Disasters and their Effects on the Population: Key Concepts

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INTRODUCTION

The recent advances in technology and the ease with which news and information travel around the world has made learning about disasters in distant countries an almost weekly occurrence. From the recent conflicts in Syria, Iraq, South Sudan, the Central African Republic to the recent typhoon in the Philippines and recent flooding in Zambezi, these disasters have lead to unimaginable levels of destruction and death. Although most of these disasters occur in underserved areas in the world without adequate resources and technology, they can also occur in societies with advanced medical systems such as the United States, Europe and Japan. It is impossible to predict when and where the next disaster will take place. However, we can strive to be prepared to handle both the acute and longer-term effects of a variety of disasters in different populations. While the timing and the actual disaster event are difficult to predict, there are several consequences of disasters that are predictable and thus we can be prepared to deal with these consequences. As pediatricians, we must ensure that disaster preparedness includes the unique needs of children. Children are a vulnerable population with physiologic, psychological and developmental needs that are not seen in adult populations. There is a professional obligation to take an active role in disaster preparedness in order to advocate for the needs of infants, children and teenagers. In this module, we will review disaster definitions, classifications, and measures of severity; describe the phases of a disaster, review the World Health Organization recommended emergency response measures; discuss the role of humanitarian organizations; and present key issues that health care workers and medical volunteers may face in the relief role. The key message of this module is to understand that, while it is not possible to predict disasters, planning and preparation can help mitigate some of the morbidity and mortality that occur in the aftermath of a disaster. This message has been clearly stated by Benjamin Franklin: “Failing to plan is planning to fail.”
**DEFINITIONS**

**OBJECTIVES**
- Recognize events that can lead to disasters.
- Understand the individual and social factors associated with vulnerability, coping, and risk.

**CASE**
1. You are informed there has been a flood affecting one of the provinces of your country. According to the latest population census, around 200,000 people who are mostly poor live in this area.
   - What are the characteristics that indicate that this event can be defined as a disaster?
   - What type of disaster is it?
2. Twenty-five percent of the population affected by the flood are children aged 0 - 12 years old. This population is more vulnerable than others in disaster situations.
   - What characteristics make children more vulnerable?
   - What specific interventions are necessary to diminish the effects of disaster upon children?
3. After arriving at the flooded area, you must decide what to do to deliver health care to the victims.
   - What is the first step to be taken?
   - How useful are field hospitals in these situations?
   - How would you estimate the need for external help?

**Definitions**
What makes an event a disaster? Why is one hurricane or tornado a disaster and the next one, even with stronger winds, just a bad storm? The answer lies with how the population is eventually affected: both the direct effects on the people as well as the indirect effects or damage to infrastructure. The United Nations International Strategy for Disaster Reduction defines disaster as a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation. A disaster disrupts the normal pattern of life, causing both physical and emotional suffering and an overwhelming sense of helplessness and hopelessness. The impact on the socioeconomic structure of a region and environment often requires outside assistance and
intervention. Although there are many definitions for disaster, there are three common factors. (Box 1) First, there is an event or phenomenon that impacts a population or an environment. Second, a vulnerable condition or characteristic allows the event to have a more serious impact. For example, a hurricane will cause much greater damage to life and structures if it directly strikes an area with poorly constructed dwellings compared to striking a community of well-built homes with greater structural support. Identifying these factors has practical implications for communities’ preparedness and provides a basis for prevention. Third, local resources are often inadequate to cope with the problems created by the phenomenon or event. Disasters affect communities in multiple ways. Their impact on the health care infrastructure is also multi-factorial. The disaster event can cause an unexpected number of deaths. In addition, the large numbers of wounded and sick often exceed the local community’s health care delivery capacity. The community’s capacity to care for those affected is often reduced because professionals, clinics and hospitals have been affected or destroyed. This will have long-term consequences leading to increased morbidity and mortality. An example of this can be seen in the 2010 Haiti earthquake disaster. Prior to the January 12, 2010 earthquake in Haiti there were only 11 hospitals in Port-au-Prince. The earthquake damaged or destroyed at least eight of these hospitals. The remaining health facilities were quickly overwhelmed by large numbers of survivors requiring a wide range of care, particularly for traumatic injuries. The 2010 earthquake in Haiti demonstrates how a disaster becomes much more devastating when the preexisting medical system is already inadequate and poorly functional. This makes integrating and organizing outside assistance more fragmented and chaotic. An epidemic/pandemic can cause a surge in the number of people seeking medical care/treatment, and thus overwhelms the abilities of even a well established medical system. The Ebola epidemic in West Africa is an example of how a disaster can affect the rest of the world, as cases of Ebola were
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seen outside the boundaries of Guinea, Liberia, and Sierra Leone including in the US and Europe. The Ebola epidemic stressed the emergency medical services and hospitals throughout the world, particularly in Guinea, Liberia and Sierra Leone. The disaster can have adverse effects on the environment that will increase the risk for infectious transmissible diseases and environmental hazards. The loss of clean drinking water and proper sewage disposal/treatment can have devastating effects on a population affected in the disaster. This will impact morbidity, premature death, and future quality of life. There can be shortages of food, with severe nutritional consequences. All these conditions lead to a sense of hopelessness, vulnerability, and inability to think that the future will be better. This means that people no longer visualize their future by making plans such as finishing school, getting married and working. This “foreshortened future” affects the psychological and social behavior of the community. (Figure 1)

Classification of disasters
Disasters can be divided into 2 large categories (Box 2):
– Those caused by natural forces.
– Those caused by man.

Natural disasters
Natural disasters are caused by natural forces, such as earthquakes, volcanic eruptions, hurricanes, fires, tornados, and extreme temperatures.

They can be classified as rapid onset disasters such as earthquakes or tsunamis, and those with progressive onset, such as droughts that lead to famine.

These events, usually sudden, can have tremendous effects. For instance, in November 2013, more than 6000 people died and displaced over 4 million people in Philippines as a result of Typhoon Haiyan. Since it is still extremely difficult to precisely predict the climatic and geological changes capable of causing a disaster, preparing for these types of disasters remains a major challenge. Great natural disasters have also occurred recently throughout the world (Box 3).

**FIGURE 1. Components of a disaster**

PHENOMENON × VULNERABILITY = IMPACT

- Droughts
- Volcanic eruptions
- Floods
- Earthquakes
- Hurricanes

- Human
- Economic
- Social
- Ecological
- Political
- Legal

Adapted from Handbook of War and Public Health; ICRC; 1996.
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2) BOX 2. Types of disasters

<table>
<thead>
<tr>
<th>Natural disasters</th>
<th>Man-provoked disasters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricanes or cyclones</td>
<td>Technological/industrial disasters</td>
</tr>
<tr>
<td>Tornadoes</td>
<td>Leaks of hazardous materials</td>
</tr>
<tr>
<td>Floods</td>
<td>Accidental explosions</td>
</tr>
<tr>
<td>Avalanches and mud slides</td>
<td>Bridge or road collapses, or vehicle</td>
</tr>
<tr>
<td>Tsunamis</td>
<td>collisions</td>
</tr>
<tr>
<td>Hailstorms</td>
<td>Power cuts</td>
</tr>
<tr>
<td>Droughts</td>
<td>Terrorism/International violence</td>
</tr>
<tr>
<td>Forest fires</td>
<td>Bombs or explosions</td>
</tr>
<tr>
<td>Earthquakes</td>
<td>Release of chemical materials</td>
</tr>
<tr>
<td>Epidemics</td>
<td>Release of biological agents</td>
</tr>
</tbody>
</table>

3) BOX 3. Natural disasters in the Americas in 2013

heat waves:
Bolivia: August 2013, People affected 17490, 18 died

Earthquakes:
Colombia: September 2013, people affected 3957
Peru: September 2013, people affected 7084

Epidemics:
Costa Rica: Viral outbreak July 2013, People affected 1200, 3 died
Guatemala: Viral outbreak August 2013, People affected 1977, 8 died

Floods:
Argentina: July 2013, people affected 350000, 52 died
Bolivia: February 2013, People affected 145000, 25 died
Brazil: January 2013, People affected 200000, 4 died
Peru: Feb 2013, people affected 180766, 67 died

Volcanic Eruptions:
El Salvador: December 2013, people affected 63079

Tornado:
USA: May 2013, Oklahoma city, people injured 370, killed 26

Modified from: http://emdat.be/disaster_list

Usually, a great number of persons die when a complex humanitarian emergency occurs.
The inability to accurately predict these types of events underscores the need for countries to have disaster response plans to mobilize appropriate resources rapidly and efficiently. A well-defined organizational structure also must be created to coordinate both national and international assistance.

Although significant progress in sanitation and response to disasters has been achieved in certain regions of the world, developing countries continue to be highly vulnerable because of their fragile economy and health care and transportation infrastructure.

Man-made disasters
Disasters caused by man are those in which major direct causes are identifiable intentional or non-intentional human actions. They can be subdivided into three main categories:

Technological disasters
Unregulated industrialization and inadequate safety standards increase the risk for industrial disasters. Examples include the radioactive leak in the Chernobyl nuclear station in Ukraine (1986) and the toxic gas leak in a Bhopal factory in India (1984). Both of these disasters were associated not only with many deaths but also with long-term health effects in the affected population.

Terrorism/Violence
The threat of terrorism has also increased due to the spread of technologies involving nuclear, biological, and chemical agents used to develop weapons of mass destruction. Too often the professionals who must respond to such disasters are not appropriately trained, although several national and international organizations are developing training programs for these types of events.

Complex humanitarian emergencies
The term complex emergency is usually used to describe the humanitarian emergency resulting from an international or civil war. In such situations, large numbers of people are displaced from their homes due to the lack of personal safety and the disruption of basic infrastructure including food distribution, water, electricity, and sanitation, or communities are left stranded and isolated in their own homes unable to access assistance. These settings are often characterized by a breakdown in social and physical infrastructure, including health care systems. Any emergency response usually has to be implemented in a problematic political and safety environment.

There has been a global increase in civil war fueled by ethnic confrontations since the mid-1990s (Figure 2). In modern conflicts the greatest loss of life (90%) occurs among civilian nonfighters because of direct physical injury and the public health impact of war (Figure 3).

Complex humanitarian emergencies often result in a staggering loss of lives. Table 1 shows the estimated excessive deaths among civilians in several recent and ongoing crises.

Displaced populations
Natural disasters and complex emergencies can force many people to leave their homes. The primary purpose of United Nations High Commissioner for Refugees (UNHCR) is to safeguard the rights and well-being of people who have been forced to flee including the right to seek asylum and find safe refuge in another country. Refugees and internally displaced persons (IDPs) are among the categories of persons that UNHCR assists.
FIGURE 2. Number of disasters and victims in the world from 1990 to 2012

*Vic*tim: *Su*mm of deaths and total affected

No. of reported disasters


Portion of IDPs protected/assisted by UNHCR

Refugees flee their countries because of war, violence, famine, or well-founded fear of persecution for political, ethnical, religious or nationality reasons. According to the 2015 UNHCR estimates there are 21.3 million refugees and 10 million stateless people. (Figure 5). A person recognized as a refugee is entitled to certain protections under the terms of international humanitarian laws.

IDPs leave their homes for similar reasons but do not cross the boundaries of their countries. These individuals do not receive the same kind of legal protection, so helping them can be much more difficult. According to the 2015 Internal Displacement Monitoring Centre estimates, there are 65.3 million displaced people. More information is available at http://www.unhcr.org/figures-at-a-glance.html and/or http://www.unhcr.org/internally-displaced-people.html.

### Phases of disasters

Since interventions in emergencies evolve as a continuum, the identification of the following four phases is useful to better establish priorities and response activities, and to systematize previous experiences:

1. Preparedness phase
2. Emergency phase
3. Recovery phase
4. Mitigation and prevention phase

#### Preparedness phase

Planning comprises all the activities and actions taken in advance of a disaster. Planning should be based on the analysis of a community’s or organization’s risk for exposure to specific types of disasters. Preparedness plans should take into account the frequency of occurrence of each type of disaster, the anticipated magnitude of effect, the degree of advanced warning or suddenness of onset and offset, characteristics of the populations most likely to be affected, the amount and types of resources available within the community or organizational structure, and the ability to function independently without additional outside resources for periods of time. For more information on planning, see Module 3.

#### Emergency phase

Response comprises all activities and actions taken during and immediately after a disaster. This includes notification

### TABLE I. Deaths among civilian populations during recent complex humanitarian emergencies

<table>
<thead>
<tr>
<th>Country</th>
<th>Deaths</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudan</td>
<td>Over 1 million</td>
<td>1983 to date</td>
</tr>
<tr>
<td>Rwanda</td>
<td>500,000-1 million</td>
<td>1994 to date</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Over 1 million</td>
<td>1975-1993</td>
</tr>
<tr>
<td>Bosnia-Herzegovina</td>
<td>200,000</td>
<td>1992-1996</td>
</tr>
</tbody>
</table>
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FIGURE 4. Number of Refugees per 1000 Inhabitants

FIGURE 5. UNHCR Refugee Population 1990–2014
of the organizations involved in disaster response, setting up of initial communication networks, initial search and rescue, damage assessment, evacuation, sheltering and other multiple activities. The response phase lasts until the initial casualties have either been rescued or acknowledged as lost, and enough resources have been made available to meet immediate humanitarian needs of affected population, assessing damages and beginning to plan for restoration and recovery. In the case of conflict situation, displacement could be protracted until safety and security return to the place of origin of affected people. For those affected, response services may have to provide in camps designed to host them for short periods. While in most instances of natural disasters, normalcy returns in days to weeks, in the case of conflict, this could take several years before people return to their homesteads.

**Recovery phase**

The recovery phase is the period in which the affected organization or community works toward re-establishing self sufficiency. This is the period of new community planning, rebuilding, and re-establishment of government and public service infrastructure. The health status of affected population begins to return to pre-disaster conditions and the outside support services are gradually withdrawn.

**Mitigation and prevention phase**

This phase usually occurs when conditions are returning to their predisaster state. Mitigation is the phase in which all aspects of emergency management are scrutinized for “lessons learned”; the lessons are then applied in an effort to prevent the recurrence of the disaster itself or to lessen the effects of subsequent events. Mitigation includes preventive and precautionary measures such as changing building codes and practices, redesigning public utilities and services, reviewing mandatory evacuation practices and warning policies, and educating members of the community. Mitigation and planning are continuous processes, as lessons learned from a previous disaster are included in planning for the next one.

**Effects of disasters**

Disasters affect communities in multiple ways. They represent a public health hazard for various reasons (Table 2):

- Can cause an unexpected number of deaths and wounded or sick people that exceed the local resources capacity to respond and require external aid.
- Can destroy health infrastructure not only affecting the immediate response, but also disrupting preventive activities, leading to long-term consequences with increased morbidity and mortality.
- Can have adverse effects on the environment that will increase the risk for infectious transmissible diseases and environmental hazards. This will impact morbidity, premature death, and future quality of life.
- Can affect the psychological and social behavior of the community.
- Can cause shortages of food, with severe nutritional consequences.
- Can cause large movements of the population, both spontaneous or organized, to areas where health services might not be able to handle the excessive requirement.
### TABLE 2. Frequent effects of disasters

<table>
<thead>
<tr>
<th>Disaster type</th>
<th>Complex emergency</th>
<th>Earthquake</th>
<th>Strong winds</th>
<th>Floods</th>
<th>Gradual floods</th>
<th>Mudslides</th>
<th>Volcanic eruptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate deaths</td>
<td>Numerous</td>
<td>Numerous</td>
<td>Few</td>
<td>Numerous</td>
<td>Few</td>
<td>Numerous</td>
<td>Numerous</td>
</tr>
<tr>
<td>Severe lesions</td>
<td>Numerous</td>
<td>Numerous</td>
<td>Moderate</td>
<td>Few</td>
<td>Few</td>
<td>Few</td>
<td>Few</td>
</tr>
</tbody>
</table>

**Increased risk for transmissible diseases**

This risk applies to ALL significant disasters, and increases with overcrowding and deterioration of sanitary conditions.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Complex emergency</th>
<th>Earthquake</th>
<th>Strong winds</th>
<th>Floods</th>
<th>Gradual floods</th>
<th>Mudslides</th>
<th>Volcanic eruptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to health centers</td>
<td>Moderate; can be severe if health centers are military targets</td>
<td>Severe</td>
<td>Severe</td>
<td>Severe but localized</td>
<td>Severe but localized</td>
<td>Severe</td>
<td>Severe</td>
</tr>
<tr>
<td>Damage to water supply</td>
<td>Severe</td>
<td>Severe</td>
<td>Slight</td>
<td>Severe</td>
<td>Slight</td>
<td>Severe but localized</td>
<td>Severe</td>
</tr>
<tr>
<td>Food shortage</td>
<td>Severe</td>
<td>May result from economic and logistic factors</td>
<td>Frequent</td>
<td>Frequent</td>
<td>Not frequent</td>
<td>Not frequent</td>
<td></td>
</tr>
<tr>
<td>Significant population displacements</td>
<td>Frequent</td>
<td>Frequent; increased likelihood in severely damaged urban areas</td>
<td>Not frequent</td>
<td></td>
<td></td>
<td>Frequent</td>
<td></td>
</tr>
</tbody>
</table>

OBJECTIVES

- Recognize crude mortality and under 5 mortality rates as a measure of disaster severity
- Recognize the environmental factors associated with increased morbidity and mortality rates
- Know the 5 leading causes of death in humanitarian emergencies occurring in developing countries

Severity of a disaster

As was demonstrated in Haiti, the more fragile the pre-event health status of the affected population and inadequate the pre-disaster infrastructure, the more severe the disaster. Disaster severity will, therefore, vary according to its magnitude and the vulnerability of the population. An example of this is seen in earthquakes of similar magnitude in different parts of the world. Earthquakes in China and Haiti resulted in a large number of collapsed buildings, including schools and hospitals, related to substandard building practices in both, and thus high number of casualties. The damage from similar magnitude earthquakes occurring in Tokyo in 2009 and Chile in 2010 resulted in far less loss of life in large part due to the higher quality of construction and stricter building codes. When assessing the outcome of a disaster, public health officers describe its severity by the number of human lives lost using the crude mortality rate (CMR). CMR is usually defined as the number of deaths per 10,000 inhabitants per day. In developing nations, the reference CMR value varies from 0.4 to 0.7 deaths per 10,000 people/day. A CMR above 1 death per 10,000 people/day or under-5 mortality of over 2/10,000 children under 5 per day is considered a humanitarian emergency. To assess the progression of a disaster and the effectiveness of relief interventions, measure the CMR over several appropriate time intervals. For example, during the month following the massive movement of Rwandan refugees to Eastern Zaire (the...
While both conflicts and natural disasters can result in immediate deaths due to trauma or drowning, there are many preventable deaths that occur in later phases of a disaster. Figure 6 displays the differences between baseline and peak disaster CMR experienced by displaced populations in different countries. Additional information regarding these epidemiologic measurements may be found in Module 2, “Preventive Medicine in Humanitarian Emergencies.”

**Vulnerable victims**

Most diseases associated with the event can be prevented by adequate interventions, especially ensuring basic life saving needs of the population are met. This includes shelter, food, water, sanitation, health care services and security measures. Immediate mortality in any type of disaster is not higher in a specific age range; instead, it usually reflects the age distribution of the overall population. However, later on the mortality rate associated with the disaster is disproportionately higher among the youngest and oldest people. In a refugee crisis in Northern Iraq in 1991, children aged 0 to 5 accounted for only 18% of the total refugee population, but they accounted for 64% of the overall refugee mortality rate.

**FIGURE 6. CMR and under-5 MR during the 2011 Horn of Africa Drought crisis**

The most vulnerable groups include children, especially those displaced from their families, women who are pregnant, lactating, or live without their spouse; individuals living in households headed only by women; disabled individuals; and the elderly. In addition to disproportionately high mortality rates, children displaced from their family are at high risk for a number of adverse consequences, including rape, torture, robbery and exploitation in child labor, child trafficking, and child soldiering. Additionally, because of certain physical and physiological characteristics, infants and children are more vulnerable to the release of toxic substances and the overcrowding associated with the displacement of large populations (Table 3). Consequently, it is critical to attempt to reunite children with their families as soon as possible and pay special attention to reducing their vulnerability in all disaster response planning (Box 4).

**Causes of mortality**

The immediate goal for any intervention in humanitarian emergencies is to reduce the number of deaths. While both conflict and natural disasters can result in immediate deaths, there are many preventable deaths that occur in later phases of a disaster over a longer time period.

Five leading medical problems have consistently been found to be the major mortality causes in post-war or post-natural disaster settings among vulnerable populations (Box 5).

### TABLE 3. Vulnerable pediatric characteristics

<table>
<thead>
<tr>
<th>Pediatric characteristic</th>
<th>Special risk during disaster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>Higher minute volume increases risk from exposure to inhaled agents. Nuclear fallout and heavier gases settle lower to the ground and may affect children more severely.</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Higher risk for dehydration from vomiting and diarrhea after exposure to contamination.</td>
</tr>
<tr>
<td>Skin</td>
<td>Higher body surface area increases risk for skin exposure. Skin is thinner and more susceptible to injury from burns, chemicals, and absorbable toxins. Evaporation loss is higher when skin is wet or cold, so hypothermia is more likely.</td>
</tr>
<tr>
<td>Endocrine</td>
<td>Increased risk for thyroid cancer from radiation exposure.</td>
</tr>
<tr>
<td>Thermoregulation</td>
<td>Less able to cope with temperature problems, with higher risk for hypothermia.</td>
</tr>
<tr>
<td>Developmental</td>
<td>Lower ability to escape environmental dangers or anticipate hazards.</td>
</tr>
<tr>
<td>Psychological</td>
<td>Prolonged stress from critical events. Susceptible to separation anxiety.</td>
</tr>
</tbody>
</table>

It is critical to attempt to reunite children with their families as soon as possible and give special attention to reducing their vulnerability in all disaster response planning.

**BOX 4. Immediate measures developed to reduce population’s vulnerability during a disaster**

- List vulnerable people in the community
- Provide visible identification tags to all children
- Identify the community leaders —women whenever possible— capable of taking care of a vulnerable individual or group
- Guarantee the care and safety of refugees
- Consider the vulnerable individuals when planning the distribution systems
- Assign priority to the search for parents or families of unaccompanied or otherwise vulnerable individuals
- Post in a central place the photographs of children separated from their families, to enhance their identification
- Make sure that camps or shelters, if needed, are located as near the affected areas as possible
- Place families and groups of neighbors together

**BOX 5. The five leading causes of death in humanitarian emergencies occurring in developing nations**

- Diarrheal diseases and dehydration
- Measles
- Malaria
- Acute respiratory infections
- Malnutrition

**BOX 6. Predisposing environmental conditions**

- Disruption of food sources/economy
- Disruption of sanitary services
- Income loss
- Discontinuation of healthcare services
- Overcrowding
- Lack of adequate water supply
- Loss of shelter

Unique features in each disaster (e.g., climate, topography, pre-existing social structure, physical conditions) affect the proportion of deaths associated with each of these, as well as other causes. Figure 7 shows mortality in various displaced populations following natural disasters and armed conflicts. Malnutrition, although not identified as a significant immediate cause of death, is the most important factor correlated to the high mortality rates due to transmissible diseases. A study including 41 displaced populations (Figure 8) showed a clear correlation between the crude mortality rate (i.e., death from all causes) and the prevalence of malnutrition.
In the context of a disaster, each of the leading causes of death relates to one or more predisposing environmental conditions that increase the incidence of disease and the mortality rate per case (Box 6). For interventions to be effective, resources should be targeted to prevent and correct these predisposing environmental factors, in addition to treating the ill individuals. At a World Health Organization conference, international relief experts identified 10 essential emergency relief measures to consider when planning a disaster response. These interventions should not to be implemented in a strict order; priority for each of them is correlated to the particular needs relating to each emergency situation. In addition, these interventions should be adjusted to the particular situation in the affected region.
Each disaster or humanitarian emergency is a unique situation determined by the event that caused it, climate, geography, culture, social structure, and previous conditions of the affected population. Thus, national and international organizations should initially implement a rapid assessment and resist the impulse to immediately respond before critical information is available. Interventions that are based on speculations rather than on accurate information obtained in the place of the disaster are likely to waste time and valuable resources, ultimately increasing the suffering of the affected population. Although similar types of disasters have predictable patterns of disruption as shown in Table 2 (page 13), the degree of severity and type of response is affected by local features.

An appropriate response should be based on the particular needs in each disaster. Continuously reassess the needs at both the local and community levels, where the disaster has occurred, as well as at national or regional levels.

Unpredicted effects may require urgent attention. For example, safe water supply is unlikely to be affected by a strong storm or a mudslide. However, if the regional system for water pumping or purification is affected, the shortage of safe water becomes the key issue that must be addressed to prevent disease and excessive mortality in the affected population. Use resources in a timely manner, within the time frame determined by the disaster. For example, trauma is likely to be the major cause of death immediately after an earthquake. If trauma surgery teams and field hospitals arrive a week after the earthquake, most of the trauma-related deaths will already have occurred and very little benefit will be obtained from this high-cost resource.

WHO and PAHO have developed guidelines for the appropriate use of field hospitals in disasters of sudden impact (www.paho.org/disasters).

Essential emergency relief measures

1. Do a rapid assessment of the emergency situation and the affected population.
An assessment should accurately define the needs, so that limited resources will be efficiently used to maximize life-savings and other vital goals.
SECTION III / ESSENTIAL EMERGENCY RELIEF MEASURES

National level: Assessments are typically done by expert teams focused on promptly defining the emergency magnitude, the environmental conditions and infrastructure damage, the major health and nutrition needs of the affected population, and the local response capacity.

Community level: In the immediate aftermath of a disaster, the initial response will primarily come from local resources. Communities must be prepared to do a local assessment of disaster impact. Health care professionals should be prepared to assess the health issues in their community, and understand the mechanism of sharing that information with higher levels of authority, in order to contribute to regional or national assessments. Assessments need to be repeated and the quality and specificity of data improved during the rescue and recovery phases or whenever any major change occurs, such as an aftershock earthquake. Information gathered through the assessments is used by the resource managers to determine the allocation of resources in any large-scale disaster.

2. Provide adequate shelter and clothing.
Exposure to the climatic conditions in disaster situations can increase caloric requirements and lead to death.

Community level: Find short-term shelters for all homeless individuals, particularly focusing on vulnerable populations. Shelters should be appropriate for the climate. Keep individuals within their communities and family networks as much as possible. In general, it is recommended to direct resources to rebuilding within the community, rather than building large camps or temporary settlements outside the disaster area.

3. Provide adequate nutrition.
Large-scale bulk food requirements are typically calculated based on a minimum of 2,100 kcal/person/day.
Community level: Communities must plan to distribute food equitably and include vulnerable groups. As global food resources improve, establish targeted supplemental and therapeutic feeding programs for malnourished individuals.

4. Provide elementary sanitation and clean water.
The estimated minimum requirement for drinking water is 3-5 L/person/day of clean water but 15-20 L are recommended for all needs including washing and cooking.

Community level: Re-establish supplies of clean water and effective sanitation and waste disposal services as soon as possible. In an emergency, there should be at least one latrine per 20 individuals. As the situation stabilizes, each family of 5 should have one latrine.

5. Set up diarrhea control program.
An increase in diarrheal disease is a predictable outcome of disasters because of infrastructure and health care services disruption.

Community level: Rapidly implement community-based education on appropriate household sanitation measures, diarrhea prevention, and household case management, particularly for young children with diarrhea. Health care centers should anticipate the needs for additional cases of dehydration, using appropriate low-cost strategies (ORS/ORT) and recognize possible cases of cholera and dysentery.
6. **Immunize against measles and provide vitamin A supplements.**
Measles has been a major source of mortality among crowded, displaced populations in which malnutrition is prevalent. Therefore, measles immunization is the only vaccine that is routinely considered for use as a preventive measure immediately following a disaster. Since vitamin A deficiency is common and contributes to measles-related mortality, consider mass distribution of vitamin A for vulnerable populations.

**National level:** National and international agencies work together to determine if measles immunization or vitamin A distribution is necessary following a particular event. If necessary for all or part of the deemed population, national authorities establish the central logistics (e.g., cold chain, personnel, materials) to manage a mass immunization/distribution campaign.

**Community level:** Health officers must immediately assess the available cold chain as part of its health care assessment. Health care professionals must monitor for cases of measles and develop a plan for mass immunization and/or mass distribution of vitamin A to the vulnerable groups in their community.

7. **Establish minimum reproductive health and HIV services and improve primary medical care.**
Immediate casualties (rescue phase) of a sudden impact disaster are likely to include a limited number of trauma victims. In most disasters in fragile communities the larger number of disaster-related deaths (i.e., deaths above the baseline crude mortality rate) will be due to preventable causes of mortality in the weeks and months following the impact. These casualties can largely be prevented by community health education and access to appropriate primary care. This included emergency obstetric and neonatal care, prevention and management of sexually transmitted infections, management of the health effects of sexual violence, ensuring safe blood transfusion and universal precautions in health facilities. Initial efforts should be focused on identifying those who were on treatment before the onset of the disaster and to restart treatment for them.

**Community level:** Health professionals should know the emergency transport and response systems in their community. Health care interventions during the rescue phase should include minimizing life losses caused by the direct impact of the event (e.g., trauma, drowning). After the rescue phase, health care resources should be focused on re-establishing and improving the access and quality of primary care, particularly for the most vulnerable groups.

8. **Set up disease surveillance and health information systems.**
Effective health information and disease surveillance systems are necessary to monitor effectiveness of health interventions and reassign priorities.

**National level:** Health authorities will use available information to define initial priorities in the use of limited resources. They should develop specific surveillance guidelines for each disaster in order to track relevant disease/mortality trends.

**Community level:** Every health care delivery setting should immediately implement a simple but effective health information collection system based on established WHO, PAHO, or governmental guidelines. Health care professionals should know how to share this informa-
tion regularly with higher level health authorities.

9. Organize human resources.
The initial shock of an event can make it difficult for a disaster-affected population to effectively respond in a quick and organized fashion. Having a pre-defined emergency plan with clearly-identified leaders can help the local community to cope until more external resources arrive.

**Community level:** Have an emergency plan and pre-defined community leaders for:
- Conducting rescue operations
- Conducting assessments (e.g., health services, transportation, food, sanitation/water systems)
- Organization of food and water distribution, and the sanitary program
- Health services management
- Corpses and gravesite management
- Identification of unaccompanied minors or other extremely vulnerable individuals (e.g., elderly or persons with a disability) and organization of a caregiver program.

10. Coordinate activities.
**National level:** In a large-scale disaster there will be many national and international agencies attempting to assess, develop plans, and establish priorities for funding at national and regional levels. Most effective relief efforts have resulted from effective collaboration between many agencies, each bringing their own expertise and experience. However, all of these agencies will ultimately depend on quality assessments from the affected communities to make appropriate decisions and determine the ability of the communities to implement the plans and projects that will help diminish suffering and restore the baseline situation in the communities.

**Community level:** Develop local emergency plans that link into regional and national plans and agencies. Understand the mechanisms for communication of information (e.g., assessments, surveillance data) during disasters. Build relationships with key individuals within and outside the community before a disaster occurs.
OBJECTIVES

- Identify national and international organizations that may respond to a humanitarian emergency in your country.
- Recognize the available resources, strengths, and limitations of these organizations.

Organizations capable of providing assistance during humanitarian emergencies

When local resources are insufficient, assistance from multiple national or perhaps multinational organizations will be needed. Each involved organization has its own institutional structure and culture, in addition to other features, such as capacity for response, technical and logistic resources, and thematic or regional approach.

Several international agencies may have activities in the country prior to the event. In response to the disaster these agencies may retarget their resources in the country to emergency relief. Effective coordination and cooperation among involved organizations are essential but very difficult to achieve in the chaotic situation of a massive emergency. There are two major types of organizations that can get involved in assistance when a disaster occurs: governmental and nongovernmental organizations (NGOs).

Governmental organizations

Governmental organizations work under the authority of one or multiple governments. The most common include:

National ministries—These are agencies at the national ministry level that have authority for disaster planning and response. A regional conference on disasters took place in 1986 to optimize the preparedness and response mechanisms of Latin American and Caribbean nations. As a result of this conference, most nations established a health disaster coordinator within the Ministry of Health (MoH). The health disaster coordinator not only coordinates health-related relief efforts in the event of a disaster, but also continuously updates emergency plans and conducts preparedness training for health care professionals.

Pan American Health Organization (PAHO)—This is an international public health agency serving as the Regional Office for the Americas of the World Health Organization. It provides health policy guidance and technical assistance in disaster planning and response (Box 7). More information is available at: www.paho.org.

World Health Organization (WHO)—The WHO provides technical advice and
develops health policies relating to disasters. More information is available at: www.who.int.

SUMA (Humanitarian Supply Administration System, developed by the PAHO)—This organization facilitates the reception, inventory, and rapid distribution of essential humanitarian supplies and equipment. In the event of a disaster, PAHO can send SUMA-trained staff to the affected country to assist in managing the inflow of supplies.

United Nations (UN)—The UN is a multinational organization that functions mainly through its sub-agencies, which are independently funded. More information is available at: www.un.org.

The Office of the United Nations High Commissioner for Refugees (UNHCR)—The agency is mandated to lead and co-ordinate international action to protect refugees and resolve refugee problems worldwide. Its primary purpose is to safeguard the rights and well being of refugees. It strives to ensure everyone can exercise the right to seek asylum and find safe refuge in another State, with the option to return home voluntarily, integrate locally, or to resettle in a third country. More information is available at: www.unhcr.org.

World Food Program (WFP)—This organization coordinates the delivery of food to regions in need around the world. More information available at: www.wfp.org.

United Nations International Children’s Emergency Fund (UNICEF) This organization was created by the UN General Assembly to advocate and protect children’s rights, to help fulfill their basic needs, and to provide opportunities for maximizing the development of their potential. When an emergency occurs, UNICEF focuses on ensuring that basic needs of
women and children are fulfilled and on protecting their basic rights. More information is available at: www.unicef.org.

Office for the Coordination of Humanitarian Affairs (OCHA)—In 1998 the OCHA resulted from the reorganization of the UN Department of Humanitarian Affairs (DHA). Its mission was expanded to include the coordination of humanitarian response, policy development, and advocacy. OCHA’s tasks are done through the Inter Agency Permanent Committee that includes multiple participating organizations, such as UN agencies, funds, and programs, the Red Cross, and NGOs. More information is available at: http://www.unocha.org.

Foreign organizations that provide help in case of disaster—Box 8 identifies some of the governmental agencies of developed countries that provide funding and technical help to countries affected by humanitarian emergencies. PAHO and WHO have developed guidelines to assist disaster-affected countries in managing donor offers from various agencies. According to the 1999 PAHO publication Humanitarian Assistance in Disaster Situations: A Guide for Effective Aid, “In the most advanced developing countries, in particular in Latin America, national health services, voluntary organizations and the affected communities mobilize their own resources to meet the most compelling medical needs in the early phase after a disaster. Requirements for external assistance are generally limited to highly skilled expertise or equipment in a few specialized areas.”

Military help—Both local and foreign military can be mobilized to assist in the response to natural disasters or complex emergencies. Certain unique features make military organizations useful in a disaster.

**Box 8. Foreign agencies for disaster assistance**

- **US Aid for International Development – Office for Foreign Disaster Assistance (OFDA)**
  [www.gov/our work/humanitarian assistance/disaster assistance](http://www.gov/our work/humanitarian assistance/disaster assistance)

- **Canadian International Development Agency (CIDA)**
  [www.acdi-cida.gc.ca](http://www.acdi-cida.gc.ca)

- **European Commission Humanitarian Organization (ECHO)**
  [www.acdi-cida.gc.ca](http://www.acdi-cida.gc.ca)

- **United Kingdom Department for International Development (DFID)**
  [www.dfid.gov.uk](http://www.dfid.gov.uk)

- **Japan International Cooperation Agency (JICA)**
Advantages

Speed: Few organizations are capable of implementing a large logistic response as rapidly as the military.

Security: The military can secure a specified environment, population, and material.

Transportation: Their fleet of planes and helicopters, as well as land and naval equipments, enable them to transport resources readily.

Logistics: They have experience in maintaining supply lines in problematic environments and situations.

Command, control, and communication: They have a well-defined and responsive organizational structure.

Self-sufficiency in the field: When military arrive to the region where the event has occurred, they are capable of fulfilling the needs of their own personnel.

Specialized units: They often have specifically trained and equipped units. These include engineers who can provide technical assistance and preventive medicine teams capable of rapidly performing epidemiologic evaluations and surveillance, outbreak investigations, vector control, and water purification and treatment.

Field hospitals and capacity for medical evacuation: Hospitals can be helpful in certain circumstances. See the WHO-PAHO guidelines for the use of field hospitals in sudden-impact disasters.

Shortcomings

Despite all the advantages mentioned above, the use of the military can have significant shortcomings and limitations in some situations.

Medical care: Field hospitals are designed for the care of soldiers wounded in combat (i.e., for the care of wounds suffered by healthy adults). During a disaster, primary care and preventive interventions for women and children are major needs.

Logistics: Supplies available in the military response system may not be appropriate for a disaster in terms of prevailing diseases or types of food.

Political objectives: The military are an asset of governments; in addition, certain humanitarian objectives can be subordinated to other political or strategic goals. The presence of the army in certain scenarios can cause tension in certain groups of the population and compromise relief workers who, for their own safety and function, wish to be considered neutral.

Cost: Military activities are expensive.

Nongovernmental organizations

NGOs are nonprofit organizations working on a full-time basis in assistance for appropriate development. Thousands of NGOs, both international and national, are functioning throughout the world. Most NGOs are small agencies focusing on very specific development projects (e.g., providing education, working tools, or training in sustainable development). Only a few of them have the resources required for supporting activities targeted to promote development and to respond to disasters in multiple countries or regions. Each NGO is specialized in specific aspects of assistance in emergencies (Box 9). Although NGOs may receive contributions from individuals, most of their funds come from the governments of industrialized countries. These governments distribute their money for assisting projects through contracts with NGOs. Unlike the International Committee of the Red Cross (ICRC), some NGOs maintain a “right to interfere.” This means
they can operate across borders without written approval of their hosts. Although usually looking for the neutrality of the ICRC, some NGOs may be more willing to report any perceived injustice. They perform well in emergencies within their area of specialty (e.g., water provision, food distribution), but most cannot achieve self-sufficiency in an emergency setting and rely on UN, military, or other agencies for security, transportation to remote sites, communication, support of logistics, or medical care for their own personnel. NGOs have enhanced ability to provide person-to-person assistance because they are likely to have a pre-disaster relationship with the affected communities and understand the local culture and public health issues. They can also shift easily from disaster relief to development, and are willing to make a long-term commitment to community development and rebuilding.

**International Committee of the Red Cross (ICRC)**—This is a hybrid agency: neither private nor controlled by a government. A number of its characteristics are unique; its mission is defined by the international humanitarian law passed by the 1949 Geneva Convention and the two 1977 protocols. The ICRC gets involved mainly when civil disturbances are present; it has the right and duty to intervene across borders when national or international conflicts break out, regardless of whether a “state of war” has been declared. The ICRC brokers relief assistance during war, assures legal protection for victims, and monitors the way Prisoners of War are managed. Also, the ICRC plays a critical role in reuniting families. The ICRC strives to preserve its neu-
trality, which is essential for its mission and enables its members to work unarmed in war regions under the control of any of the involved parties. The ICRC provides a complete account of its activities to all the parties involved in the conflict. It will refuse to participate in any activity that can be seen as showing favoritism. This may include transportation in vehicles belonging to one of the parties or joining efforts with groups that have their own interests. The ICRC is usually self-sufficient and can use its own resources for air lifts, communication, and logistics. It will participate only if all parties involved in the conflict sign an agreement recognizing and showing respect for its neutrality and mission. The ICRC is related to but independent from the Red Cross and the Red Crescent Societies national agencies. These organizations provide assistance primarily to victims of disasters or wars within their own nations. They have a similar commitment with neutrality, provision of assistance based only on the need, and independence from national governments.

Coordination of organizations

Coordinating the activities of all these organizations poses a tremendous challenge. Following a natural disaster the host nation’s government/agencies and military are likely to have operational command. Most nations now have defined governmental authorities responsible for global disaster planning and response, as well as coordinators for individual sectors such as health. External agencies or governments play a supportive role in providing technical assistance and resources. PAHO has developed a number of technical manuals and training activities to assist nations in the planning of coordinated disaster responses at the regional and national level. In complex emergencies related to a conflict, the armed forces or government authorities will have the command of operations, including the coordination of humanitarian help. The coordination in this scenario can be particularly difficult if the hostile groups are stationed nearby and try to block assistance of civilians. In this context, humanitarian help can be used as a political and strategic instrument.

Medical Volunteering

Following a disaster many pediatricians and other health professionals volunteer for a limited time. During the initial response phase, the greatest pediatric needs include air transport teams, surgical teams (a surgeon, OR nurse, anesthesiologist, and critical care pediatrician), as well as pediatricians with training and experience in emergency medicine and critical care. Volunteers may have to be self-sufficient for a period of time in terms of food, water, and shelter. Volunteers should work through an established NGO or governmental agency rather than simply “show up” to help. Volunteers should be prepared to respond quickly, as the quicker the response teams can provide appropriate care, the more effective they can be at saving lives and limiting morbidity. Part of preparation is anticipating the types of injuries that will be seen with different types of disasters. When sending a response team into a disaster during the acute response phase, it is important to have the personnel with the ability to treat the most likely injuries seen with the specific type of disaster. In a major earth-
It is critical to attempt to reunite children with their families as soon as possible and pay special attention to reducing their vulnerability in all disaster response planning.

quake like the one in Haiti in January 2010, one would expect the majority of the casualties to be secondary to traumatic injuries related to collapsed buildings. Therefore, a team should be prepared to have personnel and supplies that can be used to treat crush injuries, a large number of open wounds, along with a variety of orthopedic injuries. In a disaster involving an explosion (large industrial accident or terrorist attack), the pattern of injuries would include many of the same traumatic injuries as seen in an earthquake, but would also include a large number of burns and blast injuries such as blast lung. Personnel required in this type of disaster should include those with training in caring for burns as well as experience with other traumatic injuries. In the first days following the Haiti earthquake, there were a large number of complex orthopedic injuries that required emergent treatment. These included open fractures, traumatic amputations, and crush injuries. The treatment of these injuries included fracture reductions, wound debridement, and amputations. Thus it was essential to have personnel with the training to perform the needed procedures. Personnel with training in emergency medicine, general surgery, and orthopedics are best suited to be part of
the initial response team when a large number of traumatic injuries are expected. Supplies that are essential in caring for these patients include plaster splinting/casting supplies, wound dressing supplies, and medications for pain control and sedation. When caring for open wounds, the ability to appropriately irrigate and clean wounds can greatly reduce subsequent secondary infections of these wounds. Response teams should come prepared with supplies that would be able to provide pressure irrigation of wounds with either clean water or saline, antibiotic ointments, and large supplies of wound dressings. A large number of the orthopedic injuries can be treated with casting or splinting. Plaster casting material is far superior in this setting since casts made of fiberglass cannot be easily removed without a cast saw, whereas patients/families can be instructed to remove a plaster cast by soaking it in water.

Table 4 provides a list of pediatric equipment that, if possible, should be brought in if not available on site.

Communication in a disaster situation is essential between disaster relief team members as well as with coordinating groups and logistical support personnel in home countries. Modern technology has provided many different types of communication devices, which have different advantages and disadvantages. Communication networks and contingency plans are an essential part of the disaster preparedness phase. Radios are useful for short range communications when a disaster relief team is separated. However, they are limited by range and will not allow communication with the other teams or organizations that are a long distance away. Satellite phones are ideal for communication with the team as well as with the home country. They provide a reliable method of communication when telephone services are not working or there is no infrastructure, because they rely on orbiting satellites to transmit data. However, they are a scarce resource as well as an expensive resource. The main drawback for many portable satellite phones is that the phone’s antenna needs an unobstructed view of the sky. Cellular phones are an ideal method for communication. Voice calls can be made to team members as well as to coordinate in the home country. E-mail and SMS texting are other methods of communicating through the cellular network. However, cellular technology is dependent on a cellular infrastructure and network that has survived a disaster. The cellular networks may also become overwhelmed by the number of people attempting to use it in the time after the disaster, thus emergency/disaster relief providers and organizations need to have a communication system that is reliable and free of interference.

The availability of the internet through various means including satellite links and data over cellular networks has allowed for many novel methods of communication over the internet. There are traditional methods such as electronic mail. Web blogs also allow relief workers as well as those affected by the disaster to reach out to the world. Other social media tools such as Facebook and the microblogging service Twitter allow almost instantaneous updates from the field.

Mental health considerations
Disaster response providers are often thrust into a high stress situation with exposure to situations they may have never experienced before. The degree of
### TABLE 4. Recommended equipment to bring for pediatric emergencies in disaster situations.

<table>
<thead>
<tr>
<th><strong>Airway Management/Breathing</strong></th>
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<tbody>
<tr>
<td>Tongue Blades</td>
<td></td>
</tr>
<tr>
<td>Suctioning machine (portable, battery-powered)</td>
<td></td>
</tr>
<tr>
<td>Suction catheters - Yankauer, 8, 10, 14F</td>
<td></td>
</tr>
<tr>
<td>Simple face masks - infant, child, adult</td>
<td></td>
</tr>
<tr>
<td>Pediatric and adult masks for assisted ventilation</td>
<td></td>
</tr>
<tr>
<td>Self-inflating bag with 250 cc, 500 cc, and 1000 cc reservoir</td>
<td></td>
</tr>
<tr>
<td><strong>Optional for intubation</strong></td>
<td></td>
</tr>
<tr>
<td>Laryngoscope handle with batteries (extra batteries AA, laryngoscope bulbs)</td>
<td></td>
</tr>
<tr>
<td>Miller blades - 0, 1, 2, 3 Macintosh blades 2, 3</td>
<td></td>
</tr>
<tr>
<td>Endotracheal tubes, uncuffed - 3.0, 3.5, 4.0, 4.5, 5.0, 6.0, cuffed - 7.0, 8.0</td>
<td></td>
</tr>
<tr>
<td>Laryngeal mask airways</td>
<td></td>
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<tr>
<td>Stylets - small, large</td>
<td></td>
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<tr>
<td>Easycap (ETCO₂ analyzer), 2 sizes</td>
<td></td>
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<tr>
<td>Adhesive tape to secure ETT</td>
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<table>
<thead>
<tr>
<th><strong>Circulation/Intravascular Access or Fluid Management</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IV catheters - 18-, 20-, 22-, 24-gauge</td>
<td></td>
</tr>
<tr>
<td>Butterfly needles - 23-gauge</td>
<td></td>
</tr>
<tr>
<td>Intravenous needles - 15- or 18-gauge, or Eazy IO device</td>
<td></td>
</tr>
<tr>
<td>Boards, tape, tourniquet IV</td>
<td></td>
</tr>
<tr>
<td>Pediatric drip chambers and tubing</td>
<td></td>
</tr>
<tr>
<td>5% dextrose in normal saline and half normal saline</td>
<td></td>
</tr>
<tr>
<td>Isotonic fluids (normal saline or lactated Ringer’s solution)</td>
<td></td>
</tr>
<tr>
<td>Medications: epinephrine, atropine, sodium bicarbonate, calcium chloride, lidocaine, D25, D10</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Miscellaneous</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Broselow tape</td>
<td></td>
</tr>
<tr>
<td>Nasogastric tubes - 8, 10, 14F</td>
<td></td>
</tr>
<tr>
<td>Splints and gauze padding</td>
<td></td>
</tr>
<tr>
<td>Rolling carts with supplies such as abundant blankets</td>
<td></td>
</tr>
<tr>
<td>Warm water source and portable showers for decontamination</td>
<td></td>
</tr>
<tr>
<td>Thermal control (radiant cradle, lamps)</td>
<td></td>
</tr>
<tr>
<td>Geiger counter (if suspicion of radioactive contamination)</td>
<td></td>
</tr>
<tr>
<td>Personal protective equipment (PPE)</td>
<td></td>
</tr>
<tr>
<td>Pain/Sedation medications: ketamine, morphine, ketorolac</td>
<td></td>
</tr>
<tr>
<td>Other potential medications: albuterol, keflex, ancef, ceftriaxone, diazepam</td>
<td></td>
</tr>
<tr>
<td>Surgical equipment for amputations, incision and drainage of wounds, laceration repairs</td>
<td></td>
</tr>
<tr>
<td>Headlamps with replacement batteries</td>
<td></td>
</tr>
<tr>
<td>Scissors</td>
<td></td>
</tr>
<tr>
<td>Plaster for casting, not fiberglass (hard to remove)</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Monitoring Equipment</strong></th>
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<tbody>
<tr>
<td>Sphygmomanometer/ Blood pressure cuffs - premature, infant, child, adult</td>
<td></td>
</tr>
<tr>
<td>Portable monitor/defibrillator (with settings &lt; 10)</td>
<td></td>
</tr>
<tr>
<td>Pediatric defibrillation paddles</td>
<td></td>
</tr>
<tr>
<td>Pediatric electrocardiogram (ECG) skin electrode contacts (peel and stick)</td>
<td></td>
</tr>
<tr>
<td>Pulse oxymeter with reusable (older children) and nonreusable (small children) sensors</td>
<td></td>
</tr>
<tr>
<td>Device to check serum glucose and strips to check urine for glucose, blood, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Among the recommended equipment, elements for proper airway management in children are crucial. A major challenge of any disaster response is gathering, organizing, and moving supplies to the affected area. Resource management within the hospital and other facilities or agencies may prove to be a decisive factor in whether a mass casualty event can be handled.
destruction and death will likely be much greater than what the health care providers are accustomed to dealing with in their daily lives. Local first responders and medical providers thrust into the role of the initial emergency response phase may be faced with the additional stress of personally knowing many of the victims (or their family members) that they are caring for. The emotional impact of large scale destruction, suffering, and death will elicit different responses in different people, but all volunteer providers should recognize how their experiences can affect their wellbeing both emotionally and physically. The emotional stress experienced by disaster response providers has been well documented after events such as 9/11 and Hurricane Katrina. The affect of stress is amplified by the long hours of intense work experienced during the response to a disaster. Environmental conditions (such as extreme heat/cold/rain/flooding), lack of sleep, and inadequate nutrition impair a provider’s ability to deal with the stressful situation. Crisis response workers and managers, including first responders, public health workers, construction workers, transportation workers, utilities workers,
and other volunteers, are repeatedly exposed to extraordinarily stressful events. This places them at higher than normal risk for developing stress reactions (Pan American Health Organization [PAHO], 2001). It is important for all disaster response providers to recognize the potential emotional stress they will be entering before arriving on scene. Stress prevention and management needs to be considered and addressed from the start of the deployment in order to prevent problems. By anticipating stressors and individuals’responses to these stressors, the response team and individuals can potentially prevent a crisis within the team of care providers. The US Department of Health and Human Service, Substance Abuse and Mental Health Services Administration (SAMHSA), and Center for Mental Health Services (CMHS) have published a guide focusing on general principles of stress management and offers simple, practical strategies that can be incorporated into the daily routine of managers and workers. It also provides a concise orientation to the signs and symptoms of stress. This can be found online at http://mentalhealth.samhsa.gov/publications/allpubs/SMA-4113/default.asp. While most people are resilient, the stress response becomes problematic when it does not or cannot turn off, that is, when symptoms last too long or interfere with daily life. **Table 5** provides a list of the common stress reactions.
CONCLUSION
Disasters are, to a great extent, beyond our control and inevitable. However, we can be better prepared for the consequences and thus reduce the degree of human suffering. As Vernon Law has said, “Experience is a hard teacher. She gives the test first and the lessons afterwards.” Knowledge and understanding are needed for more effective preparation and planning. Pediatricians have a special role in the planning and preparation process to ensure that the needs of children are adequately considered in this process. Pediatric volunteers should be prepared for their experiences from the standpoint of training, available materials and resources, and mental health considerations.

SUGGESTED READING

Sharp TW. Conflict-Related Complex Emergencies, in Chap. 34, Military Preventive Medicine, 1997.
Case resolution

1. A disaster can be defined as a usually sudden event causing damages, affecting many people, and because of its magnitude, exceeding the capacity for response of local or national organizations. High morbidity and mortality rates are frequently found in the affected population, which is often exposed to critical sanitary situations, both immediately after the disaster and during subsequent phases. There is an additional risk for diseases associated with crowding and lack of adequate public services.

   Disasters can be due to natural causes, such as hurricanes and earthquakes, to alterations or to technological causes; i.e., related to events triggered by man's intervention (e.g., the release of toxic or radioactive agents). In addition, civil or international wars cause complex emergencies that affect civilians and result in their displacement.

   In this case, flooding has brought about a natural disaster.

2. Children, as well as old people and pregnant women are the most vulnerable populations when a disaster occurs. For children, the risk of being separated from their families determines their vulnerability. In addition, their physical, physiological and mental features render them more susceptible to environmental, sanitary and social changes resulting from disasters.

   All affected children should be identified and their identity should be properly documented. They should also receive preferential attention during the distribution of sanitary and feeding resources, as well as effective preventive interventions.

3. The initial and highly critical step is the immediate assessment of the situation and the affected population. This will define the actual needs and the interventions that are most appropriate in the current circumstances. It is important to establish clearly defined priorities and the effective coordination of rescue activities, in both the early and the subsequent phases.

   In this case, field hospitals are unlikely to be needed, since traumatized victims requiring immediate interventions will be less numerous than in other circumstances, when disasters have a more sudden and unexpected start.

   The capacity for response of local and regional services will determine whether or not external assistance is needed. Immediate external help is unlikely to be necessary in this case, but there will probably be a need for resources to provide the affected population with shelter and clothing.
### Myths and realities of disasters

The Pan American Health Organization has identified many myths and erroneous beliefs that are widely associated with the public health impact of disasters; all disaster planners and managers should be familiar with them.

<table>
<thead>
<tr>
<th>MYTH</th>
<th>REALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign medical volunteers with extensive medical training are needed.</td>
<td>The local population almost always covers immediate lifesaving needs. Only medical personnel with skills that are not available in the affected country may be needed.</td>
</tr>
<tr>
<td>Any kind of international assistance is needed, and it is needed now!</td>
<td>A hasty response not based on an impartial assessment only contributes to chaos. It is better to wait until real needs have been assessed. As a matter of fact, most needs are met by victims themselves and their local government and agencies, not by foreign parties.</td>
</tr>
<tr>
<td>Epidemics and plagues are inevitable after every disaster.</td>
<td>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 affected population.</td>
</tr>
<tr>
<td>Disasters bring out the worst in human behavior (e.g., looting, rioting).</td>
<td>Although isolated cases of antisocial behavior exist, most people respond spontaneously and generously.</td>
</tr>
<tr>
<td>The affected population is too shocked and helpless to take responsibility for its own survival.</td>
<td>On the contrary, many people 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.</td>
</tr>
<tr>
<td>Disasters are random killers.</td>
<td>Disasters strike hardest on more vulnerable groups: the poor, and especially women, children and the elderly.</td>
</tr>
<tr>
<td>Locating disaster victims in temporary settlements is the best alternative.</td>
<td>It should be the last alternative. Many agencies use funds normally spent for tents to purchase building materials, tools, and other construction-related support in the affected country.</td>
</tr>
<tr>
<td>Food aid is always required for natural disasters.</td>
<td>Natural disasters only rarely cause loss of crops. Therefore, victims do not always require massive food aid.</td>
</tr>
<tr>
<td>Clothing is always needed by the victims of a disaster.</td>
<td>Used clothing is almost never needed; it is often culturally inappropriate, and though accepted by disaster victims, it is almost never worn.</td>
</tr>
<tr>
<td>Things are back to normal within a few weeks.</td>
<td>The effects of a disaster last a long time. Disaster-affected countries lose much of their financial and material resources in the immediate postimpact phase. Successful relief programs gear their opportunities to the fact that international interest wanes as needs and shortages become more pressing.</td>
</tr>
</tbody>
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