategies to Control Outbreaks

The data gathered during investigations can reveal why the outbreak had occurred and the mechanism by which it spread. Further, the outbreak may be controlled by eliminating or reducing the source of infection, interrupting transmission and protecting persons at risk.

5.8.1 Prevention of exposure

Take measures to reduce the source of infection to prevent the disease spreading to other members of the community. Depending on the disease, do prompt diagnosis and treatment of cases using standard protocols. Give health education; improve environmental and personal hygiene etc.

5.8.2 Source Reduction

- Provision of safe water by monitoring of water chlorination
- Proper disposal of excreta
- Control of vector-borne diseases by source reduction, residual insecticide spray, personal protection measures to reduce man-mosquito contact, anti-adult measures and rodent control measures

5.8.3. Prevention of infection

Susceptible groups are protected by vaccination (e.g. meningitis, measles, diphtheria) and provide safe water, adequate shelter and good sanitation.

5.8.4 Prevention of Disease

Chemoprophylaxis to high risk groups (e.g. malaria prophylaxis may be suggested for pregnant women in outbreaks) pneumonic plague, meningococcal meningitis, Leptospirosis and influenza pandemic.

5.8.5 Prevention of Death

Death can be prevented through prompt diagnosis and management of cases and providing effective health care services.

5.9 Evaluation of an outbreak

After an outbreak is over, the outbreak response team must carry out a thorough evaluation of the following aspects:

- Cause of the outbreak
- Surveillance and detection of the outbreak
- Preparedness for the outbreak
- Management of the outbreak
- Control measures taken and their impact

5.10 . Documentation and Experience Sharing

Document the outbreak report and provide feedback to concerned State and District authority. Develop case studies on selected outbreaks for training of RRTs. Organize post-outbreak seminar and share lessons learned/ experiences.

5.11. Risk Communication

Risk communication is an interactive process of exchange of information. The public often relies on the media for information. The way health and emergency personnel deal with the media in these situations has a large impact on the public perception of the disaster.

Outbreaks are frequently marked by uncertainty, confusion and a sense of urgency. Unfortunately, examples abound of communication failures which have delayed outbreak control, undermined public trust and compliance, and unnecessarily prolonged economic, social and political turmoil. Therefore, communication expertise is as essential to outbreak control as epidemiological training and laboratory analysis.

5.12 . Information Sharing

International surveillance and response networks have shown their utility in enabling countries to be better prepared and respond to epidemics as it was seen during the SARS outbreak. There is a strong need to use these technical networks, document models that work best.

An outbreak control room in the country be established which should be used for sharing information regarding outbreak rumors', risk communication, dissemination of updates and technical guidelines and holding tele and video conferences on prevention and control measures etc.

To prevent the occurrence of post-disaster outbreaks, subsequently in future, the nation/district / state should be prepared to meet those eventualities. The **important preparedness actions are described under Section -2.**

Section -A2

5.13. Preparedness for Prevention and Control of Public Health Emergencies

The public health system is a complex network of people, systems and organizations working at the local, state and National levels. Public health emergencies are major concern to the nation due to the following reasons:

- Emergencies' / Epidemics are difficult to forecast
- Associated with high rate of morbidity and mortality
- Create panic in the community
- Cause social disruption
- Have negative economic impact

In this context, preparedness is the essential component of the disaster management. The objectives of epidemic preparedness plans are as follows:

- To reduce the risk of epidemics
- To strengthen capacities to detect and respond to epidemics rapidly
- To minimize the morbidity, mortality and social disruption due to epidemics

5.13.1 Strengthening of Disease surveillance system

Surveillance is the backbone of public health and preparedness is a cost-effective public health tool to manage emergencies.

5.13.2. Human Resource

Ensure an adequate number of qualified, competent and trained professionals in various specialties viz field epidemiology, entomology, molecular biology, public health laboratories, information technology, and communication etc.

5.13.3 Laboratory Capacities and use of Modern Technologies

Accurate and timely laboratory analysis is critical for identifying, tracking and limiting public health threats. Therefore, it is important to focus on :

- Generating a network of public health laboratories with strong linkages between various laboratories
- Develop or have an access to BSL 3/ BSL 4 high security laboratories to process highly pathogenic clinical specimen / organisms.
- Strengthen information sharing and networking mechanism.

5.13.4 Strengthening of Support Facilities and Logistics

Support facilities like transport, electricity, telephone, potable water, etc will have to be ensured in all the facilities.

It is very important to plan well in advance for various logistics and manpower availability. Inventorise the sources of supply of bleaching powder, halogen tablets, chloroscopes, soaps, commonly used insecticides, essential medicines, vaccines and laboratory diagnostic reagents. Updated policies and legislations related to public health should also be in place. **The focus should be on disaster preparedness and vulnerability reduction in general (Figure 1).**

5.13.5. Multi-Sectoral Involvement

Several key partners can play a significant role in preventing and controlling communicable diseases. Various partners apart from the national authorities in different sectors that are critical include private sectors, academic Institutes, mass media, NGOs and various international development partners. An enhanced public and private mix is needed to provide services to manage communicable diseases

To mitigate the impact of a disaster, urgent and concerted efforts of several agencies are required. The Ministry of Health and Family Welfare is one of the key ministries for providing emergency medical relief and sustained public health support to minimize the possibilities of outbreaks or dealing with public health emergencies. **The National framework and the status of Health Sector preparedness and response for disaster management / public health emergencies and to mitigate the impacts are described under Section -3.**

Section -A 3

5.14 National Programs to Mitigate Disaster

5.14.1. Role of Health Sector in Disaster Management

The health sector is responsible for the following activities for disaster management

- Preventing events that could leads to disasters

- Mitigating health consequences of disasters
- Management of mass casualties'
- Managing public health emergencies
- Psychosocial care
- Reproductive and child health care

The occurrence of super cyclone in Orissa (1999) and Gujarat Earthquake (2001) underscores the need to adopt:

- Multi-disciplinary, multi-sectoral, multi hazard approach
- Mitigating the impact of disasters to be an integral component of development planning
- Incorporation of 'Vulnerability Analysis' and 'Risk Reduction' in the development plans and strategies

This leads to paradigm shift from relief centric approach to that of 'Disaster **preparedness, mitigation, response, reconstruction and sustainable development**' in the National Development Plan.

5.14.2. Legal Framework

Following Acts and Regulations are in place:

- Disaster Management Act 2005
- International Health Regulations 2005
- Epidemic Act 1897
- Public Health Emergencies Act (Draft)
- Civil/ Criminal Acts, Codes

5.14.3. Institutional Framework for Policy, Planning and Co-ordination Committees and their Roles and Responsibility at National Level

Level	Headed By	Role / Responsibility
Union Cabinet	Prime Minister	Decision making Body
National Disaster Management Authority	Prime Minister	Decision making Body

National Crisis Management Committee	Cabinet Secretary	Decision making Body
National Executive Committee	Union Home Secretary	Execute Plans
Ministry of Home Affairs	Union Home Secretary	Nodal Ministry (except for draught and epidemics)
Joint Secretary (Disaster Management), Ministry of Home Affairs	Central Relief Commissioner	Nodal Officer to coordinate relief in natural disasters

Committees and their Roles and Responsibility at State and District Levels

State	District
State Disaster Management Authority	District Disaster Management Committee
Crises Management Group Headed by Chief Secretary	Crises Management Group Headed by Collector
Department of Disaster Management under Relief / Revenue Department	Department of Disaster Management under Relief / Revenue Department
Relief Commissioner / Secretary (Disaster Management)	Disaster Management headed by District Collector

Operational Framework in Ministry of Health and Family Welfare

Level	Headed By	Roles / Responsibility
Crisis Management Committee	Secretary (Health)	Overall Decision Making
Technical Advisory Committee	Director Health Services (DGHS)	Technical Decision Making
Emergency Medical Relief Division	Director, EMR	Focal point for coordination / Management at National Level

5.14.4. National Programs and Projects for Prevention and Mitigation

The following projects and programs for prevention and mitigation of disaster are in place:

- Integrated Disease Surveillance Program (IDSP)
- National Rural Health Mission(NRHM)
- National Highway Trauma Project
- Mobile Hospital Project
- Health Sector preparedness for disasters

- Emergency Operation Centers
- Hospital strengthening
- Strengthening blood banks
- Project for specialized capacity development for CBRN (Chemical, Biological, Radiological & Nuclear) disasters
- Research component with Department of Health Research

14 Core Capacities for Public Health Preparedness and Response

Public Health preparedness and response for emergencies essentially requires following three core capacities:

- i. Development of epidemiological, clinical, entomological and laboratory capacities to investigate the epidemics to characterize the cases in terms of time, person and place and to understand the transmission dynamics
- ii. Development of response capacities to prevent/control the epidemics to reduce the morbidity and mortality to the minimum.
- iii. Establishment/strengthening of a laboratory based disease surveillance system to collect baseline data on epidemic-prone diseases, monitor disease trends and to detect epidemics in early rising phase

In this context, IDSP is empowering the states and districts to develop these three essential core capacities.

The brief and current status of IDSP is as follows:

5.15. Integrated Disease Surveillance Program

To strengthen the existing disease surveillance system in the country, Integrated Disease Surveillance Program (IDSP) was launched in 2004 with the following objectives.

5.15.1 Objectives

- i. To strengthen the disease surveillance system by establishing a decentralized State based surveillance for epidemic prone diseases
- ii. To detect early warning signals

- iii. To initiate timely and effective public health actions in response to health challenges at Districts, State and National level

5.15.2 Strategies of IDSP

- i. Integration and decentralization of surveillance activities through establishment of surveillance units at Centre, State and District level.
- ii. Human Resource Development by imparting training on principles of disease surveillance to State and District Surveillance Officers, Rapid Response Teams (RRTs), other Medical and Paramedical staff.
- iii. Use of Information Communication Technology (ICT) for collection, collation, compilation, analysis and dissemination of data.
- iv. Strengthening of public health laboratories.

5.15.3 Surveillance Units

A Central Surveillance Unit (CSU) at National Centre for Disease Control (formerly National Institute of Communicable Diseases (NICD) Delhi, State Surveillance Units (SSU) at all State/UT Headquarters and District Surveillance Units (DSU) at all Districts in the country have been established.

5.15.4 Training

The Training in IDSP is three-tiered:

- i. Master Trainers, State and District Surveillance Officers and RRT members are trained at National level.
- ii. Medical Officers and District Lab Technicians are trained by Master Trainers at State level.
- iii. Health Workers and Lab Technician/Assistants are trained by District Surveillance officers/Medical Officers at District level.

The main focus of training for state level participants is on basics of disease surveillance, concepts of epidemiology and data management, whereas the District training focuses on correct procedures of data collection, compilation and reporting and outbreak response. A need based special two-week Disease Surveillance and Field Epidemiology Training Program (FETP) have been

initiated for the District Surveillance officers. 279 Epidemiologists, 56 Microbiologists and 23 Entomologists have been recruited in States and Districts and their induction training is being continued.

5.15.5 Strengthening of Laboratories

Priority district laboratories (50) are being strengthened in the country for diagnosis of epidemic prone diseases. A referral lab network (in nine states) is being established by utilizing the existing functional labs in the medical colleges and various other major centers in the States and linking them with adjoining districts for providing diagnostic services for epidemic prone diseases during outbreaks.

5.15.6 Data Management

To get trends and seasonality data is being collected on epidemic-prone diseases on weekly basis on specified reporting formats, namely “S” (Suspected cases), “P” (Presumptive cases) and “L” (Laboratory confirmed cases) respectively, filled by Health Workers, Clinicians and Laboratory staff. If there is a rising trend of illnesses in any area, it is investigated by the trained Rapid Response Teams (RRTs) to diagnose and control the outbreak. Data analysis and actions are being undertaken by respective State/District Surveillance Units.

5.15.7 Outbreak Surveillance and Response

Central Surveillance Unit (CSU) receives disease outbreak reports from the States/UTs and compilation of disease outbreaks/alerts is done on weekly basis.

5.15.7.1 Media Scanning and Verification Cell

Media scanning is an important component of surveillance to detect the early warning signals. A ‘Media Scanning and Verification Cell’ has been established at NCDC, Delhi. Every day the cell receives an average of 4-5 media alerts of unusual health events which are being detected and verified.

5.15.7.2 Information and Communication Technology Network (ICT)

Information and Communication Technology Network (ICT) plays an integral and most powerful role in implementing IDSP across the country. One of the important components of the project is data management, analysis and rapid communication in case of outbreaks.

5.15.7.3 Data Centre

Data Centre' has been installed (776 sites) by National Informatics Centre (NIC) for online data entry at district level and speedy data transmission.

5.15.7.4 E- Training Centers (NIC)

Training centre equipments have been installed (378 sites) and e-learning portal (<http://e-learning.nic.in/lms>) has been established by NIC that can be used for:

- i. E-training / e-learning (live virtual class-rooms)
- ii. Interactive electronic discussion (Chat rooms, Boards, Mailing Lists etc.)
- iii. Communication from State to District for state/district/area specific discussion on project related activities, reviewing and monitoring of the program.

5.15.7.5 Training Centre (ISRO)

Indian Space Research Organization (ISRO) has installed centre (367 sites) for training at different sites (EDUSAT/VSAT).

5.15.7.6 Call Centre

A 24X7 call centre has been established to receive disease alerts from anywhere across the country on a toll free number 1075 (1800-11-4377); for verification and initiating appropriate public health actions. The call centre has a response mechanism by informing respective health officials at concerned Districts for early response.

5.15.7.7 IDSP Portal

The IDSP portal is a one stop portal (www.idsp.nic.in) which has facilities for data entry, view reports, outbreak reporting, data analysis, training modules and resources related to disease surveillance. Districts (90%) are now reporting disease surveillance data in portal.

5.15.8 Entomological Surveillance for Vector Borne Diseases

Vector borne diseases like Malaria, Japanese Encephalitis, Dengue, Kala-azar etc. are of major public health concern. Every year outbreaks/ epidemics occur in different parts of the country leading to high morbidity and mortality. Entomologists have joined in 23 States/UTs. Entomological surveillance and monitoring of vector borne diseases are being carried out by the Entomologists.

5.15.9 Infectious Disease Hospital Surveillance Network

EDUSAT networking of Infectious Disease Hospitals of Metro / major cities (seven) has been established for weekly reporting of epidemic-prone diseases.

5.15.10 Urban Surveillance

Urban surveillance plans for metropolitans cities (four) have been developed and are submitting weekly surveillance data.

5.15.11 Tribal and Social Plan

Three states are piloting a project under Tribal Action Plan (TAP) for community surveillance among tribal community and collecting baseline data on epidemic-prone diseases and outbreaks.

5.15.12 Prevention and Control of Avian/H1N1 Influenza

Outbreak Monitoring Cell (24x7) has been established at National Centre for Disease Control (NCDC) for monitoring the situation. Community, Private Practitioners, Nursing homes and Hospitals have been requested to report to

IDSP Call Centre on 1075 (Toll free number) in case of any occurrence of clusters of Influenza like illness in the community. Laboratories are strengthened (12) for testing clinical samples of Influenza A H1N1 in different regions of the country. 11 strains have been sequenced at NCDC Laboratory. The animal component of Avian Influenza is being looked after by Ministry of Agriculture (Dept. of Animal Husbandry).

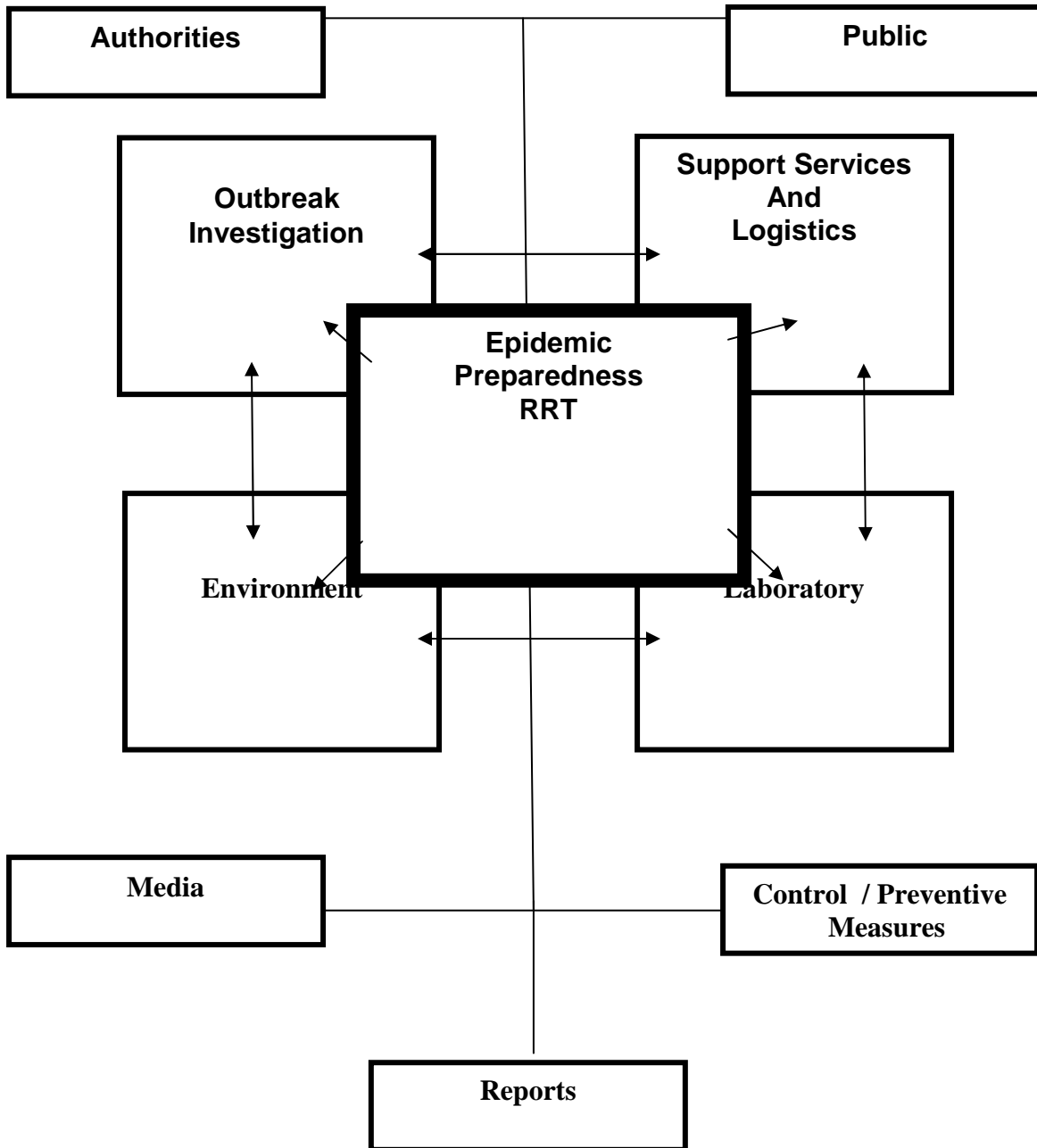
5.16. Salient Recommended Preparatory Actions at all Levels

To prevent the occurrence of outbreaks, subsequently, a district / state/ Centre should be prepared to meet those eventualities. Some of the important preparedness actions are as follows:

- Strengthen routine surveillance system
- Identify a nodal officer at the state and district levels
- Constitute an inter-disciplinary Rapid Response Team (RRT) at state/district level
- Train medical and other health personnel
- List the laboratories at regional /state/district level
- List 'high-risk' pockets in the rural / urban areas
- Establish a rapid communication network
- Undertake IECactivities for community participation
- Ensure that essential supplies are available at the peripheral health facilities and buffer stocks are maintained at the district level
- Set-up an inter-departmental committee, including Non-Government Organizations (NGOs).

Figure 1

Preparedness for Prevention and Control of Public Health Emergencies'



Part-B

Public Health Preparedness for Bio- Terrorism (Biological Disaster)

5.17 Preamble

Bio-terrorism can be defined as the use of biological agents to cause death, disability or damage mainly to human beings. Biological agents are living organisms or their toxic products that can kill or incapacitate people, livestock, and plants. Some of the pathogenic organisms used as potential weapons for biological warfare and bio-terrorism. The three basic groups of biological agents, which could be used as weapons, are bacteria, viruses, and toxins. Biological agents can be dispersed by spraying them into the air, by infecting animals that carry the disease to humans, and by contaminating food and water. Potentially, hundreds of human pathogens could be used as weapons; however, public health authorities have identified only a few as having the potential to cause mass casualties leading to civil disruptions.

The main cause of bio–terrorism is to attract widespread attention and to harm a selected target community / group, biological weapons are used since they are potentially more powerful agents to cause mass casualties leading to civil disruptions, greater harm and create panic in the affected community.

Biological material, which fulfils some of the criteria of bio-weapons are as follows:

- i. Biological agents can be disseminated with readily available technology such as commonly used ‘Agricultural spray devices’, those can be adopted to disseminate biological pathogens of the proper particle size to cause infection in human population over great distance.
- ii. Conducive or favorable natural weather conditions, such as wind and temperature inversions as well as existing building infrastructures (e.g. ventilation system) or air movement related to transportation (e.g. subway cars passing through tunnels) to disseminate these agents and thus to infect or intoxicate a large number of people.

- iii. The expense of producing biological weapons is far less than that of other weapon systems.

5.18. Routes of Transmission of Biological Agent

The commonest route of transmission of biological agents is aerosol, other possible routes could be as follows:

- **Aerosols** – Potential biological agents are dispersed into the air, forming a fine mist that may drift by wind for miles away. Inhaling the agent may cause epidemic diseases in human beings or animals.
- **Animals** – some diseases are spread by insects and animals, such as fleas, mice, flies, mosquitoes, and livestock etc.
- **Food and water** contamination –. Some pathogenic organisms and toxins may persist in food and water supplies. However, most microbes can be killed, and toxins deactivated by cooking food and boiling water. This route is effective for some agents such as *Salmonella typhimurium*.
- **Person-to-person** - spread of a few infectious agents (smallpox, plague, and the Lassa viruses) is also possible.

5.19. Potential Bio-Terrorism Agents

There are three categories of biological agents' potential to cause mass casualties. The agents in the following category have the greatest potential for fear and disruption and most significant public health impacts. The brief description of these biological agents is given below.

5.19.1 Anthrax

- Anthrax is caused by the gram-positive, non-motile *Bacillus anthracis*.
- Anthrax has been a scourge of cattle and other herbivores for centuries. During the industrial revolution, the inhalation form was first recognized as an occupational pulmonary disease in workers in the wool industries of Europe.
- Anthrax is an ideal biological weapon, since Inhalation form of disease is highly lethal. The spores can maintain virulence for decades and they can

be milled to the ideal particle size for optimum infection of the human respiratory tract.

- Different clinical forms of the disease are observed, depending on the route of exposure. Inhalational anthrax presents with non-specific symptoms that cannot be distinguished from many more common diseases based on early clinical manifestations or routine laboratory tests. Despite aggressive medical care, patient develops rapidly progressive disease and die.

5.19.2 Smallpox

- Smallpox is an acute contagious disease caused by *variola* virus. It is the only disease that has been eradicated from the world in the year 1977. Currently, the only source of the virus is the stocks held in the two WHO Collaborating Centres in the United States and Russia.
- Despite its eradication about 35 years ago, there is a little reason that smallpox disease can reoccur, but still small pox evokes fear and dread due to its potential use as a biological weapon.

5.19.3 Plague

- Plague has already demonstrated a historical potential to kill millions of people across the globe.
- Plague is caused by non-motile, gram-negative coccobacillus *Yersinia pestis*, having bipolar appearance resembling a safety pin.
- *Yersinia pestis* has two important properties that differentiate it from *B. Anthracis*. i.e person-to-person transmissibility and a lack of spore production.
- Following the bite of an infected flea, plague bacilli are carried via the lymphatic to the regional lymph nodes where they multiply exponentially.
- This is only weapon besides smallpox, that can cause devastation beyond those persons who are initially infected.
- With modern air travel, containing an outbreak of plague could be challenging.

- Vaccine for plague is no longer being produced, and does not demonstrate efficacy against infection by aerosol.

5.19.4 Botulism

- Botulism or Botulinum toxins are deadly and produce serious disease in human beings. A toxin is a toxic substance that can be produced in an animal, plant, or microbe. Mass casualties can be produced through contamination of food source or by aerosol dissemination.
- Incubation period of botulism can range from as short as 24 to 36 hours to several days from the time of inhalation.

5.19.5 Tularaemia

- *Tularaemia* is caused by *Francisella tularensis*, which is a gram-negative, non-motile coccobacillus.
- Tularemia is a zoonotic disease acquired in a natural setting by humans through skin or mucous membrane contact with the body fluids or tissues of infected animals or from being bitten by infected deerflies, mosquitoes, or ticks.
- It can remain viable for weeks in the environment or in animal carcasses and for years if frozen. Unlike anthrax, which requires thousands of spores to infect someone, tularemia can cause illness with as few as 10 to 50 organisms.
- After an incubation period of 2 to 10 days, pneumonia symptoms develop associated with weight loss and non-productive cough. The drug of choice for treatment is streptomycin with other aminoglycosides.

Other potential bio-terrorism agents are : Crimean-Congo Haemorrhagic Fever, Ebola Virus Disease, Hantann; Korean Haemorrhagic Fever, Lassa Fever, Lymphocytic Choriomeningitis, Marburg Virus Disease, Rift Valley Fever, Tick-borne Encephalitis etc.

5.20. Major Events across the Globe

Biological warfare has a long history of mass destruction through epidemic and pandemic diseases. Limited biological warfare is reported to have been carried out by Japan during World War-II. Recently, mycotoxins have been reported to be used in Afghanistan. Even before that it has also been documented that the Red Indians in North America were given the smallpox infected blankets. Nevertheless, the recent Anthrax attack in 2001 through letters caused worldwide concerns regarding the threats of bio-terrorism. Beginning in mid-September 2001, the USA experienced unprecedented biological attacks involving the intentional distribution of bacillus anthracis spores through the postal system. The full impact of this bio-terrorist activity has not been assessed, but already the toll is large. Hundreds of people were affected.

In the 20th-century, in a series of cases, the mortality rate of occupationally acquired Inhalational anthrax was 89%, but majority of these cases occurred before the development of critical care units and in most cases before the advent of antibiotics. Prior to 2001 attacks, at Sverdlovsk, it had been reported that 68 of the 79 patients with Inhalational anthrax died. However, a separate report from a hospital physician recorded 358 ill with 45 dead. A recent analysis of available Sverdlovsk data suggests that there may have been as many as 250 cases with 100 deaths.

5.20.1 Documented Intentional use of Biological

- Japan used plague bacilli in China during 1932-1945 causing 260,000 deaths
- Dispersal of anthrax spores due to accident in production unit in USSR caused 68 deaths in 1979
- In 1984, Osho followers used *Salmonella typhimurium* in salad in a restaurant in Oregon, USA leading to 751 cases
- Shigelladysenteriae Type 2 employed in Texas, USA in 1996
- Anthrax through postal envelopes in USA in Oct-Nov 2001 leading to 22 cases and 5 deaths

5.21. Impact of Bio-Terrorism

Even a small-scale biological attack with a weapon grade agent on an urban center could cause massive morbidity and mortality and rapidly overwhelming the local medical capabilities. An estimated casualty for biological warfare attack on a city of 5 lac population is shown in the table below:

Estimated casualty for biological warfare attack on a city of 5 lac population

Agent	Downwind Reach (Km)	Dead	Incapacitated
Rift Valley Fever	1	400	35,000
Tick-borne encéphalites	1	9500	35,000
Typhus	5	19,000	85,000
Brucellosis	10	500	100,000
Q-Fever	>20	150	125,000
Tularémie	>20	30,000	125,000
Anthrax	>20	95,000	125

5.22. Early Warning Signals of Bio- Terrorism Attack

Early identification of an outbreak of disease of international public health importance shall require knowledge of early warning signals amongst all the echelons of health care providers. Some of the suggested early warning signals which must command quick investigation by professionals may include followings:

- i. Clustering of cases/deaths in time and space with high case fatality rate
- ii. Large number of similar illness present at once (epidemic) with rapidly increasing number of cases
- iii. Previously healthy persons affected
- iv. More cases in people who have been outdoor

- v. More severe disease than is usually expected
- vi. Unusual syndrome or pathogen for region
- vii. Outbreaks of same illness in different areas
- viii. Sudden high mortality or morbidity following acute infection with short incubation period
- ix. Acute fever with hemorrhagic manifestations
- x. Even one case of suspected plague or anthrax
- xi. Occurrence of cases which are difficult to diagnose with available clinical and laboratory support and their non-responsive to conventional therapies
- xii. Unexplained epizootic of dead, sick animals
- xiii. Recent terrorist activity

Therefore, a comprehensive list of all the trigger events that shall attract immediate attention of local public health machinery need to be developed by a group of experts.

5.23. Response to Biological Incidents

For immediate response to biological incidents, following multi-disciplinary and inter-sectoral coordination is required:

- Civil/ Defense
- Incident/Emergency Response
- Law Enforcement/legislation
- Public Health
- Medical Personnel
- Facilities /Equipment
- Safety and Security (BSL-3/BSL-4 Facilities)
- International Assistance

5.23.1 Dos and Don'ts in Biological War Attack

Since biological war attack is not predictable, the community must be aware of actions to be performed if bio-terrorism attack strikes. In the event of a biological attack, public health officials may not immediately be able to provide information on what you should do. It will take time to determine what the illness is, how it should be treated, and who is in danger. The delivery of medical services for a biological event may be handled differently to respond to increased demand. The basic public health procedures and medical protocols for handling exposure to biological agents are the same as for any infectious disease.

5.23.1.1 During the Bio-attack

The first evidence of an attack may be when you notice symptoms of the disease, therefore, be suspicious of any symptoms you notice, but do not assume that any illness is a result of the attack. However, if the community notices an unusual and suspicious substance nearby, may perform the following activities:

- Move away quickly
- Cover your head and nose
- Wash with soap and water
- Listen to the media for official instructions.
- Seek medical attention if you become sick.
- Close the doors and windows when a biological attack is imminent
- Watch television, listen to radio, or check the internet for official news and information including:
 - Signs and symptoms of the disease
 - Areas in danger
 - Where to seek medical attention
 - Use common sense and practice good hygiene.

5.23.1.2 Exposed to Biological Agent

Pay close attention to all official warnings and instructions on how to proceed.

- Use Ultra efficient filter masks
- Follow official instructions for disposal of contaminated items such as bag and cloths.
- Take bath with soap and put on clean clothes.
- Seek medical assistance. If required and advised, stay away from others or even quarantined.

5.23.2 Principles to Address Challenges of Bio- Terrorism

The principles to address the challenges of natural epidemics and intentionally caused epidemics are same, which are given below:

- Advocacy at highest level
- Strong surveillance system
- Continuous state of preparedness for early response
- Cooperation between national and international agencies

5.24. Action Plan for Biological Disaster Management in India

Biological Disaster could arise from a source located either inside the country or outside the country (warfare). Management of such a situation could be dealt effectively only if there is a “Disaster Plan” well integrated in the system and also there is mechanism of post disaster evaluation.

5.24.1 Inter-Disaster Stage

This is the period between two disasters in which pre-disaster planning in terms of system development should be done. Action plan has following elements:

(a) Constitution of a Crisis Management Structure at all Level

- I. Identify Nodal Officers for crisis management, Focal points for control of epidemic.
- II. Constitute Administrative and Technical advisory committees
- III. Prepare ‘Contingency Plan’ including Standing Operating Procedure

(b) System of Surveillance

- I. Establish effective surveillance system for collection and flow of information and data analysis from district to state and to central level during crisis period.
- II. Establish 'Control Room' at district, state & central Level.

(c) System of Epidemiological Investigation.

- I. System of field investigation
- II. System of active surveillance
- III. Arrangement for support facilities

(d) Confirmation of pathogens by laboratory set up

- I. System of laboratory investigation at district, state and central level
- II. Quality control of laboratory practices

(e) Training to different level workers

5.24.2 Pre Impact Stage of Warning (Early Detection)

- i. **By suspicion:** Management Plan should aim to identify crisis situation at a very early stage preferably confined to a limited area. This can be done only by suspecting danger of impending disaster by local health employees (at village by village health guide, at sub centre level by multi purpose worker and PHC level by doctors at PHC).
- ii. **Alertness of institution** dealing with emergency health, medical services/ confirmation by identified laboratories. If such a situation arises, after providing symptomatic treatment at PHC level, services of well **established laboratory at district or medical college level may be requisitioned to identify the organism** and also to seek guidance for specific treatment and management.
- iii. Constant surveillance and monitoring till there is no risk of any outbreak.

5.24.3 Disaster Stage

5.24.3.1 When disaster strikes following actions would be needed

- i. System of alert and mechanism of activation of Disaster Plan.
- ii. Immediate organization of field operation for curative and preventive medical care including immunization.
- iii. Preliminary analysis of the situation.
- iv. Arrangement for laboratory support.
- v. Emergency meetings of health services advisory committee to take stock of the situation and to advise further action.
- vi. Field investigation for safety precautions and case finding
- vii. Deputation of Quick Response Teams to search for source of infection and contact tracing
- viii. Analysis of ecological, clinical, epidemiological, laboratory and entomological data to identify type and source of outbreak and mode of transmission.

5.24.3.2 General control measures to prevent further outbreak

- a) Protective measure for contacts & Community
- b) Control of common source of outbreak like food, water or mosquito etc.
- c) Emergency mass immunization and specific immunization
- d) Mass chemoprophylaxis.

5.24.4 Post disaster stage

Evaluation after disaster is most important step in disaster management in order to rectify deficiencies in the management and to record the entire operation for future guidance for which following measures are necessary:

- i. Evaluation of control measures
- ii. Cost effectiveness
- iii. Post-epidemic measures
- iv. Sharing of experience
- v. System for documentation of events.

Management of Biological disaster on above principles and steps should be taken by the health authorities of the State Government with the available infrastructure.

5.25. Steps for Management

Management of Biological disaster on above principles and steps could be done by existing health infrastructure of the states. This plan has been prepared after analyzing the requirement and existing inadequacies in consultation with experts in the field, which will require updating from time. Such updating could be effectively done after the plan is put under test during monsoon period when there is considerable rise in water born diseases all over the country.

All these elements are required to be put in operation before there is a threat of Biological disaster (Pre- disaster period), because there would be hardly any time available for organization of emergency operation de-novo when a place struck with disaster.

5.26. Planning Approach for Biological Disaster

Due to resource constraints as well as continuation of old practices, sudden change in disaster management is possible through a phase wise plan for improvement. With these intention priorities of activities is suggested.

5.26.1 Short term Planning

The aim of short term planning would be early detection of a crisis situation caused by Microorganisms (organisms and toxins) with existing resources and infrastructure. Briefly the aim could be achieved by following measures:

- i. Identification of the nodal officer at the state/district level to provide regular attention.
- ii. Constitution of an expert group for guidance at Central and State level.
- iii. Improvement in existing surveillance system for early detection and crisis situation caused by Microorganisms.

- iv. Identification of medical and referral institutions for investigation & management.
- v. Delegation of the responsibilities (administrative and technical) to undertake investigative, diagnostic and administrative responsibilities.

5.26.2 Long term measures

A long term plan would be into operation as soon as the existing inadequacies are overcome. Salient features would be:

- i. Improvement in existing laboratories in terms of physical facilities for search of Microorganisms and their handling in different types of laboratories.
- ii. Improvement in diagnosing and investigative facilities for micro level estimation.
- iii. Detailed information about institutions (Government and Private) handling Microorganisms. Research activities to find out control measures about relatively unknown Microorganisms.
- iv. Development of counter measures.
- v. Updating of contingency plan depending upon the level of improvement in the existing infrastructure.

5.27. Convergence with National Health Programs

Many national health programs such as National TB Program, National Vector-Borne Disease Control Program National AIDS Control Program are being run by the Ministry of Health and Family Welfare. These programs have their networks throughout the country, and run as vertical programs but merging horizontally with service delivery at grass-root level They have focused strategic approach with inbuilt components for surveillance and monitoring. Many of these programs were successful in achieving their objective to control / prevent major biological disaster such as malaria, smallpox and AIDS in the past.

Disaster management activities at district level should be carried out by integration with existing programs especially with surveillance network of

Integrated Disease Surveillance Program (IDSP). Also, the measures adopted in disaster management should be in convergence with National Rural Health Mission (NRHM).

II. Medical Preparedness & Response For Chemical Disasters

Introduction

Common causes for chemical accidents are deficiencies in safety management systems and human errors, or they may occur as a consequence of natural calamities or sabotage activities. Chemical accidents result in fire, explosion and/or toxic release. The nature of chemical agents and their concentration during exposure ultimately decides the toxicity and damaging effects on living organisms in the form of symptoms and signs like irreversible pain, suffering, and death. The effects can be further compounded by the micro-meteorology of the area, wind speed and direction, rate of precipitation, toxicity/quantity of chemical released, population in the reach of release, probability of formation of lethal mixtures (fuel-air or other mixtures) and other industrial activities being performed in closer vicinity. Such accidents are significant in terms of injuries, pain, suffering, loss of lives, long-term health impacts, damage to the environment. Gas leak can cause respiratory and other systemic problems. They can also have long-term health effects such as neuro-muscular problems. Chemical agents cause effects on specific target areas eg. skin, respiratory mucosa, blood, nervous system, etc. Chemical disasters, though low in frequency, have the potential to cause significant immediate or long-term health effects.

Medical Preparedness

Effective medical preparedness and response for a chemical emergency address the issues of mechanisms for creating awareness, making available trained medical first responders, decontamination facilities, risk and resource inventory, trauma care, plans for evacuation, mechanisms to maintain uniform casualty profiles, proper chemical casualty treatment kits, mobile teams/hospitals, hospital DM Plans and preparing and responding to public health and environmental effects.

A) Awareness and Capacity Building

- All medical and paramedical staff need to be trained on the type of illness, injuries, burns and other health problems caused by various toxicants and their preventive prophylactic and therapeutic measures. A list of all the toxicants and their hazardous effects on the health and environment must be prepared at all levels for medical management plans. Designing a prototype of casualty profiles and their antidotes, based on the type of toxicants would be very useful in such disasters.
- Inventory of antidotes, other prophylactic/therapeutic measures and medical equipment shall also be prepared and stocked at the hospitals. All the identified hospitals would have adequate stock of PPE including respirators. A sufficient quantity of medical stores i.e., antidotes, antibiotics, other drugs and life support system/equipment must be available at the hospitals. The availability of oxygen, continuous positive air pressure (CPAP), ventilators, dialysis facilities, blood and IV fluid for transfusion must be stock piled.
- Vital parameters (like pulse, blood pressure and respiration) and intravenous drips of disaster victims should be monitored and maintained by the trained paramedical staff in the ambulances during their transfer to hospital.
- Medical surveillance and long-term physical and mental health rehabilitation should be planned accordingly on the basis of the severity of the disaster.
- Awareness programmes also need to be conducted for the employees of the industry and community in the vicinity of the chemical industrial installations and storage regarding the easy and common preventive measures to reduce the impact of the chemicals on health. Awareness

about safe water, standards of proper hygiene and sanitation, availability of food and nutrition should also be provided to the community at risk.

- Water testing and food inspection should also be a part of the health preparedness
- Existing poison control centres, poison information centre should be upgraded and appropriately equipped to handle the requirements arise from such type of disasters
- Preparation of a toxicology database with information on specific chemicals and antidotes, diagnostic facilities, general and specialised treatment facilities, specialised sources of expertise.
- The public health response team consists of a physician, toxicologist, environmental specialists, public information experts, community and medical representatives.

B) Decontamination Facilities

Decontamination facilities should be established at the state and district level hospitals in a phased manner depending upon the chemical vulnerability of the areas. A mobile decontamination facility including a personnel decontamination vehicle and site decontamination vehicle may also be considered to be readily available to move to the site of incident.

C) Treatment Kits

A kit containing antidotes to various toxicants and resuscitation drugs need to be prepared. Gudel airways are one of the essential components of the kit. If necessary, mobile labs may be used to identify the type of toxicants and their by-products.

Medical Response

- Initially, based on early symptoms and information on the type of chemical, symptomatic treatment initiated and an antidote administered. Blood is then analysed for further course of treatment.
- The hospital casualty room should be well-equipped with resuscitation equipment like oxygen cylinders, suction apparatus, airways, laryngoscopes, ventilators, pulse oxymeters, defibrillators, life saving drugs, antidotes, auto injectors and dressing material.
- Close monitoring is required to identify and treat long term health effects like blindness, interstitial lung fibrosis, genetic disorders and neurological deficiencies etc.
- Documentation of lessons learnt and success interventions need to be done by the concerned hospital so that necessary modifications if needed can be done in the hospital disaster management plan.

III Medical Preparedness & Response For Radiological And Nuclear Disasters

Introduction

According to the National Guidelines on Nuclear and Radiological Emergencies released in February 2009, these emergencies have been broadly classified into the following five categories:

- i) An accident taking place in any nuclear facility of the nuclear fuel cycle including the nuclear reactor, or in a facility using radioactive sources, leading to a large scale release of radioactivity in the environment.
- ii) A 'criticality' accident in a nuclear fuel cycle facility where an uncontrolled nuclear chain reaction takes place inadvertently, leading to bursts of neutrons and gamma radiations.
- iii) An accident during the transportation of radioactive material.
- iv) The malevolent use of radioactive material as a Radiological Dispersal Device by terrorists for dispersing radioactive material in the environment. Normally, nuclear or radiological emergencies (referred to in points (i) to (iv) above) are within the coping capability of the plant/ facility authorities.
- v) A large-scale nuclear disaster, resulting from a nuclear weapon attack which would lead to mass casualties and destruction of large areas and property. The impact of such a nuclear disaster will be well beyond the coping capability of the local authorities and it calls for handling at the national level.

Radiological accidents can take place at locations/facilities involving the use of radiation or radioactive sources, viz., industry, medicine, agriculture and research. To prevent accidents during the transportation of radioactive material, the regulatory guidelines specify the design of the container, the quality control tests, the manner in which the radioactive material will be handled and transported, etc. During actual transportation, other restrictions like the speed of the transport vehicle, the type of physical protection, etc., are also imposed.

Impact of Radiological & Nuclear Emergencies on Health

Penetrating bullet/pellet injuries may involve vital organs of the body. Splinters and shrapnel cause penetrating injuries. Explosion can also cause loss of limbs, burns and rupture of body parts/organs. Explosion due to inflammable or pressurized items can cause burn injuries. Burn cases of varying severity due to exposure to flash, fire or ionizing (Beta) radiation, those receiving >450 rads will die and other survivors would be needing decontamination. Blast effect can cause injuries to vital organs. In case of a radiological and nuclear emergency, it is also likely that the food and water in the affected area are contaminated and hence become unsuitable for consumption. The situation arising out of a 'dirty bomb' attack using conventional explosive devices may result in blast injuries, burns and some radioactive contamination. The number of cases may vary according to the intensity of the explosion and population density at the site.

The fact that one cannot see, feel or smell the presence of radiation, coupled with a lack of credible and authentic information on radiation and radiation emergencies, the psychological and mental health impacts in the public mind could be very high.

Medical Preparedness

Timely and effective medical response is a crucial component in reducing morbidity and mortality on the one hand and alleviating fear and suffering of the affected population on the other hand.

- Experience of medical management of radiation injuries and health complications in India is very few, therefore the knowledge and skills of medical and paramedical teams along with first responders and QRMTs should be up-graded.
- A multi-disciplinary approach to nuclear emergency/disaster requires additional focus on protection, detection, decontamination, de-corporation and restitution of the immune system. Medical facilities such as

- specialised ambulances, specialized Chemical, Biological, Radiological and Nuclear (CBRN) hospitals and radiation injury treatment centres also need to be augmented to take care of mass casualties due to radiation burns and injuries. The scale of arrangements required depends upon the type of scenario, ranging from radiation accident in a nuclear facility, use of 'dirty bombs' by terrorists or a full-fledged nuclear war.
- **The existing medical facilities and capacity of medical professionals** in the country are highly inadequate to handle large-scale radiation injury cases. These are to be augmented by MoH&FW in consultation with DAE at the primary, secondary as well as tertiary levels in addition to their proper networking to cope with the need of a large-scale nuclear emergency.
 - Network of hospitals plays an important role in handling radiation-induced injuries on a large scale. As mentioned in the chapter of **Hospital Disaster Management Plan and Hospital Networking Plan**, hospital networking should be done as a pre-hospital preparedness
 - **Quick Reaction Medical Teams (QRMTs)/Medical First Responders (MFRs)** The district health authorities will constitute quick reaction medical teams for pre-hospital care. The team consisting of RSOs, medical doctors, nurses and paramedical staff would need to be equipped with monitoring instruments/equipment, protective gear, decontamination agents and other material. Critical care vans with resuscitation and life support systems are considered to be a part of QRMTs/MFRs. The specialised search and rescue teams of NDRF/State Disaster Response Force (SDRF)/ District Disaster Response Force (DDRF) need to facilitate the task of QRMTs/MFRs to provide the necessary assistance. All the QRMTs/MFRs should be trained on personal protection, evaluation of radiation exposure, decontamination and on-field radiation injury management. The provision of mobile hospitals needs to be planned for

- managing casualties at the site. The QRMT/MFR teams are required to form a part of the regular mock-drill/ simulation exercise/tabletop exercise conducted by DDMAAs.
- This is envisaged in the national guidelines that there would be at least **one mobile radiological laboratory unit in each district** and at least two units in each metropolis to support the detection, protection and decontamination procedures. Presently, a few mobile radiological laboratories are available with DAE and DRDO.
 - As part of hospital preparedness, it is also envisaged that designated hospitals require specialized Radiation Injuries Treatment Centres (RITCs) to manage nuclear/radiological emergencies. These RITCs will have a burns ward, blood bank, Bone Marrow Transplant (BMT) and stem cell harvesting facilities, etc. The identified hospitals at the secondary (district) level will require strengthening in order to develop specialized capacities such as decontamination centre, facility for safe disposal of contaminated waste, detection, protection and decontamination and managing patients exposed to radiation and primary trauma care. The tertiary (state and national level) institutions identified in vulnerable areas would have, in addition, facilities such as RITC, BMT and stem cell harvesting, genetic lab, molecular lab, immunology lab and arrangements to treat mass casualties arising from nuclear war/major accidents in the nuclear facilities.
 - The logistical requirements may actually be much higher than requirements in case of natural disasters or even mass casualties arising out of conventional weapons. In a worst-case scenario, this would require large quantities of IV fluids, plasma expanders, antibiotics, vaccines, etc. The supply system therefore, need to be geared up to provide for increased demands for certain types of medical supplies and equipment such as whole blood, blood components, burn kits, dressings, individual

protective clothing, dosimeters, etc. Specialised medical stores consisting of Amifostine and other radio-protectors, decontamination agents, de-corporation agents [DiethyleneTriamine-Penta Acetate (DTPA), Prussian Blue, etc.], Potassium Iodide/Iodate, growth factors, colony stimulating factors and other radiation recovery agents should also be readily arranged or stock piled. The main de-corporation agents, viz. DTPA and Prussian Blue, are presently not available in India. The Food and Drug administration authorities, including Drug Controllers in the state and central governments will expedite permissions for fast procurement of these essential de-corporation agents.

- The nodal agency for **psychosocial support and mental health services** (PSSMHS) need to activate the need assessment and service provision at the earliest as per the protocol.
- In case of any large-scale radiation and nuclear emergency/disaster the anticipated number of casualties may be large, therefore, may necessitate the establishment of **extended mortuary facilities** to accommodate dead bodies. The National Medical Preparedness and Mass Casualty Management Guidelines document for CBRN disasters elaborates further on these requirements.
- The development of biomarkers of radiation response, molecular biological techniques for mass screening, radio-protectors, isotope specific chelating agents, etc., are the immediate requirements on which basic and applied research will be focused. A model CBRN research and treatment centre should be established by MoH&FW in one of the advanced tertiary care hospitals, with sufficient number of beds to take care of any type of nuclear emergency/disaster.

Medical Response

Timely and effective medical response is a crucial component in reducing morbidity and mortality and alleviating the fear and suffering of an affected population.

- **Iodine Prophylaxis:** The thyroid gland is the most vulnerable organ in the body that is likely to be damaged by radiation. If exposure to radioiodine is anticipated, like in the case of radioactive releases following a major reactor accident, administration of 130 mg of Potassium Iodide (KI) or 170 mg of Potassium Iodate (KIO₃) will prevent the uptake of radioactive iodine. For high-risk individuals, this will protect the thyroid gland from the effects of radiation.
- Standard procedures should be followed for decontamination and necessary triage protocol needs to be followed for the casualties. All individuals will be decontaminated before treatment. However, critical patients may not wait for decontamination and may have to be provided treatment.
- Many persons in shelters will have varying degrees of sickness due to radiation exposure, secondary infections, and shortage of power, water and medicines. The sanitary and public health facilities for the radiation affected survivors should be as per the pre-decided protocol specific for these type of survivors. Contaminated articles will be disposed of following the guidelines of hospital waste management rules.
- People affected with acute haemopoietic, gastrointestinal, coetaneous and CNS syndrome, which requires specialized care should immediately be shifted to the nearest Radiation Injury Treatment Centre. Simultaneously, blood and blood components should also be mobilised from various certified blood banks. Large quantities of IV fluids, plasma expanders, antibiotics, vaccines, burn kits, dressings, PPG etc., should be mobilized from pre-identified indigenous manufacturers. Specialized medical stores such as Amifostine and other radio-protectors, decorporation agents

(DTPA, Prussian blue), Potassium Iodide, growth factors, colony stimulating factors and other radiation recovery agents are to be mobilized. The civic authorities need to make arrangements for dead body identification and management. The community has to be kept informed of the 'dos and don'ts'.

- Public health surveillance has to be augmented to detect any contamination in food and water.

Implementation:

MoH&FW has the role of overseeing all aspects relating to medical and health care, including identification of hospitals, building up their infrastructure to handle large numbers of radiation patients, provision and stocking of appropriate medicines. It should also maintain a national database of medical professionals who are conversant with treatment of radiation injuries and of RSOs so that their services can be tapped even for smaller emergencies. Another important task is to arrange comprehensive training programmes for medical professionals in the treatment of radiation injuries.

IV Medical Preparedness & Response For Fire Disasters

Introduction and Magnitude

Fire disaster is a major public healthcare issue in developing nations and is the second commonest injury after RTA, although there is no registry for burns due to fire accidents or other natural disasters. Approximately 7 million patients per year are affected and hospitalised due to fire disasters out of which 1,40,000 expire. Out of these fire disasters almost, in 80% of cases, it is the result of domestic fire accidents and 70% of those who are affected are in the productive age group from 15-40 years of age. Males outnumbered females in all accidental casualties due to un-natural causes except “Fire Accidents”, where as 67.6% females were killed as compared to 32.3 % males in fire disasters. The burden of suffering is exceedingly distributed among the poor.

A fire causing 25 or more deaths is termed as a fire disaster. A fire disaster may happen due to bomb blasts, residential fire accidents, fire accidents during selected festivals, fire in trains, air crash, accidents in firework industry, fire in tall commercial building, and fire in hospital/any industry.

Medical Preparedness & Response

Burn is an injury caused by heat, cold, electricity, chemicals, friction or radiation. All these agents lead to trauma of the skin and other tissues of the body. An extensively burned patient is regarded as a survivor of an event as catastrophic-earthquake, flood, or war.

Therefore a separate burn centre is needed to cater to specific medical emergencies resulting from these fire disasters and these centres are expected to provide specialized care to burns patients and those requiring reconstructive surgical interventions. The objective is to ensure fast recovery, subsequent rehabilitation of the affected so that they resume to normal daily personal and occupational life. Notwithstanding the management complexities of a multi-disciplinary medical approach to achieve the objective, other components of medical recovery include the infection control within the hospital, post recovery

rehabilitation and multiple corrective surgical procedures required by the survivors.

Composition of a Burn Centre

An ideal burn centre should have an emergency care unit, intensive care unit, operation theatre, ward unit, out-patient department (OPD), physical medicine & rehabilitation unit, special equipment and their space requirements for saline bath unit and amnion and skin banking facility.

Survivors of CBRN Disasters

Fire survivors affected by CBRN disasters also need more sophisticated medical facilities such as 1) **Decontamination room**, which is a protected area with direct access from ambulance bay / walking-in entry without entering any other part of emergency unit. This should have provision for ample water both warm and cold and have flexible water hose with pressurized water shower system along with specialized stretcher for washing the patient's body and floor drains and contaminated water trap.

2) Infection Control is a critical requirement for favourable outcomes therefore, prevention of spread of infection by any means within the facility is very crucial. 3 important methods to prevent infection are frequent hand washing, sluice rooms with separate entry & exit and rooms should not be dependent on the AHU (air handling unit) covering a patient care area.

3) While setting up the Air-Conditioning system 3 crucial considerations including laminar flow, directed vertical flow and Joubert system should be taken into account. Due to the peculiar nature of the burn patients and their immune-compromised health status, the recommended system for the airflow is directed vertical flow.

Apart from the medical management there should also be facility for police and medico-legal assistance (As a part of Hospital Disaster Management Plan)

V. Psychosocial Support And Mental Health Services (PSSMHS) In Disasters

Introduction

Disasters, whether natural or man-made, cause enormous devastation and human suffering to the community. The devastating effects on the survivor's physical as well as mental health result in social disability and affect overall well being of the survivors. These disasters usually leave a trail of human agony, including loss of human life and injuries, emotional trauma, loss of livestock, property and livelihood, resulting in long-term psychosocial and mental health problems. Global and national evidence based research recognize that most of the disaster-affected persons experience stress and emotional reactions after a disaster as a 'normal response to an abnormal situation'. While some of the survivors would be able to cope by themselves, a significant proportion of them may not be able to do so effectively. Emotional reactions such as guilt, fear, shock, grief, hyper-vigilance, numbness, intrusive memories, and despair are universal responses in people experiencing unforeseen disastrous events beyond their coping capacity. In the absence of appropriate and adequate support, these survivors experience emotional distress and decline in social functioning there by require psycho-social support and mental health services.

The National Guidelines on Psychosocial Support and Mental Health Services (PSSMHS) in disasters released in December 2009 define psycho-social support in the context of disasters as comprehensive interventions aimed at addressing a wide range of psychosocial and mental health problems arising in the aftermath of disasters. These interventions help individuals, families and groups to build human capacities, restore social cohesion and infrastructure along with maintaining their independence, dignity and cultural integrity. Psycho-social support will comprise of the general interventions related to the larger issues of promoting or protecting psycho-social well-being through relief work, meeting essential needs, restoring social relationships, enhancing coping capacities and promoting harmony among survivors. Psycho-social support helps in reducing the level of actual and perceived stress and in preventing adverse psychological

and social consequences amongst disaster-affected community. In addition, psycho-social support interventions are aimed at mental health and psychological well-being, promotion and prevention of psychological and psychiatric symptoms among disaster-affected community.

Mental health services in disaster interventions are aimed at identification and management of stress related psychological signs and symptoms or mental disorders among disaster-affected persons and persons with pre-existing mental health problems. The common mental health disorders reported after disasters are Normal and pathological grief (Bereavement), acute stress reaction, depression, generalized anxiety disorder, Post-Traumatic Stress Disorder (PTSD), alcohol and drug abuse.

The Psycho-Social Support and Mental Health Services are considered as a continuum of the interventions as an important component of general health services in disaster situations. And the overall goal of the Psycho-Social Support and Mental Health Services is restoration of well-being of the disaster-affected community.

Magnitude of the Problem

The individual psycho-social responses/reactions are directly related to the type of trauma and severity of the disaster. The greater the trauma, the more severe is the psychological distress and social disability. The magnitude of psychological trauma and subsequent experiences due to disasters like earthquakes and tsunamis may be severe for a majority of the people. The magnitude of trauma in lesser gravity disasters may be less severe.

In contrast man-made disasters such as communal riots, terrorism, chemical, biological, radiological and nuclear disasters cause more prolonged psychological distress than natural disasters. In both cases, large-scale human suffering and psycho-social consequences require coordinated response from both government and non-government organizations as well as from the

community. The recovery process is directly related to the severity of the experience and is prolonged in the case of higher magnitude disasters.

Emotional reactions reported by the people are normal responses to an abnormal event. It is estimated that nearly 90% of survivors undergo these emotional reactions immediately after the disaster. However, it reduces to 30% over a period of time with psychological reactions to stress, leading to a change in behaviour, relationships and physical or psycho-social situations. Continuation of the situation leads to an abnormal pattern and long-term mental illness among the survivors, if not attended to.

Experience based Model

The area of PSSMHS has evolved during the last two decades. From a mental disorder based approach after the Bhopal gas disaster in 1984, the approach has been modified to mental health integrated with public health after the Marathawada (Latur) earthquake in 1993 and further broadened to psycho-social and mental health care in the Orissa super cyclone (1999), Gujarat earthquake (2001), Indian Ocean Tsunami (2004) and Kashmir earthquake (2008). The purely clinic/hospital-based planning and delivery of services has given way to community-based services with active utilization of community resources. The nature of manpower involved in service delivery has also undergone a significant change. Earlier, only psychiatrists were visible but now all mental health professionals, including clinical psychologists, psychiatric social workers, etc., to professionals, para-professionals and trained community level workers (CLWs) and volunteers are considered as service providers. And the PSSMHS interventions are now considered as intricately related to the quality and quantity of general relief work and general health services after disasters. A well-planned and coordinated general relief work adequately addressing the needs of the affected people will have a positive impact on their mental health and psycho-social needs. Timely and appropriate management of injuries and general medical conditions will decrease the level of stress and the need for mental health interventions.

Preparedness for PSSMHS

Preparedness for PSSMHS as described in the national guidelines includes proper planning and resource mapping at all levels along with capacity development and up-gradation of infrastructure and hospital preparedness. The need for creating a network of institutions has also been emphasized, with an intention to prepare adequate knowledge material and modules for training of various human resources at different levels. The need for activation of psycho-social support, enhancing manpower for psychiatry and psychology, psychiatric social work, psychiatric nursing, community level workers and other trained community level volunteers is outlined. Adequate emphasis has also been laid on proper documentation, international co-operation and the role of NGOs in providing PSSMHS. Appropriate attention to vulnerable groups and the necessity of creating proper referral systems for disaster-affected people have been highlighted.

PSSMHS Response

The critical role of response mechanism for the PSSMHS at national, state and district levels, by various ministries and departments and all the other stakeholders including International Non- Government Organizations (INGOs), Non- Government Organizations (NGOs) and communities has been identified in the guidelines. Integration of PSSMHS in the general relief work, disaster health plans and community practices has also been stressed upon. Guidelines also highlight the important aspect of long-term PSSMHS services is to be included in the recovery, rehabilitation and reconstruction phases of disaster. In addition, the importance of providing special care to the vulnerable groups as well as to the care-givers to enhance the quality of service delivery is stressed.

Implementation of PSSMHS Guidelines

These Guidelines provide a framework for action at all levels. The Ministry of Health and Family Welfare (MoH&FW) shall prepare an Action Plan to enable all sections of the government and administrative machinery at various levels to prepare and respond effectively. The PSSMHS plan shall be prepared during the

pre-disaster phase which will be integrated, co-ordinated and monitored by nodal agencies at national, state and district levels. This shall cater to immediate and long-term needs of the affected communities.

The Government has initiated various programmes like National Mental Health Programme and District Mental Health Programme as part of national health plan to reach out to every citizen of the country. In order to strengthen PSSMHS in disasters it is imperative to integrate PSSMHS in to these programmes to provide both short and longer psycho-social support and mental health care.

The time-lines proposed for the milestones for implementation of various activities enlisted and explained in PSSMHS preparedness and response mechanism have been phased out in three periods such as 3 years, 5 years and 8 years.

Ministry of Health and Family Welfare (MoH&FW), the nodal ministry for medical preparedness, is mandated to formulate and implement national health policies and programmes in the country including mental health. All the other line ministries including Ministry of Railways (MoR), Ministry of Defence (MoD), Ministry of Women and Child Development (MoWCD), Ministry of Social Justice & Empowerment (MoJSE), etc would require to follow the policies and plans laid down by the nodal ministry in case of any health plan activation for service provision for any type of disaster.

SECTION-VI

COMMUNITY LEVEL DISASTER HEALTH EDUCATION

Rapid changes in the human environment and health may also occur as a result of natural disasters or acts of war or of other man made circumstances including major industrial accident. However, health problems arising out of the disasters may vary in types and degrees depending upon the different types of a disaster. Community awareness and education not only plays a vital role in reducing the disaster induced mortality and morbidity amongst the affected population but are also instrumental in preventing and spreading of public health emergencies. Disaster specific suggestions for health professionals, community level workers and community at risk could reduce the disaster related health risks to a minimum.

6.1. Components for Community Level Disaster Health Education:

The following could be the key components of community level disaster pertaining health awareness and education materials. Brochures, pamphlets, handouts, sensitisation programme, community awareness programmes, community outreach activities, etc could be few of the modalities through which knowledge on various focus issues could be disseminated. Various health professionals, community level health worker, local self government members and community volunteers could be the target audience. Contents of the resource materials should be simple in language, presentable with pictures and attractive, and should contain unambiguous instructions to follow. Information dissemination materials could contain the following contents:

6.1.1 How Do Disasters Negatively Impact on the Health of the population?

Disasters can contribute to the transmission of some diseases triggering an epidemic in three ways:

- By increasing transmission of local pathogens
- By changing the susceptibility of the population

- By introducing a new pathogen into the environment

The epidemiologic factors that determines the potential of communicable disease transmission is influenced by six types of adverse changes during disasters:

- **Changes in pre-existence levels of disease**
- **Ecological changes as a result of disaster**
- **Population displacement**
- **Changes in population density**
- **Disruption of public utilities**
- **Interruption of basic public health services**

6.1.2 Disasters & Type of Health Emergencies

In any large scale disaster resulting from natural or manmade hazards may result either in various medical or public health emergencies as mentioned in the list below.

i. Medical Emergencies

- **Trauma**

Disasters associated with collapse structures (Earthquake, Tsunami, Landslides, Avalanche, Flash flood); Stampede

- **Burns**

Disasters associated with fire (forest fire, community fires, [Village, apartments, schools, jails, slums, hospital, specific gatherings] earthquake, industrial, nuclear and chemical disasters)

- **Drowning**

Floods, Flash floods

- **Snake Bite**

Floods

- **Heat stroke, exhaustion, cramps**

Summer heat, Draught, fire incidents

- **Electrocution**

Floods, cyclone, Tsunami, Earthquake

ii. **Public Health emergencies**

▪ **Vector-borne diseases**

Enabling environment for mosquito breeding due to water collections (Flood, Draught, Earthquake)

- Malaria
- Dengue/ Hemorrhagic fever
- Chikunguniya

▪ **Water-borne diseases**

In all disasters where drinking water supply/ sanitation is affected (earthquake, flood, cyclone, tsunami, drought, civil strife)

- Cholera,
- Gastroenteritis/ dysentery
- Infective hepatitis
- Poliomyelitis

▪ **Zoonotic diseases**

Displacement of animals from wild habitat (flood, earthquake, tsunami, cyclone, forest fire; bamboo flowering)

- Plague
- Leptospirosis

▪ **Droplet infections**

- Adverse conditions of living, overcrowding in temporary shelters
- Upper Respiratory Tract infections
- Measles
- Pneumonia
- Meningo-coccal meningitis

- **Contact diseases**

Lack of personal hygiene and overcrowding especially in relief camps / temporary shelters may spread

- Skin (Scabies)
- Eye disease (Conjunctivitis, Trachoma)

- **Reproductive health**

- Temporary shelter, overcrowding, lack of family welfare services:
- Sexually transmissible diseases and HIV/AIDS
- Sexual and Gender Based Violence may give rise to various health problem
- Pregnancy related problems: anemia, malnutrition, premature delivery, abortions
- Adolescent sexual health
- Family planning services

- **Mental Health**

- Common Psychosocial problems
- Common adjustment problems
- Behavioural problems
- Post traumatic stress disorder
- Anxiety disorders
- Violent behavior
- Alcoholism
- Depression
- Suicidal ideation/thoughts/tendencies
- Psychosis

- **Health issues Leading to Health Disaster**

Epidemics

- Malaria

- Plague
- HIV/ AIDS
- SARS/Swine flu
- Pandemic influenza
- Chickunguniya

Biological warfare / Bio-Terrorism

- Small-pox
- Plague
- Anthrax
- Hemorrhagic-Ebola, Marburg
- Genetically engineered

6.2. Types Of Disasters & Proneness To Different Epidemics

The increased man-vector contact in precarious shelters and temporary camps and the disruption of control activities may be the most important causes for epidemics after disasters caused by natural hazards, in particular. More importantly, disasters caused by natural hazards (hurricanes, floods, earthquakes, cyclones and volcanic eruptions) can contribute to the transmission of some diseases in case the causative agent is already in the environment. Although major health epidemics are rare in the aftermath of these disasters, but some disasters are so great that large numbers of the population are displaced, creating perfect conditions for the spread of disease.

While earthquakes, avalanches, and landslides may result in enteric epidemics due to improper water supply and sanitation; volcanic eruption can lead to respiratory epidemic; and unprecedented amounts of rain leading to disastrous flooding flood and flash floods, and cyclone can result in pneumonia as well as other waterborne/communicable diseases. In the period immediately following a hurricane, the risk of acquiring malaria, dengue or encephalitis may decrease as a result of the destruction of breeding places of the local vectors. Similarly, industrial accidents can cause respiratory problems. Viral agents during the time

of nuclear, biological and chemical warfare can cause diseases like, Anthrax, vibrio cholera, and plague requiring immediate treatment.

However, it is important to remember that epidemics do not spontaneously occur after a natural disaster. The more likely cause of disease is the lack of potable water and adequate sanitation. In a country like India where cholera is prevalent, general assumption is that disease will spread after any disaster affecting water supply, food quality and sanitation. However, the health problems in natural as well as man-made disasters could be due to either or any combination of factors enumerated below:

- Directly due to impact of disasters like drowning during floods, multiple injuries during earthquakes, thermal blast and radiation effects during and after nuclear disaster and large number of injuries after civil unrest.
- Due to non or inadequate availability of immediate medical care
- Due to delay in evacuation and transportation to advanced medical centers
- Due to mass shelter, water shortage and contamination, unhygienic living conditions leading to outbreaks of communicable diseases and resulting in epidemics, another health disaster.

6.2.1. The Main Causes of Diseases

Population movement, poor sanitation, water contamination and the interruption of public health programmes are the main reasons for the spread of disease after natural and humanitarian disasters. Often displaced populations are forced to gather in confined spaces, further enabling the spread of epidemics, such as cholera, malaria and dengue fever.

Cholera

The spread of cholera is one of the main dangers following a natural disaster. Cholera is an acute infection of the gut, which causes chronic diarrhoea and vomiting. This can lead to severe dehydration and, in some extreme cases, death. However, most people who are infected by the bug do not become ill and

90% of those who do are only mildly or moderately ill. Cholera is spread by contaminated water and food. Sudden outbreaks, such as those, which follow a disaster, are usually caused by a contaminated water supply. The bug is most deadly when it arrives unexpectedly - as in times of disaster - because there are often no facilities for treatment or because people cannot get treatment in time. In communities, which are unprepared for a cholera outbreak, up to 50% of people who become seriously ill may die. Cholera can be effectively treated with oral rehydration salts and antibiotics. Containing a cholera outbreak involves ensuring there are proper sanitation methods for disposing of sewage, an adequate drinking water supply and good food hygiene. Food should be cooked thoroughly and should not be contaminated by contact with raw foods, flies or dirty surfaces. The only cholera vaccine that is widely available is less than 50% effective and only lasts up to six months. There are two other vaccines that protect against one strain of cholera for a short period.

Floods and other natural disasters often are followed by rumors of epidemics (e.g., typhoid, cholera, or rabies) or unusual conditions such as increased snake or dog bites. Such unsubstantiated reports can gain public credibility when printed in newspapers or reported on television or radio as facts. The potential for such rumors underscores the need for valid and systematically collected data and the importance of basic public health surveillance in such settings. Elements to be considered in such surveillance efforts are described in the CDC publication *Beyond the Flood: A Prevention Guide for Personal Health and Safety* (8), which emphasizes the importance of 1) purification of drinking and cooking water; 2) disinfection of wells; 3) food safety (i.e., handling of food that may have come in contact with flood water or of refrigerated food after the interruption of electrical power); 4) sanitation and personal hygiene; 5) injury-prevention measures to be taken during the return to and cleaning up of flooded homes; 6) communicable diseases and vaccinations; 7) mosquito control; and 8) other hazards such as animals, chemicals, and swift-flowing water. Copies of the guide are available from state health departments.

6.3. Basic Knowledge on Prevention and Alertness in Diseases for Community

6.3.1. Prevention of Water- Borne Diseases

No major public health activity can be undertaken without active participation and co operation of the community. In this context, community must be informed, educated and encouraged to participate in the following activities:

- Proper storage of drinking water in clean, covered and narrow mouthed containers at household level
- Use of tap or ladle to draw water if stored in a wide- mouthed containers
- Avoid raw and uncooked food
- Cook food properly , keep covered and reheat it thoroughly before consuming
- Hand washing with soap after defecation and before preparation or eating food.
- Aware of danger signals of dehydration and when to seek immediate medical care

6.3.2. Prevention of Vector- Borne Diseases

Community must be informed, educated and encouraged to participate in the following activities

- To protect themselves from mosquitoes by eliminating mosquito breeding sites
- Use bed nets, mosquito repellents etc. for personal protection.

6.3.3. Vaccine Preventable Diseases

- Early reporting of cases (fever with rash)
- Continue the routine immunization schedule of children (if any dose is due)
- Bring children (6 months to 5 years) for measles vaccination

6.3.4. During Bio-terrorism Attack

The first evidence of an attack may be when you notice symptoms of the disease, therefore, be suspicious of any symptoms you notice, but do not assume that any illness is a result of the attack. However, if the community **notices an unusual and suspicious substance nearby**, may perform the following activities:

- Move away quickly
- Cover your head and nose
- Wash hands with soap and water
- Listen to the media for official instructions.
- Seek medical attention if you become sick.
- Close the doors and windows when a biological attack is imminent
- Watch television, listen to radio, or check the internet for official news and information including:
 - Signs and symptoms of the disease
 - Areas in danger
 - Where to seek medical attention
 - Use common sense and practice good hygiene.

6.3.5. If Already Exposed to Biological Agent

Pay close attention to all official warnings and instructions on how to proceed.

- Use Ultra efficient filter masks
- Follow official instructions for disposal of contaminated items such as bag and cloths.
- Take bath with soap and put on clean clothes.
- Seek medical assistance. If required and advised, stay away from others or even quarantined.

The matrix presented in next few pages would elaborate the details of natural disaster specific health impacts and actions for risk reduction.

Disaster Specific Suggestions and Methodology for Risk Reduction in Health

Disasters	Impacts		Methodology	Action Points	
	People's Health	Health Care Facilities		Health Professionals	Community
Earthquakes , Landslides, & Avalanches	Medical Emergencies: - High mortality & morbidity (depending upon nature of EQ/landslides) - Severe crush injuries - Minor to moderate bruises, cuts and other injuries - Mudflow may cause choking, eye infection, etc and - Cases of burns due to accidental fires in EQs; frost bites due to avalanches. Public Health Emergencies: - Cases of epidemics mainly enteric due to improper water supply and sanitation. - Psycho-social and mental health problems	Could vary from total collapse to minor cracks depending upon the magnitude of EQ, distance from epicentre (position of building in the path of landslide), and quality of building	1) Immediate medical help & Triage: → On-site triage → Medical triage → Evacuation triage 2) Rapid Health Assessment in camps and settlements → Periodic but Regular → Food and nutrition for more vulnerable groups → Water quality check → Hygiene & sanitation → Needs of critically ill people 3) Intensive disease surveillance 4) Initiating community Based Psychosocial Care Provision through nodal agency, trained agencies and district administration	<ul style="list-style-type: none"> Follow methodology and apply appropriate tools given in this book for preventive, curative and promotive health care services in disaster management. Focus more on preparedness and mitigation measure to reduce risks and impacts. 	<ul style="list-style-type: none"> Form designated health care teams to: <ul style="list-style-type: none"> Educate people for personal and environment cleanliness Educate and aware people about safe reproductive health practices Report cases of outbreaks to health/ASHA workers Report medical needs of survivors dependent on critical health care facilities/drugs Provide psychosocial support to the survivors Report incidences of gender based violence Liaison between substance-drug abusers and health officers/worker to prevent spreading of HIV/AIDS Orient/train/retrain the teams by nodal agencies or through district administration or CMO office. One team may be given more than two responsibilities subject to the capacity of the teams Check the water quality and hygienic food (in relief camps, especially) condition from the appropriate service providers.
	Cyclones & Windstorms	Medical Emergencies: - Large number of cases of	Minor to moderate damage	1) Emergency Evacuation 2) All other as mentioned	1) Rigorous community awareness and health & hygiene

	<p>drowning, some of which can be rescued and resuscitated/ treated.</p> <ul style="list-style-type: none"> - Cases of electrocution - Mild to moderate injuries due to high velocity winds, collapse of buildings, flying debris, falling trees etc. <p>Public Health Emergencies:</p> <ul style="list-style-type: none"> - Waterborne and Vector borne diseases - Pneumonia, common cold-cough, fever - Respiratory problems - Psychosocial and mental health problems 	<p>depending upon the location of the health care facility. More non-structural damage may also occur. The machines could be waterlogged and dysfunctional if surrounded by water</p>	<p>above at point no. 1, 2, 3, & 4</p> <p>3) Surveillance of Cholera/ diarrheal diseases/Gastroenteritis/ dysentery & Malaria, Dengue/ Hemorrhagic fever, Chikunguniya</p> <p>4) Environmental Health is important</p>	<p>education</p> <p>2) Coordination with public health engineering department.</p> <p>3) Daily disease surveillance reporting</p> <p>4) Disinfectants and essential drug supply to health care facilities</p>	<p>personnel and do as suggested</p> <p>2) Food and water hygiene is very important</p> <p>3) Ensure appropriate sanitation facilities</p> <p>4) Continue with all immunisation schedule for children and pregnant ladies</p> <p>5) Breeding of vectors must be controlled with the help of health officials</p> <p>6) Report any suspected case to the health worker</p> <p>7) Visit the health centre, if needed, without any delay</p> <p>8) Don't stand under a tree or electric poll</p> <p>9) Don't touch any electric wire fallen on the ground</p> <p>10) Report the special medical needs of the affected people to the health worker or the relief distributors</p> <p>11) Share your feeling, fear, agony, grievances with others</p> <p>12) Share problems with the Community Level Workers/Volunteers working on psychosocial care</p>
<p>Floods/Flash Floods/Tsunami</p>	<p>Public Health Emergencies:</p> <ul style="list-style-type: none"> -Water borne diseases -Vector borne diseases -Drowning -Snake bites 	<p>Minor to moderate damage, but if the health facility is located on the way of flash flood complete damage could also be possible</p>	<ol style="list-style-type: none"> 1. Conduct survey for Rapid Health Assessment 2. Active surveillance for acute diarrheal diseases (ADD) 3. Water Quality Monitoring by checking residual chlorine in water by Orthotolidine (OT) Kit 4. Active surveillance of acute fever cases 5. Conduct vector surveillance to search breeding sites, adult 	<ul style="list-style-type: none"> • Daily reporting of diarrhoea cases • Distribution of ORS (Oral Rehydrated Salt) with instructions to use it • Assure chlorination of source(s) of drinking water • Distribution of Chlorine releasing tablets for chlorination of water at household level • Ensure proper excreta and solid waste disposal • IEC (Information, Education and 	<ul style="list-style-type: none"> • Proper storage of drinking water in clean, covered and narrow mouthed containers at household level • Use of tap or ladle to draw water if stored in a wide- mouthed containers • Avoid raw and uncooked food • Cook food properly , keep covered and reheat it thoroughly before consuming • Hand washing with soap after defecation and before preparation or eating food. • Aware of danger signals of dehydration and when to seek immediate medical care

			<p>vector mosquitoes, identify species and vector density</p> <p>6. Continue routine immunization of children</p>	<p>Communication) activities to increase awareness in the community about personal hygiene, sanitation, importance of hand washing, early reporting of cases, correct preparation of ORS solution etc.</p> <ul style="list-style-type: none"> • Examination of peripheral blood smears for malaria parasites and to provide radical treatment to malaria positive cases • Carry out insecticidal spray to minimize the potential risk of outbreaks • Conduct active survey to detect cases of fever with rash (suspect measles, chicken pox) <ul style="list-style-type: none"> • Mass measles immunization to children aged 6 months to 5 years and stop measles mass immunization in case of measles case but continue routine immunization 	<ul style="list-style-type: none"> • To protect themselves from mosquitoes by eliminating mosquito breeding sites <ul style="list-style-type: none"> • Use bed nets, mosquito repellents etc. For personal protection. • Early reporting of cases (fever with rash) • Continue the routine immunization schedule of children (if any dose is due) <ul style="list-style-type: none"> • Bring children (6 months to 5 years) for measles vaccination
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SECTION-VII

Summary & Conclusion

It is the nature and scale of a disaster that decides its health effects, besides the distinctiveness of affected communities and objects -population, natural environment, housing, the health care delivery services and the physical structures of health care facilities and existing health status in the community. Common epidemics and the other major diseases such as swine flu, dengue, SARS, HIV/AIDS, malaria may constitute disasters themselves.

At the same time these diseases are also hazard factors that can interact with vulnerability conditions to engender disaster. In turn, disasters from natural hazards, climatic conditions and other human made hazards can create favorable environmental conditions which, together with mass population movements, can deteriorate the health pattern of the population affected. Hence, any effort to reduce disaster risk has to be comprehensive and reflect the complex interactions among climatic, vector-specific, political, demographic and development-based factors that worsen health risks.

Emergency health preparedness does not exist in a vacuum rather it has to be contextual. This context will vary from place to place depending upon the hazard vulnerability, existing health sector preparedness and resource allocation. There is a need to develop conceptual strategic framework aimed at providing a sound basis for the health sector to develop strategies, mechanisms, systems, plans and procedures.

The Ministry of Health & Family Welfare is instrumental and responsible for implementation of various programmes on a national scale in the areas of health & family welfare, prevention and control of major communicable diseases and promotion of traditional and indigenous systems of medicines.

Apart from these, the ministry also assists states in preventing and controlling the spread of seasonal disease outbreaks and epidemics through technical

assistance. In addition, the ministry is also responsible for emergency medical response during any disaster.

Conscious and vigorous efforts by the government of India are being made for the past few years to step up funding of the health sector. This is being done as part of MoHFW's endeavor to ensure that allocations for health in the public domain reach three per cent of the GDP by 2012.

The major thrusts in this direction are the National Rural Health Mission (NRHM) which aims at significant qualitative improvements in standards of public health and health care in the rural and urban areas through strengthening of institutions, community participation, decentralization and innovative methods of reaching all habitations.

Mainstreaming disaster risk reduction in health sector implies developing/ strengthening/ extending the existing capacity; a systematic strategy for risks reduction arising from possible disease epidemics; hospital/pre hospital based management of non epidemic medical conditions after disasters; and measures for promotive or curative health care services in health sector at all levels - planning, implementation, monitoring and evaluation stages.

It can also be defined as development of a robust public and clinical health care service provision and institutional mechanism to reduce the mortality and morbidity risks induced by any disaster.

Thus, the objectives of Ministry of Health & Family Welfare and mainstreaming DRR into health sector do overlap with other.

In other words, the objectives and expected outcomes of plans, schemes and actions do supplement and complement each other.

Hence, DRR activities are to be made as a part of regular and emergency health care practices/services where public health, emergency health services and hospitals have to work together very closely in a more methodical manner.

Fortunately, India has a reasonably good health care delivery system up to the community level and what needs to be done is to augment the system with massive DRR pertaining to health education and capacity building at all levels. The idea should be to make these DRR activities become complementary to the existing health care delivery system in the country.

To summarize, the key mainstreaming strategies and methodology, which would primarily be comprised of the following broad tasks, need to be systematically pursued:

- ✓ Document review & the integration of Health related DRR issues appropriately and adequately with disaster management plans at all level
- ✓ Consultation with various officials in the Ministry, Public health and Hospital Sectors, etc.
- ✓ Vulnerability & Capacity Assessment of the health care facilities
- ✓ District Disaster Plan for the health sector and integration of this health plan with the District Disaster Management Plan (DDMP)
- ✓ Structural and non-structural capacity building of present health care facilities to meet the threats of all hazards including chemical, biological, nuclear and radiological disasters
- ✓ Special medical facilities for CBRN group of disasters
- ✓ Networking of health care facilities
- ✓ Integration with the large scale community health education
- ✓ Strengthening the psychosocial and mental health service provision through District Mental Health Programme. One nodal officer from DMHP can coordinate with DDMA to start need assessment and service provision.
- ✓ Integration with national programmes/schemes
- ✓ Capacity development activities for various professionals
- ✓ Repeated sensitization and awareness programmes at the village level
- ✓ An overall framework development for all mainstreaming issues in this sector
- ✓ Planning for an evaluation & monitoring framework

In a nutshell, the range of available tools, frameworks and methodologies for mainstreaming DRR issues reflect the diversity of the process. However, what is needed is a genuine political will, besides the efforts to sensitize of people at risk. There should essentially be the ownership of a robust health care delivery system.

To effectively propel the mission of the government of India, a multi-level and multi-sectoral coordination and cooperation by the disaster service providers, more so between the health department and district administration at a district level in India is needed.

Therefore, sensitization across stakeholders and capacity building of the health sector across various indicators need to be put on the top priority to reduce the health risks during the disasters.

It is said that as against an aware community that reduces 30-40% of public health risks, an educated community reduces more than 60% of them.

The initiatives in adopting the above-mentioned strategies could also be done very systematically in a phased manner as identified by the National Guidelines on Medical Preparedness and Mass Casualty Management and other important guidelines released by NDMA, Government of India.

The following varied key strategies are suggested for mainstreaming of DRR into Health Sector:

Priority Areas	Duration	Method	Follow up Activity
Policy & Planning	0-3 years	National Health Policy (2002) revision	Separate official order to the fill in the gaps in various schemes/plans/Yojana, etc as identified in Chapter-II
District Disaster Management Plan & District	0-3 years		District administration and Chief District Medical Officer to review once the process of plan

Health Plan			preparation is over. Sensitization programme for all the staff of these two departments
Risk & Vulnerability Analysis	0-3 years: in state level hospitals 0-8 years: in district level hospitals	Structural & non-structural vulnerability	Necessary steps to damage control, however, budgetary allocation to reduce the risk to the least- as mentioned in Chapter III
Hospital Disaster Management Plan (HDMP)	0-3 years: state level hospitals 0-8 years: district level hospitals	Plan preparation: The HDMP template may be circulated to these hospitals to contextualize the plan	Workshops at state and district level after the first draft is prepared by the hospitals. Chapter-IV Hospital Networking should be focused in HDMP- As mentioned in Chapter- V
CBRN disasters	0-8 years	Establishing special medical facilities for CBRN disasters	Training of hospital staff and procurement of Personal Protective Equipment (PPE)
Capacity Building	0-3 years: Disaster (Medical) First Responders 0-8 years: All state and district hospital staff	Trainings and re-trainings for updating knowledge and skill enhancement	Deployment of trained staff to disaster affected areas through a proper data base management of trained persons
Community Education	0-8years and then continuation with regular intervals	Continuous education and awareness activities at the village level on preventive health care Village Disaster Management Plan	Village clubs or Panchayat Raj Institutions (PRIs), Community Based Organizations (CBOs) are to be involved for continuation of activities(e.g preparing of VDMP, organizing awareness and health education progs, etc)

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CHECK LISTS

Checklist-1: Detail engineering assessment of seismic design competencies

Conduct an engineering analysis of the buildings and design seismic protection measures. The results of the analysis are necessarily aimed at identifying the best methods to reduce seismic vulnerability. The evaluation would consist of the following studies and design measures:

- a. To determine whether the structural elements that resist gravity load are adequate and can withstand the risk of motion acceleration and motion deformation.
- b. To evaluate how the entire structure will perform during an earthquake through engineering calculations and physical testing of existing building materials.
- c. To evaluate the effect of constructing an additional floor
- d. To evaluate the lateral force resisting system and seismic deficiencies in buildings
- e. To take note of canopy structures and additions
- f. To determine the capacity of the brick and stone masonry walls to resist forces required to brace shelving, cabinets, or other elements.
- g. To evaluate the distance and height of adjacent structures and the potential impacts on this hospital
- h. To design measures to retrofit the brick partition walls (if required).
- i. To design the bracing and anchorage for storage components and equipments
- j. To design seismic protection measures for all the blocks, especially the laboratories, blood banks, emergency X-Ray, emergency Operation Theatre etc. on priority basis

Checklist-2: Non-Structural Risk Assessment

Consult an engineer to determine how to anchor and brace objects heavier than 100 kilograms, sensitive medical equipment, containers of hazardous materials, and building utility systems. Certain equipment and systems, such as lifts, will require consultation with an external engineer with specialized expertise. The following are examples of when you will need to consult an engineer:

- a. While anchoring / bracing objects that are heavier than 100 kilograms.
- b. While dealing with reoccurring hazards like anchoring the window-mounted coolers. Such a hazard would require a customized solution.
- c. While seismically anchoring the sensitive medical machinery such as imaging equipment. Consult the equipment manufacturer, in addition to an engineer. Many manufacturers provide guidance in this regard.
- d. While handling containers and supply lines for hazardous materials, such as medical gas pipes.
- e. While anchoring battery packs for essential machinery like the emergency generator.
- f. Lifts- Lift systems are among the most complicated systems to protect against earthquake damage. You will need to consult a structural engineering specialist with experience in designing earthquake retrofit measures specifically for lift systems..
- g. Take consultation in case of the large architectural features. These would include stairways, sunshades and brick partitions.

Checklist-3: Non-Structural Items in a Hospital/Health Facility

- Medical Equipments
- Furnishings and Hospital Administrative Systems
- Supplies
- Mechanical and Electrical Equipment
- Pipes, Ducts, and Conduits
- Tanks and Medical Gas Storage
- Architectural Elements
- Lifts
- Wall-mounted equipments
- Window with glass
- Small pipes
- Sterile storage
- Autoclaves
- Suspended ceiling
- Laboratory bench mounted equipments
- Solid and liquid supplies on selves
- Computer
- Compressed gas cylinder
- Refrigerators
- Cupboards
- Anaesthesia machine
- Wheeled equipments
- Ceiling mounted equipments
- Ceiling fans
- Supplies on trolleys
- Medical record storage
- Ventilators
- Radiant warmers
- Wall unit air conditioners

- Racks
- Monitors
- Imaging equipment
- Scanning/ultrasound machine
- Trolleys
- Fire extinguisher
- Ducts
- Supplies on racks
- Small suspended pipes
- Chillers
- Fire suppression pump
- Large pipes
- Boilers
- Emergency generator
- AC cooling plant and tower
- Medical gas tank
- Operation theatre lights
- Blood bank refrigerator
- Emergency telephone lines
- Alarm system within the hospital
- All equipments and devices, drug cupboard in the emergency department/casualty

Checklist/Matrix.4. : Sample Rapid Visual Screening

Soil Type: Hard rock/Avg. rock/dense soil/stiff soil/soft soil/poor soil				Main hazards: EQ-IV/V, L-C - , F/FF- , I & Chemical Plant				Hospital name:		HDMP: Yes/No				
								No. of Beds:		Total No. of Daily OPD population:				
Building No.	Name & Yr. of construction	Floor area & Use	Stories	Construction Type				Non-Structural Components: Issues & Needs						
				Concrete Frame	Unreinforced Masonry bearing wall		Equipments/ Machines/Accessoraries	Piped Oxygen line	Life safety concerns	Falling hazards	Digital materials	Contents & collections		
				Diaphragms		Diaphragms								
				Rigid	Flex	Rigid	Rigid & Flex							
Comments													Detailed Evaluation Required Yes/No	

Checklist- 5 Essential Earthquake Resistant Provisions In Masonry Buildings

Besides some other specified Earthquake Resistant construction requirements, given below in the table are the most essential requirements in the Seismic masonry.

Zone	Max. Height	Mortar Mix	Seismic Bands	Vertical Reinforcement
III	Four Storey (less than 15m)	1:6 Cement Sand or 1:2:9 Cement- Lime-Sand	1. Lintel Band 2. Roof Band/Gable Band 3. Plinth Band	For Rock/Hard/Medium Soil - Not mandatory For Soft Soil -At Joints and Corners in 3&4 storeys
IV	Four Storey (less than 15m)	1:6 Cement Sand or 1:2:9 Cement- Lime-Sand	As above with higher steel	For Rock/Hard/Medium/ Soft Soil At Joints and Corners For Soft Soil At Jambs and openings
V	Three Storeys (less than 12m)	1:4 Cement Sand or 1:1:6 Cement- Lime-Sand	As above	1. At Joints and Corners 2. At Jambs of openings

REINFORCING ELEMENTS FOR EARTHQUAKE SAFETY

Seismic Zone	Number Of Storeys	Strengthening Arrangement
II	1-3	Cement mortar (1:6), Lintel Band, Roof & Gable Band, Bracing in Plan, Plinth Band.
III	1-2	Cement mortar(1:6), Lintel Band, Roof & Gable Band, Bracing in Plan, Plinth Band. Same as above + vertical steel at corners and at jambs of openings
IV	1-2	Cement mortar (1:4), Lintel Band, Roof & Gable Band, Bracing in Plan, Plinth Band + vertical steel at corners & at jambs of openings. Same as above + dovel bars or band at window sill level
V	1-3	Cement mortar (1:3), Lintel Band, Roof & Gable Band, Bracing in Plan, Plinth Band + Vertical steel at corners & at jambs of openings + dovel bars or band at window sill level.

Checklist-6 -Indian Standards On Earthquake Engineering

India is one of the most disaster prone countries, vulnerable to almost all natural and man-made disasters.

About 85% of the country's geographical area is vulnerable to one or multiple disasters whereas about 57% of it, including India's national capital Delhi, falls in high seismic zone.

Disaster prevention involves engineering intervention in buildings and structures to make them strong enough to withstand the impact of natural hazards or to impose restrictions on land use so that the exposure of the society to the hazardous situation is avoided or minimized.

Earthquake Engineering, CED 39

To enable such an engineering intervention, standards have been formulated in the field of design and construction of the earthquake resistant structures and also in the field of measurement and tests connected therewith by the Earthquake Engineering Sectional Committee, CED 39.

IS 1893:1984 Criteria for Earthquake Resistant Design of Structures

This standard criteria spells out the needed earthquake resistant design of structures and is applicable to building's elevated structures, bridges, dams etc.

It also gives a map which divides the country into five seismic zones based on the seismic intensity. IS 1893 was initially published in 1962 as 'Recommendations for Earthquake Resistant Design of Structures' and later revised in 1966.

As a result of additional seismic data collected in India and further knowledge and experience gained, the standard was revised in 1970, 1975 and then again in 1984.

IS 1893 (Part 1):2002 'Criteria for Earthquake Resistant Design of Structures

IS 13827:1993 Improving Earthquake Resistance of Earthen Buildings Guidelines

IS 13828:1993 Improving Earthquake Resistance of Low Strength Masonry Buildings – Guidelines

IS 13920:1993 Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice

IS 13935:1993 Repair and Seismic Strengthening of Buildings – Guidelines

IS 6922:1973 Criteria for Safety and Design of Structures Subject to Underground Blasts

IS 4967:1968 Recommendations for Seismic Instrumentation for River Valley Projects

CYCLONE RESISTANT STRUCTURES, CED 57

Large parts of India, particularly the coastal regions are prone to cyclones which has in the past caused large scale devastation- loss of life and property.

The coastal regions of Tamil Nadu, Andhra Pradesh, Orissa and West Bengal on east coast and Gujarat on west coast are cyclone prone. At the instance of Ministry of Urban Development and Ministry of Science and Technology, Bureau of Indian Standards set up a Sectional Committee on Cyclone Resistant Structure, CED 57 with the following scope:

'Formulation of Indian Standards Guidelines and Recommendations for planning, design and construction of Cyclone Resistant Structures and Buildings: Cyclone Protection and post Cyclone Rehabilitation Measures'.

FLOODS

The work of formulation of Indian Standards in the field of planning, irrigation, management and evaluation of river valley projects is carried out by Water Resources Planning, Management and Evaluation Sectional Committee, IS 13739:1993 'Guidelines for estimation of flood damages'.

The standard lays down a detailed scientific procedure for collection of flood damages (other than loss of human life) data under various categories and also methods of translating them into monetary terms. It also recommends methods by which data on damages through indirect flood could be collected.

Land Slides

IS 14496 (Part 2):1998 Guidelines for preparation of landslide – Hazard Zonation Maps in mountainous terrain: Part 2 Macro Zonation

Annexure

I. Fire Safety for Internal Disasters

The do's and don'ts for empowering the staff is to be in the plan and should be displayed in the hospital at prominent places.

Class A Fire	Wood, Paper, Cloth, Plastic
Class B Fire	Petrol, Oil, Paints, Varnish, Chemicals
Class C Fire	LPG, Electrically started fire, Industrial gases, Acetylene
Class D Fire	Reactive metals, Sodium, Potassium

Extinguisher type	Type of fire
Water	Type A
Mechanical foam AFFF (Aqueous Film Forming Foam)	Type B
Carbon dioxide	Type B, C
Dry Chemical Powder (DCP)	Type A, B, C

DO'S	DON'TS
Keep your area of work neat & clean.	Do not plug too many electrical appliance in one socket
Do not throw papers or dry combustible materials	Do not lay wires under carpets, mats or doorways.
Switch off all electrical appliances when not in use	Do not place obstruction in escape routes
Take part in Fire training program regularly	Do not smoke in hospital/waiting area

The fire safety precautions are to be in the plan and should be displayed in the hospital at prominent places

IN CASE OF FIRE	
Switch off electrical supply at fire affected area	Do not shout or run
Inform about fire to fire control room at telephone no. 1058	Do not use lifts as a means of escape. Use only designated routes
Close all doors and windows	Do not open doors & windows
Ensure safety of patients	In case of Emergency dial 1058 fire control room
Try to evacuate patients by nearest available exit with the help of other staff members	Break the glass nearest Manual Call Points (M.C.P) of your floor
If possible try to attack the fire with available fire extinguishers	
Remove oxygen cylinders and other inflammable chemicals away from the scene of fire	

Preventive steps at the level of hospital as a preemptive measure should be in the plan with provision for updating at regular interval.

- Install smoke detectors on each floor of the hospital building. Change batteries in smoke detectors at least once a year.
- Make sure that the smoke alarm systems are in place and every one knows what alarm sounds like
- Fire extinguisher to be made available in each floor

II. Evacuation Plan

The evacuation plans for patients for each ward should be pasted at strategic points in the ward and corridor.

Further the management of evacuated patients in terms of provision of care in the hospital, discharge from the hospital and referral of the serious cases to the networked hospitals is to be pre planned and part of the hospital disaster plan. Types of evacuation is to be understood by all staff members

Horizontal evacuation – It is the movement of patients and other from one area (smoke zone) to a safe area on the same floor or building level.

Vertical Evacuation – It is the movement of patients and others from an area or an entire floor / level to a safe area on another floor.

All hospital staff should be made familiar with exit points and evacuation plans.

- Learn the location of all hospital exits because one may have to find way out in the dark.
- Ensure that fire exits are unlocked and clear of debris.
- Respond to every alarm, do not panic and do as per the standard operating guideline.
- Type of Fire and types of Fire Extinguisher installed at various places should be known to all hospital employees

Internal Disasters

Bomb Threat: The steps to be followed is to be in the Plan

- Security is to isolate the area
- Local police will be informed immediately to take complete charge of the situation (Removal or defuse of the bomb)
- Evacuation plan is to be kept ready in case situation demands. However the evacuation is to be in such a manner that the whole hospital is not disturbed.
- Normalcy to resume when police gives the green signal

Hospital Building declared unsafe (Either part of it or the whole hospital) due to effect of earthquake

The evacuation plan for partial or complete evacuation is to be in the plan. The details of the area where the patients will be shifted (Field hospitals / other hospitals) is to be mentioned. Details of all networked hospitals where patients can be shifted is to be kept with the Incident Commander.