

INTERNATIONAL PERSPECTIVES ON DISASTER MANAGEMENT

Jean Luc Poncelet

OVERVIEW

For many years, disasters were perceived as unavoidable and only attributable to “natural” events. Over the last forty years, however, professionals in the health field have begun studying the subject, realizing that there is potential to avoid the many negative consequences linked to such hazards. Public health, sociology, and emergency medicine specialists were among the first groups to investigate these issues scientifically, examining ways to protect lives from the impact of disasters.

Pioneers in this new area of research included Professor Michel Lechat from the University of Louvain in Belgium, Professor Peter Safar from the University of Pittsburgh in the United States, and Professor Rudolph Frey from the University of Mainz in Germany. Professor Lechat established the Center for Research on the Epidemiology of Disasters in 1973, which hosts the only comprehensive worldwide hazard database. Professors Safar and Frey founded the Club of Mainz in 1976, which would become the World Association for Disaster and Emergency Medicine. Its focus was improvement in the worldwide delivery of pre-hospital and emergency care during everyday events and mass casualty disasters.¹ More recently, the approval of the International Health Regulations in 2005 by the World Health Assembly empowered public health officers, infectious disease specialists, and epidemiologists to manage evolving epidemics with the potential to reach catastrophic levels such as seen in the 1918 “Spanish flu.” The disciplines of public health and emergency medicine have both made substantial contributions to the field and are now intimately linked. Subsequently, a growing number of professionals have systematically investigated disasters from a multidisciplinary and multihazard perspective.

This chapter will provide an international perspective that focuses on the evolution of the approach health specialists have used to reduce the health consequences linked to disasters. It will highlight some of the main aspects of humanitarian disaster response training and disaster risk reduction. The first section explores how disaster management has evolved to its present status, whereas the latter section explores avenues for future growth. Examples of developments in emergency medicine education and research will also be discussed.

STATE OF THE ART

40 Years of Steady Improvement in the Approach to Preparedness

In 1976, a major shift took place in the field of humanitarian disaster response. Several disasters occurred in a relatively short period of time in a same geographical region. The most significant of these were earthquakes impacting Peru in 1970, Nicaragua in 1972, and Guatemala in 1976. These caused significant devastation and loss of life, and the ministers of health in Latin America and the Caribbean subsequently called for changes in the international humanitarian response mechanism. Until that point, disaster response was mostly reactive both at the national and international levels.

Recognizing the shortcomings of an improvised disaster response, these ministers of health requested assistance from the Pan American Health Organization (PAHO) to propose ways to reduce disaster health consequences. PAHO is the regional office for the World Health Organization (WHO) in the Americas. In response, PAHO created a disaster preparedness program that improved the national capacity for responding to catastrophes. The resulting plan, passed as Resolution X at the PAHO 24th Directing Council, called on member states to, “develop plans, and, as necessary, enact legislation, set standards, and take preventive or palliative measures against natural disasters and disseminate these measures throughout the sectors concerned [with] coordinating their action with that taken by the corresponding services of the Pan American Health Organization.”² Passage of this resolution represented a turning point in disaster response strategy, switching from an ad hoc response to a systematic preparedness approach. What was considered by many as an act of God or nature became viewed as an event with consequences that could be significantly reduced by improving governmental and institutional preparedness.

In the field of public health, disasters are defined as situations in which the local health response capacity is overwhelmed to the point that external (often international) assistance is required. Typically, in these events, the number of injuries and deaths exceeds the level the emergency services can absorb. **At the same time, the health system loses capacity because its infrastructure**

Table 5.1. Topics Frequently Included in Disaster Health and Medicine Curricula

Acute medical response	Prehospital emergency plans
Long-term medical support	Epidemiology
Surveillance	Hazard vulnerability analysis
Reconstruction of the medical and health system	Refugees
Disaster impact on public health	Sanitation
Transportation and communication	Water supply
Mental health	Nutrition and food supply
Hospital emergency plans	Shelter
Management of donations	Reconstruction of infrastructure
Mass casualty management	Disaster legislation

is seriously affected or completely overwhelmed and healthcare personnel have suffered injuries and deaths or are unable to work.

Hence, disasters are situations in which a system can no longer meet the demands for health and medical services. The science of disaster response integrates all existing resources to increase capacity and address the needs that could not be met using standard operating procedures. The central objective of a disaster program is to prepare entities for coordination of necessary resources to reduce the disaster’s negative impact on health. The funding needed for preparedness activities can be relatively small; what is most needed is the political support empowering the disaster management entity to assume the necessary leadership role to conduct the coordination function. It is very difficult for politicians to invest resources in the management of disasters as such events are rare and unlikely to occur during the tenure of any one individual. In addition, efforts invested in disaster preparedness are much less likely to attract the interest of voters.

More recently, the concepts reflected in Resolution X have been applied not only to “natural” disasters but to all hazards. This preparedness methodology is now widely accepted and used to address any public health event of international interest, such as a possible influenza pandemic, as described in the International Health Regulations (IHR).³ Professionals in the field of chemical and radiological disasters have also adopted similar preparedness approaches.^{4–6}

The first pillars of health preparedness began in the late 1970s with simulations or tabletop exercises, and drills or live exercises that included the participation of several institutions through a multidisciplinary approach. Following suit, a number of countries started preparedness planning in their hospitals and later expanded activities to other institutions such as water systems.⁷ Presently, a wealth of guidelines exist on the web covering a variety of topics, from establishing an Emergency Operations Center to describing the amount of water in liters that should be distributed to displaced populations or those in shelters.^{8–10} This and other information can now be found at virtual knowledge centers such as the Knowledge Center on Public Health and Disasters.¹¹

Training in disaster preparedness has expanded over these last few decades. According to a survey performed in 2003, 70%

Table 5.2. Recommendations for International Donations

1. Donations of cash or credit provided to health authorities or international agencies should be used whenever possible.
2. Donations should be aimed at restoring the quality of healthcare to pre-disaster levels.
3. Perishables or short-life donations should only be made on request from, and with prior approval by, the National Health Disaster Coordinator or other Ministry of Health authority.
4. The World Health Organization’s list of essential drugs and supplies should be used as a guideline by those wishing to donate.
5. Recipient countries should improve their distribution systems to ensure the best utilization of donated resources.

of the faculties of medicine in Latin America and the Caribbean were teaching at least a few hours of disaster management.¹² A sample of the most frequent topics included in such trainings is listed in Table 5.1.

Health and disaster legislation has also greatly improved.^{13,14} In many countries, the progressive expansion of health and disaster-related standards and legislation resulted largely in response to the occurrence of disasters. These events helped governments identify problems and propose solutions. Based on these experiences, research activities, and field work, new standards and legislation were eventually created.¹⁴ Some examples of these are found in countries where they form the basis of establishing hospital emergency committees and defining hospital construction standards. On a broader scale, subregional institutions – such as the Ministries of Health for Central America, South American Andean Countries, and South East Asia – also pass resolutions providing standards and defining the scope of regulations that form and implement a National Disaster Relief and Prevention System.

Although great progress has been made in preparedness, issues first identified in the 1980s remain as significant challenges. For example, nongovernmental organizations (NGOs), representatives from governments, and United Nations (UN) agencies met in Costa Rica in 1986 and established a series of specific recommendations to guide direct international donations (see Table 5.2).¹⁵

Although these approved policy guidelines have been updated over time, relief agencies remain far from being compliant with the recommendations. Examples of such noncompliance are reflected in the continually perpetuated disaster myths and misconceptions of disaster management realities, which contradict these recommended standard procedures (see Table 5.3).

In the 2010 Haitian earthquake, more than 400 health and medical groups provided services. While several were excellent, many of them were of questionable skill and efficiency, and some may have actually inflicted harm.¹⁶

From Preparing the Response to Mitigating the Impact

In a perfectly designed health disaster preparedness plan, all existing resources, including those at the local, national, and international levels, are used in the most efficient way to minimize the number of lives lost, contain diseases, and limit disabilities. However, preparedness has its limits as reality has shown. The Mexico City earthquake of 1985 illustrated the limits of preparedness,

Table 5.3. Disaster Myths and Realities

<i>Myth</i>	<i>Reality</i>
Foreign medical volunteers with any kind of medical background are needed.	The local population almost always covers immediate life-saving needs. Only medical personnel with skills that are not available in the affected country may be needed.
Any kind of international assistance is needed, and it is needed now!	A hasty response that is not based on an impartial evaluation only contributes to the chaos. It is better to wait until genuine needs have been assessed.
Epidemics and plagues are inevitable after every disaster.	Epidemics do not spontaneously occur after a disaster and dead bodies will not lead to catastrophic outbreaks of exotic diseases. The key to preventing disease is to improve sanitary conditions and educate the public.
The affected population is too shocked and helpless to take responsibility for their own survival.	On the contrary, many find new strength during an emergency, as evidenced by the thousands of volunteers who spontaneously united to sift through the rubble in search of victims after the 1985 Mexico City earthquake.
Disasters are random killers.	Disasters strike hardest at the most vulnerable group, the poor, and especially women, children, and the elderly.
Locating disaster victims in temporary settlements is the best alternate.	Temporary settlements should be the last alternate. Many agencies use funds normally spent for tents to purchase building materials, tools, and other construction-related support in the affected country.
Conditions are back to baseline within a few weeks.	The effects of a disaster last a long time. Disaster-affected countries deplete much of their financial and material resources in the immediate post-impact phase. Successful relief programs gear their operations to the fact that international interest wanes as needs and shortages become more pressing.

Source: PAHO/WHO.¹⁷

when one of the best-prepared medical response teams in the city was killed in a hospital collapse. Almost 20 years later, Hurricane Ivan struck Grenada in 2004 (a Caribbean island of 90,000 inhabitants). The country suffered such a level of destruction that no response could be generated from the island's resources, regardless of its previous preparedness level. The 2010 earthquake in Haiti destroyed most public buildings and homes in the capital. The 2011 Tōhoku earthquake and tsunami in Japan that caused a nuclear reactor breach and released radiation surprised authorities who did not plan for a combination mega-disaster with all three events taking place nearly simultaneously.

These extreme situations illustrate the limits that preparedness can achieve. If destruction is complete and only victims remain after a major disaster, such as in the Philippines after Typhoon Haiyan in 2013, there is little that a preparedness approach can offer, no matter how well developed it is. These types of situations require a different perspective and new approach. The new approach developed after the 1985 earth-

quake in Mexico is based on the concept of mitigation, emphasizing protection of infrastructure and the health system.

In 1987, the UN Assembly adopted a resolution launching the International Decade for Natural Disaster Reduction.¹⁷ Its goal was to reduce loss of life, property damage, and social and economic disruption caused by disasters, especially in developing countries. The resolution establishing the International Decade for Natural Disaster Reduction was implemented in 1990.¹⁸ The concept of mitigation was born.

Later, the mitigation approach helped produce the concept of risk reduction, which recognizes the importance of moving beyond preparedness. Risk can be defined as a function of the hazard and vulnerability in which the hazard is an environmental (e.g., earthquake or hurricane), technological (e.g., chemical or radiological accident), or political (e.g., war or civil strife) event. The essential idea of mitigation focuses on separating the hazard (an earthquake or biological agent) from the vulnerability of the institution or the system. **If a building collapses, it is not attributed to the earthquake; rather, it was a consequence of poor building design or failure to use appropriate shake-resistant construction techniques.**

Since the late 1980s, an ongoing effort has existed in the health sector, especially in Latin America and the Caribbean, to protect health facilities so that life-saving functions can continue after a disaster. In the beginning, efforts centered on mitigating and refurbishing health facilities. Currently, the approach includes a more comprehensive vision, not just focusing on the construction aspects (structural and nonstructural dimensions), but also considering the functional aspects of a hospital.^{19,20} In this context, "functional" refers to all organizational components needed to provide service.

Enormous progress has been achieved in the field of mitigation. For example, methodologies now exist that can produce a vulnerability analysis for buildings. This is the detailed study on how a building would perform if a maximum magnitude event (such as an earthquake or hurricane) occurs. The information generated by these analyses provides guidance on how to improve construction and revise existing building codes.

Mitigation can be a very efficient strategy. For example, some structures have been protected from collapse through targeted adjustments, such as retrofitting. The cost of the additional construction requires a relatively small financial investment compared with the overall value of the building. However, mitigation can be expensive when applied to existing facilities in poor condition and it frequently reaches the point at which it is too expensive to be considered. Hence, a lower cost approach is needed to reduce vulnerability.

From Mitigation to Resilience

In the late 1990s and early 2000s, the increasing engagement of financial institutions in risk reduction opened the door to considering new incentives and justifications for such activities in addition to typical health-centered metrics such as lives saved. Participating institutions included the World Bank through its Global Facility for Disaster Reduction and Recovery and regional banks in Asia and Latin America.^{21,22}

Increasingly, studies demonstrate that the perception commonly accepted 40 years ago, that it is too costly to make a society resilient to disasters, does not hold true. Contrary to earlier thoughts, if mitigation is part of the development process, it is not too costly to make a society disaster resistant. For example,

when hazards are taken into account before construction begins, the increase in expenditures represents less than 4% of the total construction cost.²³

Although cost is an essential factor in justifying risk reduction, it is not the only element. It would be unacceptable to construct a critical facility, such as one providing an emergency service, in so suboptimal a manner that it collapses during an earthquake simply due to financial considerations.

The integration of these financial and other technical considerations is an extremely positive step, as it allows development professionals to include “risk reduction” in their projects. The end result is an improvement in society without increasing the risk from disasters. For example, development professionals have begun to take into consideration locating critical services on higher ground, instead of flood prone areas. With these advances, it is possible to design technical tools and to train experts to conceive new development projects in such a way that they will remain functional even after a major event occurs.²⁴ The objective is no longer simple mitigation, but to build resiliency by considering vulnerability in a more comprehensive way through the risk reduction approach.

Although at the time of this writing the risk reduction approach is still in the initial stages of development, it has already generated some results. The World Bank established an online tutorial for “Strengthening essential public health functions,” and one of these essential functions refers to disasters.²⁵

This tool allows the user to estimate a country’s level of preparedness and some aspects of risk reduction. Another example is the WHO/PAHO Hospital Safety Index.²⁶ This instrument allows trained local professionals to assess the safety level of health facilities. By applying this tool, government authorities can determine the likelihood that health and medical facilities will remain functional during and after exposure to known hazards.

Additional medical tools have also been developed to improve the quality of patient care. These instruments provide guidance on how to ensure quality care in disaster situations. For example, the U.S. Institute of Medicine within the National Academies has proposed a series of protocols referred to as “Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response.”²⁷ Many organizations have succeeded at improving the quality of care under catastrophic conditions. In 2012 and 2013, groups such as the ICRC (the International Committee of the Red Cross), MSF (Médecins Sans Frontières), and AusAID (Australian Agency for International Development) have developed their own guidelines, especially for the delivery of care during armed conflicts.

The UN launched a 2-year campaign in 2008 called “Hospitals Safe from Disasters” to ensure that these institutions are prioritized in reducing their vulnerability to hazards. Spearheaded by WHO and the UN International Strategy for Disaster Reduction (UNISDR), “the campaign will focus on structural safety of hospitals and health facilities, on keeping health facilities functioning during and after disasters, and on making sure health workers are prepared when natural hazards strike.”²⁸

However, simply having safe structures and processes may not be comprehensive enough or may not apply to a given situation. For example, countries with very weak economies could not expect to have a state of the art safe society in a decade. However, these countries could improve their overall disaster readiness by increasing their resilience. UNISDR defines resilience as the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of

the hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. The principle is to permit a community to experience the disaster with the capacity to absorb the impact without sustaining significant permanent damage. The first practical definition and documentation of resilience was achieved by the United Kingdom’s Department for International Development in 2011.²⁹ Hundreds of such projects now exist, created by this British agency in support of community resilience.

Although this topic has been proposed previously in other forms, the concept of resilience goes far beyond what has been done to date by the humanitarian community. It requires that all development activities fully embrace disaster risk and ensure that all tools are used in an integrated manner.

Shift in the Institutional Approach

Both governmental and regional institutions have significantly improved their disaster management efforts over the last 40 years. In a recent WHO survey report, 85% of the Ministries of Health globally have policies or programs related to disaster preparedness.³⁰ In Latin America and the Caribbean region, all countries with more than 20 million inhabitants have a formal multidisciplinary disaster agency and a staffed national disaster coordination office within the Ministry of Health.^{31,32} The goals of these groups are civil protection and disaster risk reduction at the national level. These departments within the Ministries of Health are the designated entities for protecting the public’s health from the consequences of disasters. The national disaster coordination office’s mission is to ensure the synchronization of all governmental disaster reduction efforts. These agencies promote preparedness and risk reduction responsibilities across all sectors, such as a federal emergency management agency or other organizations that provide civil protection. Over the last few years, especially since the adoption of the international health regulation renewed mandate, Ministries of Health have developed centers that catalogue information and coordinate responses for events with international consequences.³³ Such events include epidemics and any event occurring at a border, such as a volcanic eruption. In some countries, like the United States, the offices responsible for IHR and disaster management are integrated into the same department within the government.

Although these achievements represent a major step forward in national preparedness, the sustained improvement in quality and institutional continuity of these offices still relies on the frequent occurrence of disasters. In fact, the rate at which disasters occur has a substantial impact on institutional development of these agencies. Just as these national disaster programs and offices were established or have been significantly strengthened as the consequence of a catastrophe, they have also experienced reductions in their capacity or disappeared entirely when such events do not occur for prolonged periods. This tendency has been noted in both wealthy and developing countries. In the latter, a change of government is another common reason for reducing the disaster preparedness investment or for assigning new personnel with no experience to these offices. In countries where the percentage of career disaster employees is small (staff that earned their position rather than being politically appointed), it is difficult to maintain a capable disaster management program. The absence of a disaster in such countries is a threat to institutionalizing preparedness and changes the nature of the roles and functions within these offices. With time, these agencies focus increasing attention on smaller events. When a government

institution attends only to smaller emergencies, it loses its perspective and hence its capacity for cross-cutting coordination – its main function. Over time, the institution will isolate itself from other administrative entities and it will lose its close relationship with the top authority.³⁴

On the international scene, similar progress and challenges exist. In 1974, the international community made a significant commitment with the creation of the UN Disaster Relief Organization (the precursor entity to the Office for the Coordination of Humanitarian Affairs, OCHA) as a way to improve the international response to disasters. The reaction to the 2004 tsunami in Southeast Asia clearly showed that OCHA and many other agencies could successfully deliver aid, but also suggested that a stronger mechanism is needed to make the international response more efficient. Establishing a mechanism that attracts and coordinates more UN agencies (as is intended by UN humanitarian reform efforts) is an important step, but remains insufficient on its own.

Even in an ideal situation, in which all UN agencies and major NGOs agree to coordination using a single unified command structure, planners could not guarantee the most effective response. Instead, the efficiency of international assistance is mostly dependent on the recipient country's capacity to absorb, coordinate, and distribute the deluge of resources that could reach the affected population. Any international response effort that is not strictly and exclusively complementary with the national response will result in competition with, and disruption of, the country's relief activities. In other words, the best international humanitarian response is the one that complements the local response. The only exception to this is when no local organization exists or when the local authority is the reason for the chaos, such as in some complex public health emergencies (see Chapter 27). Even in those rare situations when the local population relies primarily on an international response, the objective must remain to rebuild the local response capacity that existed before the disaster. International assistance cannot be considered successful if the recipient country is left with minimal institutional capacity when support is withdrawn.

Institutionalization of Knowledge

Four decades ago, disaster-related issues were viewed simplistically, primarily guided by the lack of resources and the limited number of professionals in the field. The decision-making process was also less complex, because those issues that could be addressed were solved quickly and efficiently because few people were involved. Today, with the availability of more human and financial resources, institutions are compelled to both raise and respond to more complex issues. As a consequence, this expansion of the field requires a lengthy and more sophisticated consultation process, through networks of various professionals and professional associations.

The knowledge base for the field of international humanitarian assistance increases every day. This explosion of information is reflected not only in the number of experts in the field, but also in the number of related scientific and technical publications. A few examples are listed in Table 5.4.

The U.S. National Library of Medicine has inventoried more than 30,000 publications related to disasters.³⁵ Disaster management, however, is still a relatively new field, and the majority of the technical “knowledge” is derived from anecdotes and personal experiences, rather than from scientifically rigorous studies published in peer-reviewed journals, although this is chang-

Table 5.4. Sample List of International Disaster Medicine Journals

<i>Publication</i>	<i>Sponsoring Institution or Society</i>
<i>Japanese Journal of Disaster Medicine</i>	Japanese Association for Disaster Medicine (first published in 1996)
<i>Prehospital and Disaster Medicine</i>	World Association for Disaster and Emergency Medicine, editorial offices in the United States (first published in 1985)
<i>Disaster Medicine and Public Health Preparedness</i>	Society for Disaster Medicine and Public Health (first published in 2007)
<i>International Journal of Disaster Medicine</i>	Published by Taylor & Francis, editorial offices in Sweden (first published in 2004)
<i>American Journal of Disaster Medicine</i>	American Society of Disaster Medicine (first published in 2006)
<i>Annals of Disaster Medicine (web-based journal)</i>	Taiwan Society of Disaster Medicine (first published in 2002)

ing. The number of sophisticated investigations published to date is limited by a lack of research funding for such projects and the fact that disasters occur relatively infrequently. Therefore, the best training centers today must still rely significantly on post facto documentation of individual and group experiences. On the other hand, the number of institutions invested in disaster-related education, training, and research are growing. In the United States alone there are approximately 180 institutions sponsoring emergency management-related programs. Several websites document available courses.³⁶

Some information centers such as the Regional Disaster Information Center have been compiling an inventory of gray (non-peer reviewed) literature.³⁷ More than 15,000 publications are now accessible on the web without cost through this resource.

Within emergency medicine, formal education and certification in disaster-related fields is also developing. The Department of Emergency Medicine at the University of Paris, France, in collaboration with the Paris Fire Brigade, introduced a “Capacité de Médecine de Catastrophe” in 1981. The name of the certificate (capacité), although a postgraduate diploma, clearly indicated it was not meant to be a specialty.³⁸ This capacité was later organized in other French-speaking countries, such as Morocco. The European Center for Disaster Medicine was founded by the Council of Europe in the aftermath of earthquakes in southern Italy that occurred during the early 1980s. Since 1989, the Center has organized courses on emergency and disaster medical response, targeting mostly an Italian audience, but also countries from the Mediterranean basin. In the United States, Johns Hopkins University in Baltimore, Maryland, and the U.S. Center for Disease Control (CDC) organized international workshops on earthquake injury epidemiology that mainly focused on mitigation and response.³⁹ Several other U.S.-based universities have developed postgraduate programs for trained emergency physicians. For example, in 2006, the University of California at Irvine founded its Emergency Medical Services and Disaster Medical Sciences Fellowship, a 2-year program that includes completion of a master's degree.⁴⁰ Another example of postgraduate training is at the University of Linköping in Sweden where they collaborated with the regional health authorities and founded a Center

for Teaching and Research in Disaster Medicine and Traumatology. The center introduced a certificate in disaster management, which subsequently was offered to international students. The university continued to expand its educational portfolio and in 2006 granted its first Doctor of Philosophy in disaster medicine.

In addition to individual institutions offering advanced degrees, international consortia of universities now exist, creating a global educational effort. One example is a program initially developed in Europe called the European Master in Disaster Medicine (EMDM). In 1998, at the European Society for Emergency Medicine's first European Congress, organizers discussed the idea of an education platform for disaster medicine. The European Center for Disaster Medicine had offered training in emergency and disaster medicine since 1989. Similarly, the Department of Emergency Medicine at the Catholic University of Leuven, Belgium, had taught a postgraduate course on disaster medicine and management since 1988, in collaboration with the Medical Service of the Belgian Armed Forces. Integration of these two courses led to the establishment in 2001 of an educational program in which students could obtain EMDM certification. All partners agreed that this certificate was meant to acquire the status of a university diploma, as soon as requirements listed in the European Directives on Higher Education were satisfied. In 2004, the diploma designated as the European Master in Disaster Medicine was established as a second-level master's degree, (a master's degree obtained by an individual already holding a master's degree or equivalent), according to the Directives of the European Union. The two sponsoring organizations are the University of Eastern Piedmont, Vercelli, Italy, and the Free University of Brussels, Belgium. The diploma is issued by the University of Eastern Piedmont on behalf of both universities. Subsequently, several institutions in the United States have formally affiliated with the EMDM and supply faculty; these include Harvard, Yale, and the University of California at Irvine.

The EMDM program emphasizes concept development and strategic thinking, with less weight placed on operational training. The basic content is offered in a modular format and the modules address all subjects commonly classified under the terms "disaster medicine" and "public health." The design of the EMDM consists of an electronic textbook with problem-based interactive simulation exercises, delivered via the Internet. This distance-learning component is combined with a residential session, a master's thesis, and a final examination also administered over the Internet. Student evaluation is continuous.⁴¹ Due to the format chosen (Internet), the student population (between twenty-five and thirty-five per year) is international in scope. Total enrollment to date represents all five continents and more than fifty countries. Although the EMDM is European, as it is based on European Directives and the title is issued by European Universities, it is global as far as the faculty and the students are concerned.

Broadening the Approach to Include Multiple Institutions

The central premise of disaster health response and risk reduction is management of resources for a *population's* health, as opposed to therapeutic measures applied to large numbers of individual patients in an emergency medical situation. Not surprisingly, disaster response, preparedness, and vulnerability reduction rely not only on a multiplicity of institutions within the health sector (e.g., the Ministry of Health, the Red Cross and Red Crescent

societies), but also require resources administered by organizations outside of the healthcare field. Involvement of other sectors including national disaster coordination entities, financial institutions, military, fire brigade, and meteorological centers is essential. In theory, determining the entity that can and should coordinate these multiple organizations is straightforward. In practice, however, it remains a challenge.

Some countries that have marginalized the Ministry of Health's role in disaster response have met with catastrophic results. Such poor outcomes have occurred when the health response is assigned to agencies outside the ministry. It eliminates the health institution's ownership of the process and creates an unproductive competition with entities outside the health sector. Experience has shown that the Ministry of Health should lead the health sector as a complement to the national disaster coordination system. The Ministry of Health is recognized by sovereign states as being the highest decision level entity dealing with health issues. A Ministry of Health without a functional disaster program will leave a country's population vulnerable to disasters and reduce effective management of health resources.

The humanitarian reform movement has generated the concept of dividing humanitarian assistance into several topic-specific groups called clusters. Under this approach, one UN agency has been assigned to lead each cluster, as described in Table 5.5.⁴² Although this approach has great advantages from a management perspective, it also raises new challenges as health-related topics such as nutrition, water quality, or sanitation are split among different clusters. Continued improvement in multi-agency coordination at the international level is necessary. This issue was discussed at the PAHO/WHO 2012 assembly, where the ministers of health of Latin America and the Caribbean clarified responsibilities.⁴³

Table 5.5. Global Cluster Leads

<i>Sector or Area of Activity</i>	<i>Global Cluster Lead Agency</i>
Food Security	Food and Agriculture Organization/World Food Program
Camp Management & Coordination	UN High Commissioner for Refugees/International Organization for Migration
Early Recovery	UN Development Program
Education	UN Children's Fund/Save the Children
Emergency Shelter	UN High Commissioner for Refugees/International Federation of Red Cross and Red Crescent Societies
Emergency Telecommunications	World Food Program
Health	World Health Organization
Logistics	World Food Program
Nutrition	UN Children's Fund
Protection	UN High Commissioner for Refugees
Sanitation, Water, and Hygiene	UN Children's Fund

Source: <http://www.unocha.org/what-we-do/coordination-tools/cluster-coordination>.

RECOMMENDATIONS FOR FURTHER RESEARCH

Striking the Appropriate Balance between International Response and National Preparedness

International institutions continue to improve their disaster response capabilities. However, further improvement is needed, especially for mega-disasters such as the Southeast Asian tsunami of December 2004, the Haitian earthquake in 2010, and Hurricane Ivan that completely destroyed the Island of Grenada in 2004. New mechanisms resulting from the humanitarian reform movement, such as the cluster approach, and new sources of funding like the UN Central Emergency Response Fund, are signs of progress.⁴⁴ These and other developments are likely to stimulate further advances in international disaster response programs. However, coordination in situations where an overwhelming number of international response entities arrive in just a few days remains a challenge. Another area of concern is that improving international institutional response capability will only be successful if the level of individual countries' national preparedness improves simultaneously.

The difference in the preparedness levels between low-income countries and the international community is increasing. As a consequence, national authorities, especially in fragile states, increasingly see this gap as a threat to their authority. Countries that are more dependent on external assistance due to lack of wealth are less able to control those providing international assistance. This loss of autonomy and authority in developing countries is considered by some as a minor inconvenience, as it is outweighed by the immediate benefit from international assistance. However, there is some evidence that this gap in preparedness results in long-term political instability and negative impacts on the population after international aid arrives. The struggle for control between the national government and the international community has the potential to negatively impact the effective delivery of assistance.

In contrast to response efforts, national disaster preparedness receives much less international attention. The perceived failures in response coordination have been more visible than the contributing effects of inadequate national preparedness. As a consequence, analysts focus more on response issues when discussing deficiencies in disaster management. The conclusions that misattribute all the problems with disaster relief activities to failed response efforts frequently result from a lack of proper analysis. Although many failures in disaster response coordination exist, the root cause is primarily due to the lack of support for preparedness activities prior to the event.

This situation is of particular concern because disaster preparedness is the most efficient way to improve disaster response. Effective preparedness, especially in the least developed countries, is also the only way to ensure cost-effective mobilization of national resources and cost-effective international assistance. Focusing on preparedness is a more challenging approach because the international community has no control over planning efforts of individual countries, and these nations must juggle the competing priorities of daily emergencies with planning for the "what if." In the long run, however, it is the only possible solution for true improvement in disaster management.

Although this topic has been discussed for twenty years, the scientific evidence supporting the impact of preparedness is limited. For example, no rigorous comprehensive study exists analyzing the cost effectiveness of providing a region with needed infrastructure, supplies, and equipment to manage a disaster

prior to its occurrence in order to avoid the response deficiencies that result from the absence of these resources in the aftermath. This would provide low-income states a better idea of how much and on what preparedness activities to invest. Having just 1% of the operations budget dedicated to such research could make a difference.

Strengthening Emergency Medicine

Progress is possible, as is exemplified by a WHO document produced during the 60th World Health Assembly on May 23, 2007, which emphasizes improvements in national disaster preparedness. The document, entitled "Health systems: emergency-care systems," recognizes that "improved organization and planning for provision of trauma and emergency care is an essential part of integrated health-care delivery, plays an important role in preparedness for and response to mass-casualty incidents, and can lower mortality, reduce disability, and prevent other adverse health outcomes arising from the burden of everyday injuries." In addition, the document urges member states to assess comprehensively their prehospital and emergency care systems with regard to identifying unmet needs; ensuring involvement by Ministries of Health; establishing integrated emergency care systems; monitoring performance as a solid basis for ensuring minimum standards for training, equipment, infrastructure, and communication; ensuring that appropriate core competencies are part of relevant health curricula; and promoting continuing education.⁴⁵

However, additional issues remain. Large disasters with high casualty numbers, such as earthquakes, create ethical challenges for medical response teams. Can a team deployed by a country with high medical standards provide substantially lower quality medical services if these lower standards are the norm for the region in which they are working? Should a medical team be dispatched from a country that is not recognized for high healthcare standards to provide service to other countries? The WHO is now developing guidelines for Foreign Medical Teams, which have been implemented at least partially in the Philippines after hurricane Haiyan.⁴⁶ More operational research is required to identify the qualifications, selection criteria, and post-disaster evaluation metrics for these teams.

Improving Donations and Countering Disaster Myths

Appropriate handling of international donations remains an unresolved issue. At a conference in 1986, the main NGOs, government representatives, and UN agencies agreed on a set of recommendations for appropriate international humanitarian assistance.¹⁵ Although these recommendations have been widely published and subsequently implemented by a small number of agencies (those with the most experience and largest donor support), they are still not commonly practiced.⁴⁷ Presently, there are still large quantities of mostly useless supplies, sent at a high cost, that arrive too late to be beneficial following a disaster.

The types and quantities of humanitarian assistance donations are largely determined by the needs of the donors rather than by those requesting aid. Donations are still motivated by the horror of images on a television screen, rather than the sudden pressing needs of the affected population. To move toward resolving the problem, an international information campaign to educate the public and the media on ways to make appropriate donations is urgently needed. Improving the quality of

donations will require further research investigating ways to change the public's behavior and perceptions and will need to align incentives with institutional donors.

Instruments exist that provide more transparency in the management of humanitarian supplies. In the early 1990s, the Humanitarian Supply Management System was developed as a joint effort of Latin American and Caribbean countries, with the technical cooperation of PAHO. In 2004, the inter-agency Logistic Support System (LSS) was created to expand the experience of the Humanitarian Supply Management System in the Americas while building a global interface that serves agencies, NGOs, and donors, as well as countries. LSS was developed jointly with OCHA, the World Food Program, the UN Children's Fund, WHO, PAHO and the UN High Commissioner for Refugees, and is the most advanced example in the field.⁴⁸ This free instrument enables all users, both agencies and governments, to capture information on all humanitarian supplies received for the same disaster. This software enables the coordinating entity to collect and track the quantity of pledged and received donations. It complements existing tracking systems (systems designed to track supplies managed by one institution from the point of reception to the point of distribution). A large number of domestic disaster agencies have used the LSS software; however, this management tool and others similar to it are still rarely utilized proactively by international relief agencies. This challenge of managing donations is likely to remain unresolved until public opinion demands that the international community be held as accountable as national governments. For example, groups that constitute themselves as NGOs at the moment a disaster occurs, collect money, and then provide ineffective aid have not yet suffered consequences as a result of this dysfunction.

The issue of appropriate donations is only one of the recurring concerns identified more than twenty years ago as disaster myths and realities.¹⁷ Each of these seven notorious myths requires further study to analyze why they persist and suggest new potential solutions to counter them.

Improving Knowledge Discovery

A systematic analysis of large disasters would be an effective technique to gain knowledge from previous experiences and many organizations have attempted to adopt this methodology. One problem is that only a few large-scale disasters (events that overwhelm national capacity) occur. Therefore, a systematic analysis at the institutional or even at the country level is problematic because the limited number of events makes it difficult to draw meaningful conclusions.

A second challenge is the difficulty in obtaining an impartial analysis. Some improvement has occurred in this area, as exemplified by the 2004 South-East Asia Tsunami review coordinated by WHO.⁴⁹ However, many post-disaster analysis exercises are still limited to providing success stories, and few address the issues that require change. Many such documents are not even peer-reviewed. No real progress can be expected without a scientific and objective evaluation of a disaster's management.

Finally, a method is needed to incorporate this information permanently into the growing body of knowledge in the science of disaster public health and medicine. One example is that the National Library of Medicine is now creating web sites compiling the best of the grey and peer-reviewed literature. However, until this is done in a more systematic fashion, information will be lost as those who "learn" it retire or change jobs. The

fact that the same issues are identified again and again demonstrates that these recommendations have not been incorporated by institutions and universities into the growing body of science. The commonly used term "lessons learned" is problematic as it implies that this information is gained on a personal level (as when a child discovers that touching a hot object hurts) and not incorporated into an expanding permanent record. More appropriate terms for the results of these exercises would be "issues for action," "outcomes identified," or "new knowledge discovered." Research centers have a responsibility to collect these identified outcomes, retain them, and make them accessible to professionals in the field and to the public at large. Endeavors by universities such as those sponsoring the EMDM – or institutions offering postgraduate degrees in health disaster-related topics such as John Hopkins, the Hawaii Pacific Disaster Research Centers, and Cayetano Heredia University in Peru – are changing this pattern but more work must be done. This methodology offers the only real long-term solution for disaster coordination entities and international humanitarian agencies to absorb this knowledge into their operations and policies.

Strengthening the All-Hazard Approach

Previously unrecognized hazards, events, and threats are becoming national or international concerns. For example, chemical intoxication from dumping sites in Cote D'Ivoire, hemorrhagic dengue in Paraguay or Africa, severe acute respiratory syndrome in Asia, and the threat of bioterrorism are among the types of challenges that have recently justified declaring a national emergency. This trend is likely to increase and become more complex in the future. Experts from various specialties would have responded to these same disasters 10 years ago, but such events would not have attracted a great deal of political attention. Now, even incidents with smaller numbers of deaths or with the mere potential to threaten neighboring countries have become events of international interest. The disclosure of threats is expected to further increase because countries must now report all public health events with international implications under the International Health Regulations procedures.³

With the recognition of each emerging threat, the tendency has been to create a new mechanism at the national or international level to address it. Bioterrorism and pandemic influenza are among the recent examples. Addressing each hazard with a separate and unique mechanism, project, or agency is not sustainable. Such an approach weakens the existing coordination mechanisms by establishing parallel systems. One solution is implementation of a comprehensive all-hazard approach to managing threats. This would stimulate countries to revisit and strengthen their existing national disaster coordination system each time a new threat is perceived, rather than creating another separate strategy. This approach would initiate responses from both national and international systems during major crises, increasing inter-agency contact and enhancing mutual trust between all organizations. This all-hazard approach is logical but not yet widely recognized. The United States and several other countries have officially embraced an all-hazard strategy. However, rigid administrative procedures, departmental culture, and existing compartmentalization among professions and institutions are restrictive obstacles that require significant energy to overcome. Further identification and refinement of the essential disaster components associated with these events is required to promote a better understanding of this methodology.

Toward Stronger Inter-Agency Cooperation

Due to the increasing number of specialized disaster-related topics and the diversification of players in the humanitarian assistance field, it will be increasingly difficult for one entity to address sufficiently the multifaceted needs of disaster response and risk reduction – even in a specific sector. To be relevant, institutions will need to further specialize while simultaneously striving for stronger inter-agency cooperation. This also applies to national governments. These bodies will need to develop human resources in their respective Ministries of Health to specifically know what is available internationally, how to access such resources, and how to incorporate them as part of the national response.

Entities representing intergovernmental regional organizations, such as the Asian Development Bank or African Union, and subregional intergovernmental agencies, such as the Andean Committee for Disaster Prevention and Assistance, will become increasingly relevant and dually supported by national governments and donor countries. These groups, however, should maintain a limited scope and address the challenges of interconnectedness with a mosaic of partners. To be efficient, each entity must identify its unique valued-added specialty within the global village environment. In contrast, entities involved in improving global response processes must better recognize regional or subregional processes, and most importantly, include national systems in all of their considerations.

The International Federation of Red Cross and Red Crescent Societies have analyzed many multinational laws and regulations and created international protocols based on these evaluations.⁵⁰ More such efforts are needed. Subregional protocols, multinational agreements, and national legal frameworks are some additional examples of tools to improve inter-agency and intergovernmental cooperation that have been poorly documented and studied to date.

Addressing Climate Change and Security

Significant progress has occurred in risk identification, stemming mostly from the analysis of previous disasters. UNISDR is now regularly publishing the Global Assessment Report on Disaster Risk Reduction.⁵¹ These reports are developed based on a large body of original research by a wide range of institutions including UN agencies, governments, NGOs, and businesses. Material incorporated into these reports includes original data, case studies, analysis, and survey results. It enables the identification of a number of socioeconomic and environmental variables that may point to causal processes of disaster risk. In addition to this publication, specific risk vulnerability assessments have been developed by WHO to protect health from climate change.⁵²

New threats, such as the advent of climate change and its implications for disaster medicine, oblige relief organizations to revisit the concept of risk analysis. The 2003 heat wave, which is estimated to have killed approximately 15,000 persons in France, took Europe largely by surprise. In comparison, the threat of pandemic influenza has been much better anticipated. It is clear that efficient disaster management programs must guide their actions not only based on past experiences but also on future projections.

The concept of security is currently limited to discussions between northern hemisphere specialists. Developing countries remain more preoccupied by historically prevalent conditions rather than by lower probability “potential” threats. Bioterrorism and pandemic influenza are mostly overlooked in countries

where they are not present today. This may change in the not too distant future.

Security threats and climate change are examples of recently emerging challenges. In the near term, disaster agencies will require tools that can assist them in recognizing and anticipating such potential risks. The methodology for identifying the risks a country is likely to face (mostly perceptions, based on probability analysis assessing rate of occurrence and magnitude of impact) is incomplete and must await future investigations. Once established, however, this methodology will allow disaster entities to switch from a reactive attitude (based on probability of past events) to a proactive stance (based on perceived risks in the future). This would be a much more scientifically valid method to focus disaster mitigation and preparedness efforts.

A Stronger Scientific and Professional Approach

Historically, disaster preparedness and risk reduction have been based on a nonscientific common sense analysis of past events. As new resources become available, a more scientific approach is required to address important issues such as a country's degree of preparedness. At present, there are no internationally recognized standards for estimating either a country's or an institution's level of readiness. Research focused on establishing benchmarks for the assessment of preparedness is necessary. The WHO Office for Southeast Asia has developed a framework of twelve national disaster preparedness benchmarks. These are associated with a corresponding set of standards and indicators that elaborate the best practices to facilitate political commitments through a uniform framework for planning and evaluating emergency preparedness actions for the countries of Southeast Asia.⁵³ Baseline surveys measuring progress in a region are necessary to provide a gauge for further growth and compliance with such benchmarks.⁵⁴ Other areas that would benefit from scientific inquiry include identification of where disaster preparedness and risk reduction programs are needed and the essential elements that comprise a national disaster management policy.

Scientific and professional organizations must be involved not only in the investigation of the aforementioned topics, but also in lending expertise in response to issues raised by disaster management personnel. WDEM is proposing some criteria to identify minimum standards that define a disaster professional. However, future progress requires that research centers and academic entities propose scientifically rigorous methods to study, analyze, and respond to present challenges. Therefore, universities and professional associations must be included as partners in the disaster preparedness field. Some of these professional societies exist; however, thus far most are in emergency medicine. These include the World Association for Disaster and Emergency Medicine, the European Society for Emergency Medicine, the American Public Health Association, the Australasian College of Emergency Medicine, and the American College of Emergency Physicians. Still, more professional associations should be encouraged to participate.

Determining precise definitions remains a problem due to the multiplicity of expertise involved in this field. More deliberation will be required to move beyond the current multitude of existing classifications and reach agreement on internationally accepted definitions. For example, the International Strategy for Disaster Reduction has proposed some excellent definitions of disaster risk reduction terminology; however, too few entities regularly accept and utilize these definitions.⁵⁵ Instead, they promulgate

their own systems. Standardizing terminology would improve communication among sectors.

Research techniques will develop in new and innovative ways. The challenge imposed by difficulties in performing prospective investigations can be partially overcome through sophisticated simulation of disaster events. Simulation template models allowing experimental changes of environment, preparedness level, and response capabilities may serve as platforms for research and produce performance and outcome indicators. They may allow comparison of different scenarios and quantify the results of environmental manipulation, vulnerability reduction, and preparedness modification without creating risk to populations and care providers.

In this field, the tradition of using simulation exercises has continued to evolve and now has the ability to address massive public health problems. One such example is the U.S. "Top Officials" simulation exercise, referred to as "Top Off." This full-scale simulation was the largest and most comprehensive terrorism-response exercise ever conducted in the United States, involving multiple sectors and multistate participants.⁵⁶ The ConvEx simulation exercises, coordinated by the Inter-Agency Committee for the Response to Nuclear Accidents, test and evaluate the international emergency management system. They identify best practices, deficiencies, and areas requiring improvement that could not be detected in national exercises.⁵⁷ Sometimes these simulations precede real events (mass gatherings where there is a risk of disaster), such as the simulations conducted for the Cricket World Cup in the Caribbean in 2007. These types of simulations are considered one-time events and frequently do not include evaluation or continuity parameters to build cumulatively on previous exercises.

Another example of using simulations to improve disaster preparedness is the I SEE (Inter-active Simulation Exercise for Emergencies) project, financed by the Leonardo da Vinci Agency of the European Union. The goal of this endeavor was to develop an electronic platform and a pilot exercise for the team training of all the participants involved in disaster response management. The project involved a collaborative effort of universities and educational institutions from five European countries (Belgium, Italy, Romania, Spain, and Sweden) and started with a survey on the educational needs of 206 teaching institutions, providing different levels of education, from these five countries.⁵⁸ Project design was based on the survey results and followed by system development, formative evaluations, refining and retuning of the product, and development of a policy for implementation.

The I SEE project ran from October 2004 through September 2007. It was developed primarily as a research project to evaluate training methodologies in disaster medicine.⁵⁹ In the future, however, it may evolve into a tool for studying decision making, preparedness, and logistics, as the template allows customization of the exercise environment and scenario.

Improvements in disaster management will continue at a greater rate and more publications on disaster health management will appear. Subsequently, this expansion of information will require more intense participation of information centers. In the near term, the gray literature will remain among the best sources of information. New initiatives must be encouraged, especially in lower-income countries, which do not have ready access to or appropriately consider peer review as part of their daily operations.

Many governments have created positions within various agencies to manage disasters. These positions are mostly occu-

pied by professionals with a variety of backgrounds and training. A consensus does not yet exist on what constitutes the minimum qualifications for a specialist in disaster management. Creating such criteria would encourage further development of the specialty and improve professionalization of those involved. Ultimately, acceptance of such standards would increase the quality in all components of disaster management. Further work is needed to define these qualifications.

Reconstruction

Increasingly, reconstruction following disasters has been included as part of humanitarian assistance and mostly funded by emergency budget lines. The issues that arise during reconstruction, although similar to the acute aspects of risk reduction, are not lifesaving time-related decisions, but rather must be approached using a more deliberate and orderly process. Expertise is needed from developers and planners that is unrelated to the required knowledge for those making immediate disaster risk reduction decisions. As such, it may not be optimal to have humanitarian assistance personnel involved in reconstruction.

Similar to the long-term aspects of risk reduction, humanitarian specialists should remain in the advocacy role and permit development specialists to supervise reconstruction. If the initial response and rehabilitation phase must be under the leadership of humanitarian specialists, the long-term reconstruction efforts should be the responsibility of development professionals.

Some financial institutions such as the World Bank are developing tools for reconstruction based on post-disaster assessment. More such instruments should be developed. For example, very few individuals tasked with providing infrastructure expertise within Ministries of Health have developed a reconstruction plan or strategy that anticipates the approach to rebuilding damaged hospitals that account for known vulnerabilities of these institutions.

Resilience

Many disaster management specialists have recently adopted the concept of resilience (see UNISDR definition earlier in this chapter). This concept now requires authorities to develop a more comprehensive view of disaster management. A non-resilient community will lack redundancies or viable response and recovery alternatives, rendering it more vulnerable to the initial and long-term consequences of a disaster's impact. The challenge is in identifying which components of a community's assets are the most crucial in maximizing resilience. It is recognized that many aspects of a community can fail during a disaster, however relatively few will significantly compromise response and recovery. It is easy to identify such critical community resources after an event has occurred, but more difficult to quantify beforehand, when it really matters. More work is needed in the field of resilience to identify and implement effective strategies.

Conclusions

Disaster management has been a thriving global field for the last 40 years and remains a very promising area of specialization. In a short period of time, the discipline has evolved from using an ad hoc emergency response approach to a more comprehensive preparedness, mitigation, risk reduction, and resilience approach. It is now becoming intimately involved with emergency medicine and epidemiology. Presently, disaster management is at a critical

point; it must move from utilizing a “common sense perspective” in analyzing disasters to one involving more systematic, scientific, and professional methodologies. Initial progress was possible utilizing accumulated individual experience. However, the topic is now so vast and complex that its evolution will depend on substantive investment of additional resources in the support of future research. One proposed funding strategy is to designate a percentage of the disaster response budget for research.

Disaster myths identified almost thirty years ago still persist, such as the ineffective manner in which donations are appropriated. These myths represent important areas for growth as they involve fundamental principles of disaster management. Although these issues have been identified and described over the years, they remain an ongoing concern.

The main risk for the future is that the importance of national preparedness will be minimized. Although there is still the need for a global response to disasters, it must be based on national coordination to be successful. Strong national coordination capacity is the best investment the international humanitarian community can make because it is the most effective way to ensure that international assistance is efficiently used. In addition, it preserves the function of local organizations and leaves behind a positive image among the assisted population.

Witnessing the significant negative impact of disasters on human life provokes a great deal of public sympathy. Often, the need to respond to such events seems overwhelmingly important. As such, the disaster response component of the overall disaster management strategy seems most significant. Hence investment in improving disaster response capabilities has seemed to be the appropriate answer. The last 30 years of disaster management indicate that preparedness and risk reduction play even more important roles than the response phase. A real improvement in response to disasters will only be possible when additional resources are invested prior to the event, rather than when it is already too late to make a real difference – when victims already exist.

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