

Mass Casualty Management in Disasters

Executive Summary

Catastrophic disasters inevitably lead to large numbers of dead and injured in the immediate aftermath. This paper primarily reviews issues in regard to the management of mass casualties (focussing primarily on natural disasters) in the first days up to 2 weeks following the event.

Clearly this is just one aspect of an integrated emergency management plan for a disaster and the importance of population health strategies in maximising the benefits for the community as a whole cannot be underestimated. However, both clinical care and population health measures should be managed concurrently and in an integrated fashion (they are not mutually exclusive)

The immediate mass casualty management issues are primarily related to severe trauma and its medical and critical care consequences, in the context of a large acute casualty surge with severely affected infrastructure.

Inevitably the ability to manage such a situation is dependent on the existing infrastructure and existing trauma and critical care systems in the affected nation. Similarly well tested emergency preparedness and response plans are necessary.

The well recognised trimodal distribution of deaths¹ from traumatic injury demonstrates that to reduce mortality and morbidity in the first hours and days following a disaster, local response capability and infrastructure management must be strengthened to ensure the best outcomes for those severely injured in an event.

In regard to trauma management, international teams/field hospitals are unlikely to be deployed within the scope of one or two days so that those with life-threatening injuries requiring emergent surgical intervention will not have survived. This also applies to large scale urban search and rescue deployments that arrive many days after the incident.

However, there is some utility in ensuring targeted clinical teams are deployed as soon as possible, with appropriate logistic infrastructure, configured on the basis of the known epidemiology of the disaster and the background national demographics/population health denominators. This process should occur with concurrent detailed needs assessment to further tailor the response. A multidisciplinary focussed task force should include a "whole of health" approach to the response phase.

WHO plays a key role in co-ordinating the health assets in both the pre and post disaster phases. A targeted expert incident team should be convened in the immediate post-disaster phase to advise on the best way to manage the clinical care issues.

While donor governments will inevitably provide offers of assistance to the affected nation, WHO remains well placed to provide expert advice to the sovereign nation.

Therefore, in general, the management of mass casualties following a disaster is best undertaken by strengthening local capacity during the pre-disaster phase and in terms of clinical care, international response is best focussed on the management of later trauma complications (eg sepsis, infectious disease, multiorgan failure, surgical debridement) as well as providing hospital and primary care infrastructure support.

The recommendations from the WHO Conference on the Health Aspects of the Asian Tsunami Disaster provide a very good strategic template for defining the way forward.

Further detail is required in terms of implementation actions.

Issues challenges and strategies for mass casualty management

1. Pre-disaster phase.

a. Understanding the epidemiology of disasters

- A recent epidemiologic review of the health effects of tsunamis, earthquakes and floods², found 19 relevant studies published. In general, malaria, fungal infections, leptospirosis, mental health events, and cardiac causes were the main reported health events in the short term intervals following floods and earthquakes. In the longer term, orthopaedic injuries, trauma, leptospirosis, and mental illnesses emerged as significant health issues.
- While both earthquakes (multiple trauma) and flash floods (communicable diseases) result in great numbers of deaths, the disease patterns they cause are different³
- A review of the types of cases treated by the Australian medical team in Banda Aceh⁴ were trauma and wounds (39%), respiratory disease/lung injury, (31%), diarrhoea (7%) and other infectious diseases, including tetanus and background health problems accounted for the remaining 22% of cases. In regards to surgical interventions 80% involved debridement of wounds and dressings with very few primary closures or external fixation procedures.
- An example of the types of injuries encountered during an earthquake is described in a comprehensive review following the Gujarat, India event in 2001.⁵ The most common injury was to the lower extremity (56%). The spine and pelvis were injured in 17% of cases, and the upper extremity in 13% of cases. Chest and/or abdominal trauma constituted <4% of cases. Crush syndrome was seen in <2% of cases. Most of the surge in casualties occurred in days 1 to 3 with normal levels of activity from day 6.
- Most deaths during complex humanitarian emergencies are due to preventable causes, especially increased rates of infectious diseases, malnutrition and violent trauma. The most appropriate health interventions are therefore based on the models of public health and primary health care, emphasising disease prevention and health promotion.⁶⁷
- Understanding the epidemiology of specific disaster events, allows an appropriate first response, with subsequent detailed needs assessment allowing further refinement.

b. Understanding the population health demographics and critical care infrastructure in place.

- This particularly allows a focus on those at risk especially women and children.
- Undertaking a gap analysis in regards to trauma and critical care infrastructure allows improvements to be made in the pre-disaster phase.

c. Undertaking risk and hazard assessments

- Allows for pre-planning of response and likely effects of a disaster.

d. Capacity development to ensure acute event can be appropriately managed by the affected nation.

- Assisting with the development of integrated trauma and critical care systems based on cultural needs within the scope of appropriate levels of healthcare. Includes the chain of survival issues, call receipt, pre-hospital, and trauma centre development. Extensive community and government consultation is required.⁸
- Advanced training for health providers in emergency medicine, trauma and critical care.⁹
- Training in first aid and triage. Buddy care and focus on the community is important as first responders will be community members.
- Programs in the development phase must incorporate provision for training members of local communities to carry out health care functions in ways that are culturally appropriate and sustainable.
- The whole system needs to be considered in managing a mass casualty event. In addition all 4 phases of emergency management (prevention, preparedness, response and recovery) must be considered and integrated.¹⁰
- WHO plays a key role in the preparedness phase, particularly in regard to ensuring that the capacity enhancement issues described above are implemented based on risk management.
- Includes the implementation of benchmarks, standards and codes of practice as recommended by WHO¹¹¹²

2. Post-disaster phase

a. Ensuring timely response and appropriate response

- The key is timeliness of response focussed on pre and post disaster assessment.
- The focus of international response should be on the third trauma modal peak, medical and primary care issues and population health.
- An initial multi-disciplinary task force should be deployed, including needs assessment and population health capability.

b. Logistics

- Logistics is a key issue for successful disaster response and the continued development of detailed logistics plans remains important.
- Utilisation of military assets is controversial and is not always diplomatically or culturally appropriate.
- The deployment of assets needs to be predetermined.
- Teams being sent to the region require standardization of experience and equipment and must be self-sustainable in an austere environment.
- Utilisation of the Incident Command System specifically factors in logistic capabilities.

c. The “field hospital”

- Some of the current recommendations for the provision of a field hospital in a disaster situation include¹³;
 - be fully operational within 24 hours of the disaster.
 - be able to provide services that coincide with medical needs.
 - allow for national health personnel to operate the technology contained within.
 - it should remain on-site for a minimum of 15 days, allowing for follow up (secondary) care of trauma and routine medical attention.
 - Field hospitals serving as temporary facilities pending reconstruction should be donated and not loaned.

- The main problem with “field hospitals” is that they arrive many days after the disaster, are usually poorly integrated and focus on high level trauma care when the needs of the population are different.

- Setting a standard of “arrival in 24 hours” is not able to be fulfilled on most occasions.

- Following the Bam earthquake in Iran, more than 10 field hospitals were sent. There were also a number of field hospitals sent to Banda Aceh following the tsunami. The variability in standards of care, the delays in setting up, the lack of focus on needs assessment and the lack of co-ordination are the main issues of concern.¹⁴

- Following the Asian tsunami disaster, the Australian Government provided 8 teams of 124 civilians at the request of 4 governments.^{15 16}The first 28 member team that deployed to Banda Aceh was configured and established by the New South Wales Government, was multidisciplinary in nature and initially tailored to emergency medicine and surgical care (although also had population health and infectious disease capability). Later teams deployed focussed on reconstructive surgery, primary health care and population health (over a six week period). A review of the nature of disease and injury following the tsunami disaster in Papua New Guinea in 1998, as well as ongoing needs assessment, assisted in defining the clinical skills necessary.¹⁷Deployments to Sri Lanka, (population health), Thailand (forensic) and The Maldives (population health and primary health care) were specifically tailored at the request of the affected nations.

- While there has been significant debate over the utility of field hospitals in international humanitarian relief, there is certainly scope for a “light” multi-disciplinary team for acute response based on the epidemiology of disasters. An appropriate acute phase response as well as a focus on population health can be implemented concurrently.

- The literature and the known epidemiology would support the need for trauma capabilities in the first week and beyond that period supporting lost health infrastructure. Similarly focussing on the primary healthcare needs of women and children remain important.
- Ongoing needs assessment allows further tailoring of the response with a co-ordinated and seamless transfer of personnel required after an appropriate period of deployment.

d. Role of donor governments

- Donor governments will inevitably provide assistance based on a number of complex interplays. There should be efforts to ensure that WHO provides the clinical advice and co-ordination on the health aspects of disaster response.
- Regionalisation of national assistance would assist in having a more direct relationship with potentially affected states and allow a more targeted approach to assistance.
- The Australian Government has established the Australian Health Disaster Management Policy Committee, chaired by the Deputy Secretary of the Department of Health and Ageing. This centralised structure has been vital in allowing co-ordination of regional disasters such as the Asian tsunami and the Bali bombings. The committee also ensures a whole of government approach in preparing for and responding to disasters. The committee includes all the Chief Health Officers from the States and Territories, expert advisers and emergency managers as well as the Australian Defence Force.
- Central co-ordination high-level government arrangements such as this also allows the response to be appropriate and within the context of local governance and sovereignty arrangements.
- Donor government provision should be based on need at the request of the host government. WHO plays an important link in assisting with evidenced based advice and co-ordination of multiple assets in country.

e. Needs assessment

- Detailed needs assessment is important but key decisions will continue to be required in the immediate post-disaster phase without “perfect” data availability.
- Annotating risk assessments in the pre-disaster phase will assist in ensuring the best possible response.

f. Communication and co-ordination, through incident management team

- The co-ordination of many agencies, including non government organisations undertaking multiple needs assessments remains troublesome and creates a challenge for WHO.
- WHO should convene an expert group to determine the type of response required in consultation with the affected sovereign nation and potential donor government.
- WHO should implement an operational emergency management process such as the Incident Command System (ICS) which has been successfully utilised in public health emergencies in a number of countries.¹⁸

Success factors

- The recommendations from the WHO Conference reviewing the Asian tsunami disaster in Phuket in May 2005, are very sound and act as a way forward for future deliberations and policy implementation.
- WHO continues to be the best organisation to provide evidenced based advice on international health issues.

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¹⁸ Incident Command System. Centers for Disease Control and Prevention.
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