The Management of Mass Casualties in Case of Disasters

Prof. Dan Mănăstireanu, MD, PhD
Discipline - Disaster Medicine, Faculty of Medicine and Dentistry Titu Maiorescu University of Bucharest

Prof. Nicolae Steiner, MD, PhD - Specialization - Master of Disaster Medicine, Faculty of Medicine and Dentistry Titu Maiorescu University of Bucharest Romania
NATO's International Disaster Medicine Expert

Assist. Prof. Mihail Pîslă, MD
Chief of the Republican Centre for Disaster Medicine, Chisinau, Moldova
Health Ministry's Principal Specialist for Disaster Medicine, Moldovan Health Ministry's Senior Specialist for Disaster Medicine

1Honorary Member of the National Disaster Medical System of the USA

Introduction

International Strategy for Disaster Reduction defines the disaster as an event with a serious impact on the way in which a community or a society as a whole functions that produces widespread human, material, economic or environmental losses beyond the capacity of the affected community to cope with using its own resources.

Disasters inevitably leads to a large number of wounded and dead which increases the specific morbidity and mortality. By analyzing the period between the first days of the disastrous event and two weeks after this, the authors of this paper will review issues relating to the management of mass victims (focusing particularly on natural disasters).

Emergency management, otherwise known as disaster management, relates with the organization and management of resources and responsibilities to deal with all aspects of emergencies, in particular the preparation, response and rehabilitation. Emergency management involves plans, structures and arrangements established to engage the efforts of government and voluntary and private agencies in a comprehensive and coordinated way to address the entire spectrum of emergency needs.

Clearly this is only one aspect of an integrated management plan for a disaster emergency. The importance of public health strategies and the maximizing of the benefits for the community as a whole can not be underestimated. Moreover, both clinical care and public health measures will be conducted in an integrated manner (not mutually exclusive). The problems faced by the immediate management of dealing with a mass influx of victims refer mainly to polytrauma and severe pathology and their consequences on increasing intensive care needs in the context of a large and sudden influx of victims in an infrastructure potentially affected by severe logistics and often unprepared [13,19].

Inevitably the ability to cope with such a situation is dependent on the existing infrastructure and on how well the intensive care systems of existing polytrauma care in affected areas can be efficiently mobilized and can cope with the situation [38].

Emergency plans should be well designed and then tested. Together with the immediate response plans they constitute the only solution to deal with a situation where faced with a lack of personnel and overall logistical shortcomings.

WHO and DHA continue to be the best organisations that provide advice based on evidence and previous experience in international health issues and disaster management and humanitarian issues.

Doctors, who are trained in disaster medicine, should achieve an adequate level of education and training in the unique principles and practices of the medical management of disaster and of massive inflows of victims and to play a key role in this area.

Key words: mass influx of victims, disaster, management

The problems faced by the immediate management of dealing with a mass influx of victims refer mainly to polytrauma and severe pathology and their consequences on increasing intensive care needs in the context of a large and sudden influx of victims in an infrastructure potentially affected by severe logistics and often unprepared [13,19].

Given that most deaths occur during the first 24 hours and then in the first few days, it is well known that it is extremely difficult to send aid during this period from distant areas (i.e. international aid) in the form of medical facilities (i.e. mobile hospitals) or first aid teams dealing with search and rescue.
The usefulness of using medical teams which can be dispatched quickly and which have the appropriate logistics infrastructure, based on the knowledge of the disaster epidemiology and of the health/demographic indicators and public health of the area in which the intervention takes place, is extremely problematic. Even economically developed countries can hardly afford to maintain an effective structure for taking action in disaster situations. Foreign aid must be made on a detailed assessment of the needs for proper quantification of the international response. That is why there is a need for a special multidisciplinary team to approach in an integrated manner the situation of the victims during the immediate response phase.

DHA (Department for Humanitarian Actions) and WHO (World Health Organisation) play a key role in connection with the coordination of the intervention elements, both during the pre-disaster and the post-disaster phases. In the event of such incidents, complex and complete teams of assessment experts should be sent immediately (in the form of UNDAC teams backed-up by medical experts) in the post-disaster phase to provide specialist support to local authorities in order to choose the best ways of implementing the management of health problems of immediate medical intervention.

Naturally, there will be many governments offering assistance to the affected country, but DHA and WHO remain the main UN bodies that provide expert, unconditional advice to a sovereign country struck by disaster.

Therefore, generally speaking, the management of the massive influx of casualties after a disaster is best carried out through the strengthening of the local capabilities during the pre-disaster phase. The international response is better directed towards the management of the subsequent trauma complications (septicemia, infectious complications, multiple organ deficiencies, major surgery) as well as ensuring that there is a hospital support and primary care infrastructure to prevent the occurrence of transmissible diseases.

The challenges and strategies of the management of a massive influx of casualties

The Pre-disaster phase.

A. Understanding the epidemiology of disasters

A review of recent materials that set out the effects on the state of health of the population caused by the Asian tsunami and the floods in South East Asia, shows that in general, malaria, fungal infections, leptospirosis, mental health issues and cardiovascular diseases were the most common health problems reported shortly after earthquakes followed by flood [3,4,5]. According to the literature researched by us [7,8] politraumatism do not come at the top of the list, and in our opinion that is because of a 'demonetisation' of their presence/predominance in most types of natural disasters.

In the long-term the complications of politraumatism, leptospirosis and mental illness prevailed as additional significant problems that had an impact on health. Both earthquakes (where politraumatism are predominant) and sudden floods (where transmittable diseases are predominant) can produce a large number of deaths and injuries, causing different disease elements, but fitting into logical sequence of events.

A review of the cases treated by the Australian medical team in Banda Aceh (daling with the evaluation of the effects of the Tsunami) revealed a hierarchy of the pathology: injuries and politraumatism represented 39%, respiratory/lung diseases represented 31%, diarrhoeal diseases represented 7%, while infectious diseases, including tetanus, represented 22% of cases. As for surgical interventions, 80% involved wound treating and dressing with very few external fixation sutures, most likely forced by the presence of septic factor.

Our opinion regarding the allocation of injuries and illnesses following the Indonesian tsunami are also supported by the description of the injuries occurred as a result of the 2001 earthquake in Gujarat, India. The most common injuries were at the level of the lower extremities (56%). Pelvic and spinal injuries represented 17%, whereas injuries of upper extremities represented about 13% of all cases. [28,29,30] Thoracic and abdominal trauma represented 4% of cases, and crush syndrome was observed in 2% of cases. Most complications occurred within 1-3 days as part of normal daily activities [6]. Most deaths occurring during complex emergencies and humanitarian actions are due to preventable causes, such as the increase of transmittable diseases, malnutrition and violent politraumatism. The most appropriate public health intervention is therefore based on the model of public healthcare and basic first aid assistance, emphasizing illness prevention and health promotion.

Only the understanding of the specific epidemiology of disastrous events, allow us to form an adequate response, with a subsequent detailed assessment of the needs to ensure subsequent readjustments.

b. The understanding of health indicators of the population, the demographics and intensive care facilities in operation.

The analysis of the post-disaster deficiencies regarding the general care of politraumatism and for the intensive care is the basis for improvements of the infrastructure in the pre-disaster stage. This will allow to be focused further on the risks faced by all victims, especially women and children.

c. The assessment of risks and hazards

The identification and assessment of risks during the pre-disaster stage enables the pre-planning of
the response to the probable effects of the disaster, to create optimal conditions for efficiency, and to avoid if possible, both an over-evaluation and an under-valuation.

d. Ensuring there is an adequate response developed by the country affected by a disaster.

The first steps in developing an efficient response to a disaster include issues relating to the medical care chain of survival, the way in which applications are received and the development of the pre-hospital and trauma centres. An extensive consultation of communities and local authorities is necessary, which constitutes the PR (public relations) side of medical interventions in disasters [8].

The disaster medical practitioner must pay particular attention to relations with both local government authorities, regional and even national and directly with communities through media. These connections both on a vertical (government) and horizontal level (community) will achieve his/her recognition as the leader of the emergency intervention. This recognition must be supplemented with the staff's knowledge of the intervention teams and the skills of the individuals in charge with leading the assistance efforts.

The preparation of first aid and triage should be the first steps in organizing the response to the impact of disasters.

The care in specialized teams and the focus on the realities existing in the area in which intervention are very important for first persons involved.

The training of health care providers in emergency medicine, trauma and intensive care is an integral part of preparing the entire health system [9].

The pre-disaster stage programs should incorporate the training of members of the local communities in providing health care functions which should be appropriate and sustainable.

The entire system must be integrated into a single plan of action that follows the principles of medical management of an event with a mass influx of casualties. In addition, the four stages of civil emergency management (prevention, preparation, response and recovery) should be considered and incorporated as components of the plan [10].

Central national and local authorities would play a special role in providing advice with regard to the strengthening of the capacities described above and their implementation based on the principles of risk management. This requires the implementation of the available data, the standards and the national codes of practice and those recommended by specialised international institutions (DHA and WHO) [11, 12].

The massive influx of disaster victims is characterized by the massiveness, diversity and severity of injuries, which typically exceed the capacity of local and sometimes even national medical resources to ensure a complete and definitive treatment for all the casualties. Surgeons presented as generic name for all surgical specialties, have traditionally played an important role in disaster response. The preparation and the specific skills of the surgeons' intervention in situations of large influx of casualties is an essential prerequisite for intervention in disasters. Also, the resources and the infrastructure of trauma centres will be especially designed for providing logistical needs and the rapid decision making required by an event of mass influx of casualties that occur both in the case of natural disasters and in the case of those caused by man (i.e. chemical, biological, radiological, nuclear and explosive disasters).

We believe that physicians specially trained in disaster medicine, to the extent that they exist in the system, will provide leadership at regional and national community level in the case of disasters involving physical injury to casualties and in the case of disasters that require special emergency response and medical healthcare management (such as explosions, structural slides, gunshot wounds, fires or large road accidents).

The American College of Surgeons suggests that surgeons have the obligation to actively participate in the multidisciplinary planning, selection and medical management of mass influx of victims that exist in all disasters.

Disaster Management poses a range of issues that are distinct from normal surgical practice. It requires a paradigm shift from the application of unlimited resources in order to achieve the best result for each patient to the allocation of scarce resources in order to achieve the best result for the greatest number of casualties (the golden rule of disaster medicine).

This shift is most effectively achieved through the institutional planning and training in disaster medicine of all doctors, through internal hospital drills and exercises involving all stakeholders and community resources. The rescue, decontamination, triage, stabilisation, evacuation and definitive treatment of victims requires a continuous and contiguous integration of all central and local capabilities. This integration will include without limitation the pre-hospital services, media, emergency management and public health agencies, transportation and communications resources, military and health care facilities and their staff. The Medical Management of the massive influx of casualties is one of many critical functions involved in the general response to a disaster, and constitutes an integral part of primary importance to disaster medicine. The disaster medicine education system should take account of this goal and should contribute effectively to the training of doctors specialising in this field as leaders of intervention...
teams, regardless of the place, level and mode of activity (first aid, politraumism surgical therapy, intensive care and complications, sepsis and therapy of infectious and contagious diseases, etc).

**The Post-disaster phase**

**Ensuring a prompt, appropriate, continuous and contiguous response**

The government is the highest authority in emergency management due to its overall responsibilities for security and safety. Depending on the size and seriousness of an incident, the government is responsible for setting national coordination structures, approving extraordinary resources, involving the armed forces and assuming extraordinary powers to activate the relevant international cooperation and support systems.

Irrespective of the form taken by the public or government administration, the national emergency management should include:

- the identification of the authority lines at national and local level;
- financial arrangements to fund emergency activities;
- arrangements to ensure that the government and community activities are sustained (e.g. by creating a parallel or enhanced communications system to replace the normal communication system if this is destroyed);
- storing appropriate resources at national level (including the creation of material resources located at county and local level);
- databases of national experts who can be consulted on specific issues;
- protocols and formal commitments to coordinate efforts with other countries or between county and local authorities within the country.

Frequently, governments adopt ever more decentralized models of emergency management, in which authority is delegated to the lowest levels possible, recognising that many emergencies can be effectively managed at a local level, even if later a response at national level may be required. However some response capacity will be retained by the national level authority. These may include search-rescue teams (SAR) and specialized functions such as hazardous materials teams (HAZMAT) needed to respond to special events (such as terrorist attacks with chemical or unintentional chemical incidents).

Incidents with mass casualties occur at community level and therefore the highest benefits of emergency preparation can be achieved at this level.

Experience shows that on average, a period of approx. 48 and 72 hours (but sometimes considerably more) is needed before the international assistance is mobilised and begins operations at the place of an incident with mass influx of victims.

During this period, the community and local authorities are "on their own". What is done during this critical period is vital to the outcomes of the incident in terms of mortality, morbidity and disability control [37].

The central point of a possible international support must be the third pillar, namely the specialist trauma disorders interventions. The first two pillars regarding 1) primary care and advanced medical aid and 2) population health sectors, the both belong to the local, regional, national authorities.

A special multidisciplinary force playing the rear guard role in order to assess the needs and capacities of the health care system has proven effective in all situations.

**a. Logistics**

The logistics issue is an important one for developing a successful response to disaster assistance and therefore the constant updating of detailed logistical plans remains essential.

The use of military means remains controversial and is not always culturally appropriate and diplomatic.

Teams that will be sent to the affected region should be standardised in terms of experience and equipment be self-sufficient in an austere environment. Based on our experience, during the intervention of 1999 earthquake in Turkey, we understood the importance of logistics for the foreign aid teams at a time when local authorities are overwhelmed [20].

The Centralized Incident Command System (CICS) must focus its efforts specifically on providing logistical capacity.

**b. Mass fatality management**

A large incident such as a natural disaster is likely to result into a large number of deaths which will exceed the capacity of local authorities to bury the victims whilst complying The local authorities must be prepared to give a response in such situation in cooperation with other sectors, including religious authorities as well as those who play a formal emergency response role. For example, communities that lost many of their loved ones will be more able to cope and recover after a major emergency if they trust that the authorities will support the return of the remains to the families for proper observance of cultural and religious rites. Among other issues, policies and procedures must be in operation, must respect cultural and religious traditions and provide aid to reduce exposure of the remains and providing support for relatives [37].

The conflict generated by religious differences may degenerate, resulting in conditions of disaster, and so a generous humanitarian action to be compromised. Physician, specialized in disaster medicine will need to know how to solve any conflict, religious or
otherwise, but always respecting the first law of disaster medicine (protect yourself first).

c. Field Hospitals

Field Hospitals could be extremely effective tools in disaster medicine. Our personal experience in Somalia (1993-1994 – operation "Restore Hope" under UN) shown us how a realistic way in which field hospitals should be used [20].

Some of the current recommendations for hospitals in disaster situations include [13]:

- they should be fully operational within 24 hours of the disaster;
- they should be completely independent in terms of logistics, energy, medical and technical facilities for all staff;
- they should be able to provide medical services to cover the medical needs;
- they should allow local health personnel to operate within their technological framework;
- they should remain in place for at least 15 days, allowing monitoring and treatment (secondary) of injuries and routine health care.

Field Hospitals serving as temporary facilities, rehabilitation and reconstruction phase must be donated and not borrowed. However, the main issue of "Field Hospitals" is that they arrive several days after the disaster in general are poorly integrated and focused on the highest level of trauma care when the needs of the people are different. Establishing an operational standard of "arriving within 24 hours" is impossible to achieve in most occasions.

Following the Tsunami in Indonesia a number of hospitals were sent to Banda Aceh. The differing standards of care, the delay in setting them up, the absence of focusing on assessing the needs and the lack of co-ordination are the main concerns which lead to the decrease in performance of those structures [14].

Following this disaster, the Australian Government has provided eight teams of 124 civilians at the request of four governments[15,16]. The first team of 28 members which arrived in Banda Aceh was set up by authorities in New South Wales, being a multidisciplinary team originally intended for emergency medical and surgical care (although it had a capacity of public health care and infectious diseases). Other teams that were sent later focused on reconstructive surgery, primary care and population health (for more than six weeks). A review of illness and injuries in the tsunami disaster in Papua New Guinea in 1998 led to the identification of the continuous needs, and of the necessary clinical skills [17]. The sending of the teams to Sri Lanka (population health), Thailand (forensic) and Maldives (population health and primary care) were specifically designed at the request of the affected countries.

Given that there was a significant debate on the usefulness of the field hospitals for international humanitarian aid, there is a consensus on the need to dispatch “light” multidisciplinary teams for a rapid response based on the epidemiology of disaster. An appropriate acute response that focuses on specific health problems of the local population would be implemented. The available literature and epidemiological data recommends the need for trauma capabilities during the first week to support the lost capacity of health infrastructure. Similarly, focusing on primary care needs of women and children will remain important.

The continuous evaluation of the needs allows for the subsequent identification of a response through a coordinated and immediate transfer of required staff after an appropriate period of assessment.

d. The role of donor governments

Donor governments will inevitably provide assistance based on a complex number of intermediate players. Efforts must be made to ensure that DHA and WHO provide advice and coordinate all medical aspects of disaster response [21,22,23].

The regionalisation of national support will help increase relations with potentially affected States and allow a more targeted assistance.

The higher level of government coordination such as in Australia, makes it possible for the response to be appropriate within the context of the local autonomy and sovereignty arrangements [24,25].

The aid sent by donor governments must be based on needs expressed in the request for assistance from the affected country government. DHA and WHO play an important role in counselling and assisting with data necessary for proper intervention and coordination of the many ways reached the affected country.

e. Needs assessment

Detailed needs assessments are important, but key decisions will continue to be needed in the immediate post-disaster stage, without the availability of perfect information, given the short time elapsed since the end of the disaster.

The notification of risk assessments during the pre-disaster stage will help ensure the best possible answer.

f. Incident management team communication and coordination

The coordination of multiple agencies, including non-governmental organisations that require multiple needs assessments, remains difficult and creates challenges for DHA and the WHO.

DHA and WHO will send a group of experts to determine the type of response required in consultation with
the affected country structures and potential donor governments.

DHA and WHO will implement operational process management, such as an Incident Command System (ICS) that has been successfully used in public health emergencies in a number of countries [18].

**CONCLUSIONS**

The recommendations of the WHO Conference which considered the intervention during the 2005 tsunami in Phuket, Asia, are present and constitute a point of view to improve future interventions [31,32,33].

National authorities, central and local government play the leading role in disaster management and mass incidents involving casualties, especially for [26,27]:

- Education and training;
- Planning for disasters and conducting exercises;
- Integrating local, regional and national resources in a disaster system;
- Introduction to Incident Command System (ICS); [28]
- Communications and security;
- Media relations;
- Protection of personnel providing health care and the relevant facilities;
- Detection and decontamination after exposure to biological, chemical and/or radioactive agents;
- Practical implementation of triage with all its benefits;
- Logistics of medical evaluation, stabilization and treatment of victims;
- Maintaining post-disaster records and information, and assessing the interventions and making the necessary reports;
- Critical incident stress management (MSCI);
- Publicising disaster management research and experience.

WHO and DHA continue to be the best organisations that provide advice based on evidence and previous experience in international health issues and disaster management and humanitarian issues [34,35,36].

Doctors, who are trained in disaster medicine, should achieve an adequate level of education and training in the unique principles and practices of the medical management of disaster and of massive inflows of victims and to play a key role in this area.

**References**