

## Review

# Emergency health services systems

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## Introduction

An emergency is a sudden incident that necessitates urgent and appropriate management to treat its results and avoid its sequelae. It becomes a health emergency if it results in an unexpected risk to the health of people or the physical environment in which they live [1]. Such an emergency may be caused by mass and serious injuries brought about by man or nature. Apart from wars, national strife and natural disasters, health emergencies can be caused by transportation, fire and chemical accidents, epidemic diseases and acute life threatening illnesses. When the magnitude of such an emergency is so severe that it is beyond the capabilities and resources of the local community to manage, it becomes a disaster.

Such disasters are a major health problem because of the mortality and morbidity they cause, the burden placed upon medical and health resources, possible destruction or impairment of the health infrastructure, the medium- and long-term effects of intermittent suspension of basic sanitation services, interruption of disease surveillance and control programmes, and shortage of safe drinking water and food. In addition, disasters are usually accompanied by psychosocial problems resulting from population displacement and people's need for appropriate shelter and protection. Psycho-

logical disturbances and mental health problems may affect the disaster-stricken people and their relatives as well [2].

A systems approach to emergency health services is a way of thinking about the cause and effect relationship that influences the health and well-being of the population as a result of an emergency. It allows understanding and consideration of these relationships in a specific political, social, cultural and economic context to enable decision-makers to create new models of management by shaping new rules and boundaries. Systems thinking is critical to the process of health policy formulation and to the process of its management.

The establishment and implementation of a national system for emergency health services is the responsibility of the government. It should involve all levels of those responsible for health services delivery and include both public and private health care providers and professionals. However, the organization of such a system and its sustainability necessitates preplanned coordinated collaboration with other health-related government sectors and nongovernmental organizations. It also includes grassroots community organizations to ensure their moral, technical and logistical support, and mobilization of their collective resources to prepare for and respond to health emergencies [3].

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## Emergency health service systems

Emergency health service systems should accommodate the following subsystems: safety promotion and accident prevention, emergency preparedness for health, emergency medical and health services response and post-emergency rehabilitation of health services [4].

### Safety promotion and accident prevention

Accidents caused by people usually occur as a result of an imbalance in the equilibrium that should exist between the human being, the surrounding environment and the physicochemical or mechanical elements a person is subjected to or manipulates in that environment. The environment includes the house or shelter, road, workplace, schools, playgrounds, fields and forests and the prevailing atmospheric situation in that environment, such as temperature, humidity, wind, light, visibility, rain and snow. The physicochemical and mechanical elements manipulated by humans in these environments include two parts. Physical items such as fire, electricity, radiation and noise as well as mechanical installations and appliances used in houses, recreation and workplaces. Chemical substances used in the household, for agricultural purposes, produced by industries, vehicles and other means of transportation, machinery and energy production also come into play. The human factors that may contribute to the occurrence of accidents include age, disability, education, technical knowledge, skills and training, awareness and alertness and state of the senses. Preventive maintenance and checking the adequate performance of the mechanical equipment used in people's daily life in any specific environment is also important [5].

Safety promotion and accident prevention systems can, to a large extent, be controlled by factors related to human management, education and teaching, attitudes and behaviour. Furthermore, this system should be managed as a cross-sectional issue and be a prerequisite for any socio-economic developmental activity of all sectors responsible for the above elements, or any individual, community or professional organization who can be affected by it [6]. Ministries of health, as well as professional organizations, being responsible for the health of the population and environmental health protection, should have a vital role in promoting safety as a means for prevention of accidents and injuries. They should also be concerned about saving the already meager resources of health services and its proper utilization. Through adequate recording and epidemiological surveillance of accidents and injuries, health authorities should be able to expose its magnitude, and raise the awareness of politicians, decision-makers, and the community at large to the detrimental socioeconomic effects of accidents and injuries on the community.

### Preparedness for health emergencies

This system aims at planning at the central, governorate and district levels for a continuous state of health preparedness for emergencies [7]. This is done in collaboration with other sectors in the community. Effective leadership is essential which is capable of proper mobilization and adequate use of its resources, taking into consideration the prior identification of potential risks and disaster-prone areas in the community.

The plan should consider saving lives as its first priority, followed by solving health problems, especially those related to water, food, sanitation, disease surveillance and control. It should also consider any evolu-

ing psychosocial problems, using appropriate technology and locally available resources. The plan should be executed under an authorized and unified command capable of setting it in motion, without duplication and with some flexibility and ability to improvise according to the situation. It should also establish levels of identified and trained authorities with proper liaisons between health and other related sectors.

The elements of the plan should include the following. Adequate information and an updated profile of the topographic and geodemographic details of the local community is essential, and a current inventory of its human, material and institutional resources that may have an effect on health care. In particular, the inventory should include names, positions and addresses of all responsible officials in the health care field. The inventory should also include other relevant sectors involved in emergency management such as security, civil defence and military sectors, as well as community leaders and concerned international agencies.

The responsibilities assigned to those officials should be well defined but also allow for them to improvise in making decisions according to the situation and possible response. Every health care facility in the local community should prepare a specific emergency preparedness plan defining its role and how it will coordinate with other existing facilities [8]. These plans should be shared with other health care facilities and health related sectors. Health personnel, emergency medical and civil defence staff and volunteers should be trained on its implementation through periodic emergency simulation drills. This will ensure the plan's effectiveness and give those responsible the chance to explore practical constraints that may face its implementation. It will also serve to orient local officials and the community about the emergency response plan.

It is also important to coordinate and collaborate with local security, civil defence and military authorities to define their role and appropriate channels of communication in cases of emergencies.

Medical facilities should keep a reasonably modest and renewed stock of drugs and medical sundries on hand in order to respond to the possible needs in an emergency. Preparation of a specific plan for every hospital in the local community should be prepared for emergencies and disasters. This plan should have four main objectives: safety of inpatients and hospital staff, provision of emergency medical services to mass casualties, the presence of clear alarm/calling and an appropriate assignment system of all hospital staff, and the proper control and monitoring of the emergency managerial processes. Control of those processes will ensure the availability of necessary energy, water, food, means of transportation, communications and exchange of information [9].

The hospital emergency preparedness plan must be easy to understand, widely disseminated, highly flexible and should accommodate changes due to major incidents. Major incidents may necessitate evacuation from the hospital of its patients and staff to a safe area in or outside the building, or the expansion of the treatment and patient care areas of the hospital to accommodate incoming casualties. It should respond to probable demand and account for the resources that must be available and those that should be provided in emergencies. The plan is usually developed by a hospital disaster committee, chaired by the director of the hospital with an original and alternate member of the chief of medical staff, chief of nursing staff, radiologist, pathologist, dietitian, pharmacist, heads of clinical departments, representative of the community and potential volunteers. Besides developing

the plan, the committee ensures coordination of the plan with the community disaster plan, supervises frequent drills to test its effectiveness, and revises it in accordance with the outcome of the drills and ensures the hospital's continued preparedness for disaster and emergencies.

A medical staff subcommittee for disaster preparedness in hospitals is chaired by the chief of medical staff and made up of chiefs of clinical services and diagnostic departments. They should be responsible for executing the plan through assigning physicians and other health professionals to positions indicated in the plan, and for coordination with the local medical syndicate or society. Moreover, this subcommittee is responsible for organization of training and education programmes for health personnel on management of emergencies and the establishment of standard emergency medical care procedures for the hospital. In addition, the committee supervises the preparation of detailed departmental disaster and emergency plans that ensure the availability of trained personnel, supplies and equipment needed for such procedures.

### **Emergency medical and health services response systems**

These include systemic actions that should be preplanned and capable of responding to the possible immediate, medium and long-term effects of emergencies on the health of the community and its population [10].

#### *Situation analysis and needs assessment*

The emergency health coordinator in the affected community should be able to provide information at the site of an emergency regarding its geodemographic nature and communication links, estimated number of casualties and type of injuries, availability and capability of local resources for its

management and the approximate number of dead and missing persons. In addition, assessment of prevailing environmental health problems resulting from the emergency, especially those related to water, sanitation, food and shelter, and displaced population is also needed. This rapid primary assessment should be followed at a later stage by a general assessment of the different local civil services affected and then by specific situation analysis and needs assessment of every sector involved in the local community.

#### *Provision of urgent and adequate medical care to casualties*

Such services are usually needed during the first 2 days of an emergency. Their efficiency and effectiveness is dependent on the availability of hospital and health care facility emergency preparedness plans, in addition to a well established national emergency medical services system.

The main components of such a system include the following items [2].

- Legislative support and protective procedures with well defined responsibilities and authority of its personnel.
- Qualified and well trained human resources including the first responders (police, civil defence or emergency medical technicians or laymen), alarm receptors and activators, emergency transportation officers, hospital emergency reception and triage department personnel, and those responsible for emergency medical care provision or referral.
- Appropriate communication channels are needed to enable information exchange and mobilization of resources as well as adequately equipped and efficient medical emergency means of transportation.

- Also important are medical emergency reception, management and referral hospital units or departments capable of rapid assessment of injuries and triage of patients, life-saving clinical and critical care measures, as well as proper referral to defined and prealerted specialized medical care facilities within or outside the receiving hospital.
- Efficient critical or intensive medical care units for management of severe injuries, multiple traumas, extensive burns, spinal cord injuries and poisoning are necessary.

In addition to the above components, it is essential to ensure coordination and secure sustainability and support to the system through the involvement of locally available sectors responsible for security, civil defence, communication, transportation and military services, as well as through orientation, health education of the community and training of potential volunteers. These sectors should also be invited and encouraged to participate in the monitoring and periodic evaluation of the system and its efficiency.

#### *Communicable diseases surveillance and control*

This comes as a second health care priority after management of injuries in disasters and emergencies. Communicable diseases usually appear a few days after the onset of emergencies resulting in environmental disruption causing water, sanitation, food and housing problems, which may lead to intestinal and respiratory infections. Proper surveillance of these and other diseases and laboratory test confirmation is necessary for their control and management. Expansion of immunization programmes, especially for children, may be advisable and for those who have been displaced or who are temporarily sheltered.

#### *Environmental health protection*

Disasters may lead to environmental health hazards due to a shortage of or damage to drinking water resources and piping networks as well as the sewage disposal system [11]. Moreover, lack of personal hygiene facilities and a solid waste disposal system may lead to an increase in insects and disease vectors.

In such situations, it is essential to guard against chemical or bacteriological pollution of available drinking water reservoirs and tanks and to increase chlorination within acceptable limits. It is also necessary to protect water wells from contamination and to provide the affected population with mobile tanks of quality-controlled drinking water. Moreover, temporary latrines for the displaced population should be constructed at a ratio of 1 latrine for every 20 inhabitants. Solid waste should be collected and appropriately disposed of by burying or burning, and disease vectors and insects should be controlled by appropriate measures including spraying of insecticides and fumigation of tents or other shelters. Health education and public information for the affected community and provision of safe food supplies to them is also an important aspect of environmental health protection in emergencies.

#### *Emergency medical supplies*

Urgently needed medical supplies are usually limited to the first few days after the onset of an emergency for those who require stabilization and treatment or for management of injuries and mass casualties and prevention and control of communicable diseases. Other medical supplies that will be needed at a later stage of emergencies include drugs, medical sundries, environmental health protection materials and equipment, as well as food, transportation vehicles and building materials. The World

Health Organization, since the early 1980s, has proposed a health emergency kit for such situations that contains enough drugs and standard clinical equipment to satisfy the medical needs of 1000 people for 3 months [12].

However, medical supplies, more than those stocked, may be urgently needed. In this case, the following procedures are recommended. Requests must be made through a well defined and unified channel to prevent duplication and to coordinate their submission to concerned national sectors and international agencies. Requests should be itemized for supplies in sufficient quantity, quality and at reasonable cost. Vaccines should not be ordered unless a cold chain system is available or also simultaneously requested. Packing, freighting, storing and distribution of these supplies should abide by the internationally recognized colour coding system of red for food materials, blue for clothes and housing materials and green for drugs and medical sundries. Delivery, receipt, storage and distribution of these supplies should be undertaken according to preset rules and regulations.

#### *Allied intersectoral support processes in health emergencies*

Response to health emergencies may necessitate certain procedures that are not the responsibility of the local health sector or not within its resource capabilities. These may include transportation and communication means, as well as security of the affected and displaced population and their shelter accommodations [13]. Health authorities should coordinate assistance needed from these sectors and should be involved in the selection of a suitable location for the displaced population to live that is a reasonable distance from urban communities and away from potential risk areas. In addition, health authorities should

be involved in the design and management of the habitation area and the water supply and sanitation facilities.

#### *Organization of international aid and relief operations in health emergencies*

Upon the request of the government concerned and its appeal for assistance after a declaration of a state of disaster, the following are examples of agencies that may be approached.

- United Nations agencies
  - United Nations Development Programme at country, UN and head-quarter levels
  - International Civil Defence Organizations
  - World Health Organization, Division of Emergency and Humanitarian Action
- Bilateral and governmental agencies
  - European Economic Commission (EEC)
  - Gulf Cooperative Council (GCC)
- International nongovernmental organizations
  - Red Crescent and Red Cross International Society
  - International Council for Voluntary Association (ICVA)

#### **Post-emergency rehabilitation of health services and facilities**

During the weeks after the disaster or emergency, health needs will gradually shift from urgent medical care and environmental sanitation to normal services. Reorganization and modification of these services should be considered according to the degree of exhaustion or damage of available health resources by the emergency, and the possibility of repairing or reconstructing health care and environmental health ser-

VICES facilities as well as deployment of the human resources needed.

Meanwhile, there should be continuous follow-up of injured patients needing long-term treatment or rehabilitation because of brain and spinal cord injuries, limb amputa-

tions or chronic infections. Concomitantly, communicable disease surveillance should be adhered to at the site of the emergency and the temporary habitation location for several weeks, until absolute prevention and control of these diseases is ensured.

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