

MILITARY PREVENTIVE MEDICINE: MOBILIZATION AND DEPLOYMENT

Volume 2

Section 7: Preventive Medicine Efforts Following Disasters



Airmen unload boxes of MREs (Meals Ready To Eat) for victims of Hurricane Marilyn. The hurricane hit the US Virgin Islands in September 1995. The role of military organizations in operations other than war is long and distinguished. As the issue of homeland defense evolves, it is likely that the mission of both Active and Reserve Component units will encompass some of the new challenges the United States faces.

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Chapter 41

THE CHALLENGE OF HUMANITARIAN ASSISTANCE IN THE AFTERMATH OF DISASTERS

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MILITARY INVOLVEMENT IN DISASTERS

SUMMARY

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INTRODUCTION

Military forces of the United States and other developed nations are sometimes called on to cope with the aftermath of the entire spectrum of disasters, from natural events to complex humanitarian emergencies (Table 41-1). While the appropriate roles of military forces in the post-Cold War world and in coping with disasters are controversial, it is likely that the military will always play some role in coping with disasters.

This section provides background on the causes and consequences of disasters and the potential roles of military preventive medicine personnel. This chapter focuses on basic definitions, concepts, and future challenges for the growing discipline of disaster medicine. The next three chapters, numbers 42

to 44 (Military and Public Health Aspects of Natural Disasters, Complex Emergencies, and Public Health Perspectives Related to Technological Disasters and Terrorism, respectively) describe the public health consequences of different types of disasters: natural, complex, and technological. Chapter 45, The International Humanitarian Response System, and Chapter 46, Domestic Disaster Response: FEMA and Other Governmental Organizations, describe the intricacies of the US domestic and international disaster response systems and Chapter 47, Nutritional Assessment and Nutritional Needs of Refugee or Displaced Populations, describes nutritional aspects of humanitarian relief operations. All chapters highlight issues relevant to the military.

DISASTERS AND DISASTER MEDICINE

Disaster is a broad term that has been defined in several different ways.^{1,2} One commonly used definition is "...events of environmental disruption or destruction that can be of sudden or gradual onset,

and that are severe enough to overwhelm the resources of the affected community and necessitate outside assistance."^{1(p422)} An alternate definition is "...an event that exposes the vulnerability of individuals and communities in such a way that their lives are directly threatened, or sufficient harm has been done to their community's economic and social structures to undermine their ability to survive."^{2(p13)} Both definitions emphasize the catastrophic nature of disasters and the need for externally provided assistance.

Disasters may be categorized in different ways. Some authors have differentiated between natural disasters (such as typhoons) and man-made disasters (such as war). Others have grouped disasters into sudden-onset events (such as earthquakes) and long-term situations that develop over months or years (such as refugee crises). Technological disasters, which are events such as the Chernobyl nuclear accident that involve major exposures to chemicals or radiation, are often placed in another category. Terrorist actions involving conventional explosives or weapons of mass destruction are regarded as an increasingly important type of disaster.^{3,4}

Any categorization scheme is somewhat arbitrary and may oversimplify the interaction of many factors. For example, a disaster in Durunka, Egypt, in 1994 combined elements of both natural and technological phenomena. Torrential rains led to severe flash-flooding, which disrupted fuel depots located in flood-washed ravines. Fuel-contaminated water flooded downstream villages and caught on fire. The majority of the 580 deaths that occurred were not due to drowning but to burning fuel.⁵ Also, some disasters can be difficult to categorize. Land

TABLE 41-1

SELECTED US MILITARY DISASTER OPERATIONS FROM 1990 THROUGH 1996

Operation	Type of Disaster
Fiery Vigil Philippines, 1990	Volcano
Provide Comfort Northern Iraq, 1991	Complex emergency
Sea Angel Bangladesh, 1991	Tropical cyclone
JTF Andrew Florida, 1992	Hurricane
Restore Hope Somalia, 1992	Complex emergency
JTF Hawaii Hawaii, 1992	Hurricane
Support Hope Rwanda, 1993	Complex emergency
Uphold Democracy Haiti, 1994	Complex emergency
Joint Endeavor Bosnia, 1996	Complex emergency

JTF: Joint Task Force

mines may be considered as a technological disaster or as an aspect of conflict. Natural disasters are often part of the dynamic of conflict and complex emergencies. The 1971 India-Pakistan war and subsequent refugee crisis was triggered in large part by a cyclone when the disruption caused by this natural event exacerbated political unrest. A severe drought was the principal catalyst for the civil war and humanitarian crisis in Somalia from 1991 to 1992.⁶

While the term “disaster” invokes connotations of the forces of nature to many, the hand of humans is found in almost all disasters. What is identified as the disaster, even when it is a natural event, is often better understood as a trigger event that exposes underlying societal problems. Virtually every famine since 1977 has been the result of underdevelopment, armed conflict, inadequate economic and social systems, failed governments, and other man-made factors.^{3,7}

The term “complex emergency” (also complex humanitarian emergency or conflict-related complex emergency) was coined to refer to disasters that involve an intricate interaction of political, military, economic, and natural factors and that have armed conflict as a central feature.⁸ These types of disasters have been increasingly common since the end of the Cold War. Victims are usually large populations or specific ethnic groups or cultures; armed conflict against these groups is almost always a critical factor.⁹ Somalia in 1992 is an example in which civil violence was the most visible, proximate cause of the disaster, but years of underdevelopment, governmental failures, superpower intervention, ethnic conflict, drought, and famine all contributed substantially to the situation.

To provide a basic approach to the subject of disasters, this section will consider three basic types of disaster: natural, complex, and technological (Table 41-2). Some events that could be considered disasters, such as a disease outbreak, are considered in other chapters.

The discipline of disaster medicine is rapidly evolving. Disaster medicine has its roots in the emergency activities undertaken in the immediate aftermath of natural disasters, but the discipline is

TABLE 41-2
CATEGORIES OF DISASTERS*

Natural
Flood
Tropical cyclone
Hurricane
Earthquake
Tornado
Volcano
Tsunami
Drought
Complex
Civil conflict
War
Famine
Mass migration or displacement of people
Technological
Explosions
Fires
Chemical Exposures and Spills
Radiation Exposures
Terrorist Actions

*This is not a comprehensive list of all disasters.

evolving to include other types of disasters. This chapter will use a broad definition for disaster medicine: “The study and collaborative application of various health disciplines—eg, pediatrics, epidemiology, communicable diseases, nutrition, public health, emergency medicine, social mending, community care, international health—to the prevention, immediate response and rehabilitation of the health problems arising from disaster, in cooperation with other disciplines involved in comprehensive disaster management.”^{10(p23–24)}

PREVENTIVE MEDICINE IN DISASTERS

One way to understand disasters, especially complex emergencies, is as catastrophic public health crises. Disasters often involve serious damage to preventive and curative medical systems and to important public health infrastructure, such as water treatment systems and sanitation networks. Disasters also may affect the public health through disruption of other segments of society, such as the

police, judiciary, communications networks, transportation systems, agricultural production, and markets.

In the aftermath of disasters, interventions that are the most urgent, that save the most lives, and that are the most cost-effective are often basic public health measures. Military medical personnel, particularly those in preventive medicine, may be

able to make substantial contributions after disasters by organizing immunization campaigns, reestablishing water treatment systems, investigating outbreaks, providing basic sanitation, controlling disease vectors, and implementing other fundamental public health programs.^{3-5,11-13}

Another important role for preventive medicine personnel is using the tools of epidemiology to gather critical information. In the aftermath of disasters, sound information is always needed to develop relief priorities and strategies and to identify vulnerable populations. Rapid assessments, targeted surveys, and surveillance are essential for effective disaster response.^{14,15} Preventive medicine personnel have unique skills in collecting needed data and using those data to develop objectives and strategies for disaster response.

Although some aspects of disasters and disaster response are well understood, there is still much to be learned. The tools of preventive medicine—epidemiology and biostatistics—are also useful in conducting research to better understand the causes of disasters and their management.¹⁶⁻¹⁸ In addition to helping with the immediate response, documentation of the principal causes of morbidity and mortality in disasters and of the effectiveness of relief measures through well-conceived epidemiologic studies is essential.

Preventive medicine personnel can be of great assistance in planning and preparation for disasters. Important activities in this domain include preparing disaster contingency plans, devising

standard medication and supply lists, organizing disaster response medical teams, developing early warning systems, and helping plan better infrastructure engineering.¹⁹⁻²¹

Preventive medicine personnel may become involved in a myriad of activities that are beyond their usual realm. Organizing feeding programs for a malnourished population, developing standardized treatment protocols to be used by health workers in refugee camps, or establishing rehydration centers during a diarrhea epidemic are just a few examples.²¹⁻²³ Preventive medicine personnel could also become involved in investigating and documenting human rights abuses.²⁴

Finally, preventive medicine personnel are the best advocates for the public health agenda in disaster response.^{12,25} Because preventive medicine personnel are trained to see the big picture and to understand “health” in a broader context, they are in a unique position to see important consequences of a disaster and to work across disciplines in helping to develop and coordinate the most effective response. Military medical officers must advise line commanders on the best roles for the military in disaster response. Preventive medicine personnel in particular are well situated to understand what the military can and cannot contribute to relief efforts. When line commanders, who may become focused on security issues or other aspects of a response, lose sight of critical public health needs, preventive medicine personnel can have a powerful voice in focusing relief priorities.^{11,26,27}

THE MAGNITUDE OF DISASTERS

Natural Disasters

Each week there is at least one natural disaster in the world of sufficient magnitude to require the assistance of the international community.⁵ In the 1970s and 1980s, natural disasters affected at least 800 million people and caused more than 3 million deaths.²⁸ The incidence of natural disasters appears to be rising, and the number of highly vulnerable persons in disaster-prone areas, particularly in the developing world, is at least 70 million and growing.²⁹ Large populations are vulnerable to disasters in at least 60 countries, many of which are in the tropics. The devastating tropical cyclone in Bangladesh in 1991, in which more than 100,000 persons were killed, illustrates the potential impact of natural disasters on a vulnerable population in the developing world. Historically, the US military has responded to many natural disasters domestically and internationally.

Complex Disasters

The number of armed conflicts in the world has increased dramatically since World War II³⁰ (Figure 41-1). Between 1980 and 1997, more than 150 major armed conflicts were waged.³¹ Complex emergencies are inextricably linked with violence; the number of complex emergencies has increased in parallel with the increase in war. Whereas in the late 1970s there were approximately 5 complex emergencies per year, by the late 1980s there were 10 to 15 per year, and by the late 1990s there were 25 to 30 each year.⁸

Armed conflict and its related complex humanitarian emergencies have profound effects on civilian populations,³⁰⁻³⁴ particularly since most armed conflict occurs in the developing world (Figure 41-2). Some estimate that in many conflicts for every death of a combatant there are eight to nine deaths among civilians.^{31,32} Toole and Waldman have described the

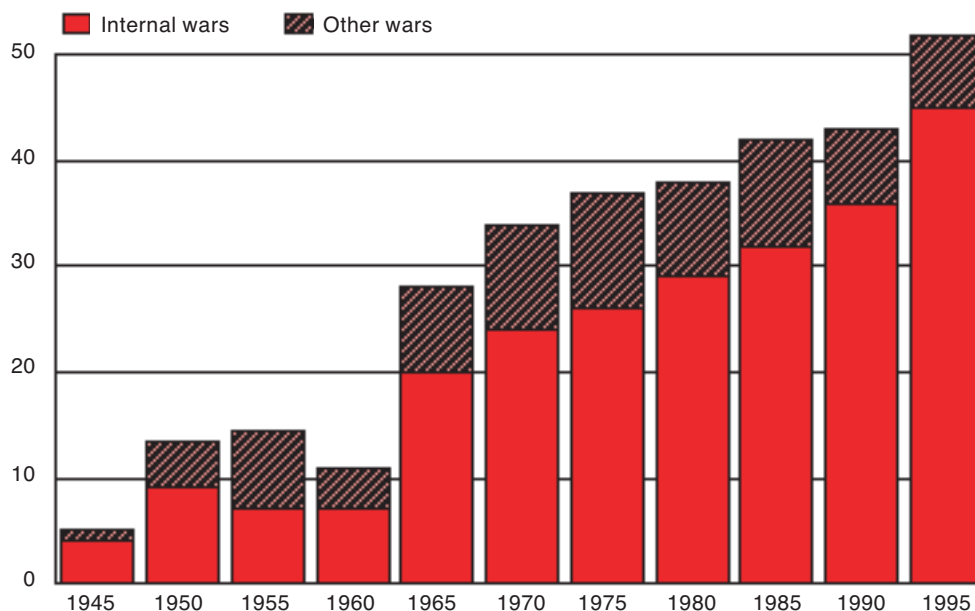


Fig. 41-1. Increase in Armed Conflicts and Internal Wars since World War II. This figure shows the dramatic increase in armed conflict overall, and particularly in internal conflicts, since the end of World War II. Most armed conflict since World War II has not involved the militaries of two nations fighting each other but, rather, has been strife within the borders of a sovereign country. The combatants in internal wars have typically been less clearly defined groups than national armies. They have usually been factions based on ethnic, cultural, or tribal affiliations, and many have had shifting allegiances. Some factions have acted essentially as a form of organized crime, attempting simply to control valuable resources. Prominent examples of internal wars in the 1990s were the conflicts that occurred in Somalia, Rwanda, and the former Yugoslavia. Adapted with permission from: International Federation of Red Cross and Red Crescent Societies. *World Disasters Report*, 1992. Dordrecht, The Netherlands: Martinus Nijhoff Publishers, 1992. Additional data from: Sollenberg S, Wallenstein P. Armed conflicts, conflict termination, and peace agreements, 1989-96. *J Peace Res.* 1997;34:339-358.

insidious cycle of armed confrontation, famine, and population displacement.^{33,34} In 1980 there were approximately 5 million refugees in the world; as a consequence of this cycle, though, by the mid-1990s there were approximately 23 million refugees and 25 million internally displaced persons (those who have fled their homes but who have crossed no international boundaries).³³ Thus, roughly 1 in 110 persons in the world was a refugee or was displaced from his or her home. As demonstrated by operations in Somalia, Rwanda, Haiti, and the former Yugoslavia, the US military has been drawn increasingly often into these situations.

Technological Disasters

The rapid and unregulated industrialization of much of the world and the misuse of technologies are increasingly recognized phenomena.^{3,5,35,36} The extensive environmental pollution in former Soviet

bloc nations, the nuclear reactor accident at Chernobyl, and the toxic gas leak at Bhopal, India, are examples of disasters resulting from industrial pollution and industrial accidents. While an important issue in the industrialized world, this is also an urgent concern in much of the developing world, where industrial growth often far exceeds necessary regulatory laws and safety practices.

The sarin gas attack in the Tokyo subway system and the Oklahoma City bombing, both in 1995, demonstrate how weapons technologies in the hands of terrorists have the potential to become massive disasters.³⁶⁻³⁹ The potential for terrorist actions has increased markedly since the collapse of the Soviet Union and the ensuing dissemination of technologies for building weapons of mass destruction. The US military has critical capabilities for coping with both technological disasters and terrorism and increasingly is seen as having an important role in responding to these incidents.

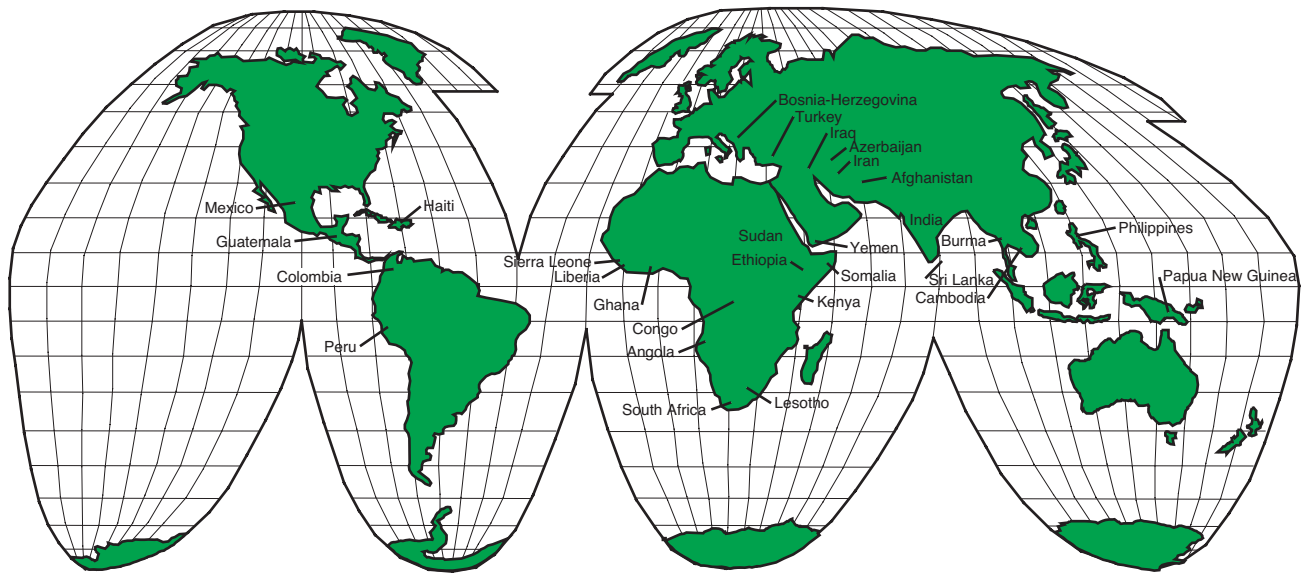


Fig. 41-2. Worldwide Conflicts, mid-1994. This figure shows the countries in the world in 1994 in which significant armed conflict was occurring. The fact that approximately one in five countries overall was at war is notable for the extent of armed conflict worldwide, as well as the fact that most conflict was taking place in the tropical developing world. Wars in the former Yugoslavia and former states of the Soviet Union were exceptions to this general trend. Data source: Fitzsimmons DW, Whiteside AW. *Conflict, War and Public Health*. London: Research Institute for the Study of Conflict and Terrorism, 1994. Study 276.

THE CONSEQUENCES OF DISASTERS

Every disaster is unique, and the consequences of each one will vary considerably by person, place, and time. In part this is because different types of disasters have very different effects. Whereas an earthquake often causes many immediate trauma deaths and usually does not result in food shortages, a flood typically causes few immediate deaths and disrupts food production and distribution networks.³ Similar events that occur in different environments can have very different consequences. An earthquake in Armenia has a markedly different impact than an earthquake in southern California because the extent of the development, the local building codes, the population density, and the local response capabilities are different. One refugee population may be devastated by measles while in another, in which vaccination coverage has been high, diarrhea may be the most important cause of morbidity and mortality.^{21,22,40}

Within any given disaster, relief needs can evolve considerably over time.²³ Some authors have described the phases of natural disasters, such as an impact phase, post-impact phase, and recovery phase, to discuss the importance of understanding

how relief needs change.⁴¹ In the impact phase after earthquakes, for example, there may be an urgent need for trauma services, but deploying trauma hospitals that will arrive 4 or 5 days after the earthquake is fruitless and wasteful.³

It can be difficult to delineate clear phases of a complex disaster. Because the crisis is usually the result of many years of complicated and deeply rooted problems, events do not progress in a clear, linear fashion. Nevertheless, relief needs in complex emergencies change substantially over time as well. For example, priorities for refugees who have just arrived in a location—usually shelter, food, water, and basic medical care—are likely to be different from what this population needs a few months after a camp has been established, such as family planning, medical care for chronic problems, and rehabilitation.^{22,23}

The health effects of a disaster can vary considerably by location. De Ville de Goyet describes the different spatial zones of a natural disaster to illustrate the severity of effects in relation to the epicenter of an earthquake.⁴¹ In hurricanes, the devastation can be quite unevenly distributed across an affected area.^{3,42}

Within a particular disaster, certain subpopulations may be more vulnerable, have fewer biological or social reserves to fall back on, and have less access to help. Women and children, particularly small children, typically experience much increased morbidity and mortality.^{21,22} In Rwanda, for example, it was shown that refugee-camp children living in households headed by single women had a significantly higher risk of malnutrition because they had less

access to food and other relief services.⁴³ Ethnic, religious, or cultural groups may be particularly vulnerable. In Somalia, certain unarmed agriculturally based clans who were not participants in the fighting were particularly devastated by the civil conflict and had extremely limited access to emergency relief services. Even adults and adolescents, who are the most capable segments of the population, require special attention in some circumstances.⁴⁴

ASSESSING AND RESPONDING TO DISASTERS

A critical first task for disaster responders is assessing rapidly what has occurred so as to determine urgent needs and relief priorities for that unique situation. The importance of rapid assessments has been increasingly recognized, and the science of conducting these assessments has developed considerably.^{14,15,42} Although good assessments may not be the norm, it is widely recognized that in the absence of sound early assessments, relief efforts can easily be misguided and inappropriate.

After initial assessments, targeted surveys and specific investigations can be of much value in answering more focused questions.⁴⁵ In addition, standardized surveillance and health information systems need to be established (or re-established) after disasters to continually assess and monitor the needs of the affected population²² (Figure 41-3). Relief efforts should be modified accordingly as critical data become available. In the absence of mechanisms to constantly evaluate the health of the target population, priorities may become skewed and resources may be inappropriately directed or even wasted.⁴⁶ There are many examples in the disaster medicine literature of how early information collection has been a critical factor in successful disaster response.^{43,45,47,48}

Emergency assistance following a disaster is often thought of as providing the basic necessities, such as food, water, shelter, medical care, and agricultural supplies, to save lives in the immediate aftermath of a devastating event. This is a key aspect of disaster response, but disaster response is

often much more than this. According to the United Nations High Commissioner for Refugees, the “aim of humanitarian assistance is to sustain dignified life, to strengthen local institutions’ efforts to relieve suffering and build self-reliance, and to assure that the first step is taken towards reconstruction, rehabilitation and development.”^{27(p1)} This definition emphasizes the importance of viewing disaster response in a broader and more long-term context. Therefore, disaster relief often must consider long-term development and must involve many realms, such as political, economic, social, security, and human rights, among others.

Relief needs may vary substantially in different cultural situations. Food items appropriate for one population may not be appropriate for another. For example, potatoes donated to the displaced Kurds in northern Iraq remained uneaten because potatoes are not a part of the normal Kurd diet. Sanitation practices can also vary markedly. Latrines inadvertently built facing Mecca were not used by Muslim Kurds.

In addition to cultural sensitivity, international relief responders must be careful to involve local personnel in relief efforts. Although this seems obvious, much emergency relief is conducted by outside groups who presume that they know best and that they must do everything for the “helpless” victims. In fact, disaster-affected populations are not helpless victims. The most effective disaster relief gives local personnel themselves the means to recover and rebuild.⁴⁹

PROGRESS IN DISASTER RESPONSE

In 1975, Dr. Michael Lechat noted that disaster relief could be described as “the crisis dominated convergence of unsolicited donations of mobile hospitals, time expired drugs, medical students volunteering for disaster safaris, and vaccines for diseases with zero incidence.”^{50(p845-846)} Fortunately, the knowledge and practice of disaster response has

progressed considerably.

Since the publication of the first textbook on disaster medicine in 1984,⁵¹ there has been an explosion in research into and knowledge about disaster relief. Many articles have been published in the peer-reviewed scientific literature, and there are many excellent technical manuals, textbooks, guide-

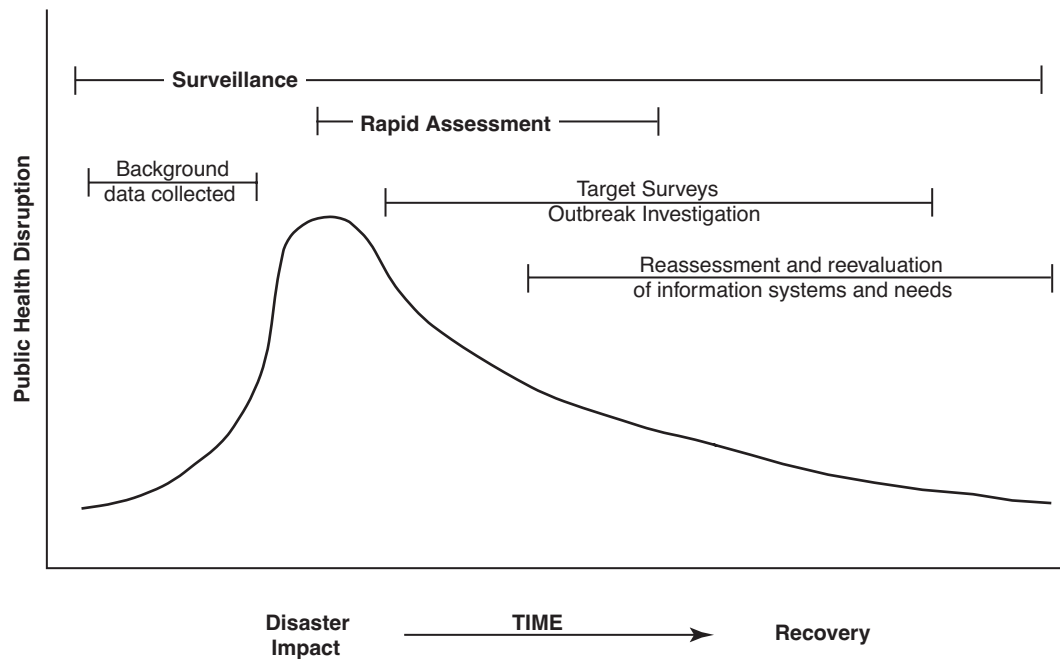


Fig. 41-3. Information Gathering in a Sudden-onset Disaster. This figure illustrates when information should be collected in a sudden-onset disaster. Ideally, certain background information is collected and archived before a disaster strikes, such as baseline rates of diarrheal diseases or malnutrition. Baseline data is needed for comparison to make sense of information collected after the disaster has occurred. Once disaster has struck, rapid assessments of the situation should be undertaken, followed quickly by focused surveys and outbreak investigations as they are needed. Ideally, surveillance systems are in operation before the disaster and are either continued or reestablished after the event. If not, surveillance should be started or modified as soon as possible after the disaster to gather data on appropriate medical outcomes. As conditions stabilize, assessments of information needs and information collection practices should take place to improve information gathering and adjust to changing circumstances.

books, and other publications^{22,23,27} that address not only clinical aspects of disaster-related medical problems but also public health issues, supplies, logistics, program management, and other important aspects of disaster response.

There is much evidence that improved understanding of the consequences of disasters and disaster relief has lead to improved practice since the 1970s.^{33,34,43} The development and implementation of the Federal Disaster Response Plan⁵² has greatly facilitated appropriate and coordinated relief efforts in the United States (see Chapter 46: Domestic Disaster Response: FEMA and Other Governmental Organization). This plan identifies the many different disaster response organizations in the United States and how they are to work together in a crisis. Internationally, the Pan American Health Organization has made enormous strides in preparing for and coping with natural disasters in the Western hemisphere. Most major UN agencies and nongovernmental organizations have also developed much-improved response capabilities.⁶ Nongovernmental

organizations have also made major strides in improving their capabilities to respond to disasters.⁶

The 1994 civil war in Rwanda was an unprecedented and overwhelming complex emergency by any standard. By the third week of international intervention, however, much critical information had been obtained through rapid assessments, targeted surveys, and standardized surveillance. The most important relief measures, such as potable water, measles immunizations, vitamin A supplementation, standardized treatment protocols, and community outreach programs, were implemented based on good information and sound practices while other less-effective interventions were curtailed. During the relief efforts in Rwanda, a very high level of cooperation and coordination among the majority of governmental, nongovernmental, and military relief efforts was achieved.⁴³ There were clearly still substantial problems in the response to this disaster, but it nevertheless exemplified much of the progress that has been made.

CHALLENGES IN DISASTER RELIEF

Despite the advances made in the knowledge and practice of disaster relief, many challenges remain. The number of disaster-affected persons in the world continues to increase, and the numbers of disasters and disaster-affected persons will probably continue their almost exponential rise.^{5,29,33}

Alternative Approaches

Focusing only on the acute, emergency response to an event once it has occurred is inadequate and, some argue, even detrimental. Early warning systems and early intervention strategies that may prevent

EXHIBIT 41-1

THE PREVENTION PARADIGM APPLIED TO DISASTERS

Complex Emergencies

Natural Disasters

Primary Prevention (action taken before the disaster to avoid or minimize adverse effects)

- | | |
|---|--|
| <ul style="list-style-type: none"> • Establish and maintain sound public health programs, including surveillance • Foster development overall and within health sector • Promote disarmament and demilitarization • Promote democracy and democratic institutions • Develop disaster contingency plans and public health early warning systems | <ul style="list-style-type: none"> • Conduct risk analysis of natural threats • Promote safe engineering and building practices • Foster development overall and within health sector • Develop early warning and rapid evacuation systems • Develop disaster contingency plans |
|---|--|

Secondary Prevention (actions taken when the disaster is imminent or in its early stages)

- | | |
|---|---|
| <ul style="list-style-type: none"> • Perform public health assessments and early interventions as indicated • Use diplomatic and/or military pressure or intervention • Conduct advocacy to alert decision-makers and public | <ul style="list-style-type: none"> • Implement early warning and rapid evacuation • Implement contingency plans |
|---|---|

Treatment (actions taken during or after the disaster to treat the effects)

- | | |
|--|---|
| <ul style="list-style-type: none"> • Conduct rapid assessments, targeted surveys, and outbreak investigations • Undertake peacemaking or peacekeeping interventions • Provide emergency relief services • Conduct advocacy to alert decision-makers and public | <ul style="list-style-type: none"> • Conduct rapid assessments, targeted surveys, and outbreak investigations • Provide emergency relief services |
|--|---|

Tertiary Prevention (actions taken post-disaster to prevent further ill effects)

- | | |
|---|---|
| <ul style="list-style-type: none"> • Stabilize peace • Rehabilitate society, economy, and health systems • Resume development • Demobilize militaries • Dearth and clear landmines • Strengthen democratic institutions | <ul style="list-style-type: none"> • Rehabilitate society, economy, and health systems • Resume development |
|---|---|

crises from being so severe are important in coping with complex emergencies as well as natural disasters.^{6,43,46,53} With the dramatic rise in complex emergencies, the resources devoted to emergency response has increased markedly in the past few years. At the US Agency for International Development, for example, the dramatic shift in funds from long-term development programs to disaster response may, ironically, serve to exacerbate the threat and consequences of disasters by sapping funds that otherwise would be used for infrastructure improvement and disaster preparedness.^{53,54} A true preventive approach would call for better development strategies, preventive diplomacy, and early conflict resolution. Once a crisis has occurred and emergency relief efforts have been begun, increased resources should be devoted to the stabilization, rehabilitation, and development of the affected communities (Exhibit 41-1). Without this, a society can plunge back into a catastrophe, as occurred in Somalia.

How limited emergency response resources are allocated around the world is a concern. Some observers argue that particularly during the Cold War, but still today, populations who receive relief often have been chosen on the basis of political agendas rather than true need. The media can play a critical role in determining which crises receive public attention. In general, government-controlled areas instead of rebel-controlled areas, refugees instead of internally displaced persons, and regions of interest to the major powers instead of regions less strategically valuable receive more international assistance.⁵³ Thus some have argued that the international community needs improved mechanisms to determine who merits international aid.⁵⁵

Coping with Violence

Many humanitarian emergencies today are inextricably linked with violence.^{31,32,56–60} Fighting is waged between various factions, many of whom do not recognize or follow international humanitarian law. Unfortunately, as has been well described regarding Cambodia and the Sudan, the provision of humanitarian relief can easily be perceived as a partisan act or it can be overtly manipulated for the benefit of certain warring factions.^{7,46,59} Many humanitarian organizations are struggling with how to work with “predator” states (those governments that exist to prey on their own population) or amoral warlords while providing impartial and neutral humanitarian aid.

In some emergencies, the greatest public health threat may be violence. In the former Yugoslavia,

for example, many more people were killed by shelling and shooting than by food shortages and disease.^{60,61} The provision of traditional humanitarian relief can be largely ineffective in such circumstances; the most effective humanitarian relief would be enforcing and keeping the peace.^{32,57,60,61}

Provision of relief is dangerous for humanitarian workers. As of 1996, more than 1,000 relief workers had been killed in the former Yugoslavia. The International Committee of the Red Cross has had over 35 workers killed between 1992 and 1997.⁶² Relief organizations are struggling with how to operate in insecure environments without having to resort to arms themselves or depend on military forces to protect them.

Improved Strategic Planning and Coordination

In domestic disaster response, local, state, federal, civilian, and military agencies must work together. Internationally, United Nations agencies, nongovernmental organizations, the International Committee of the Red Cross, local officials, and militaries must cooperate. The diversity of the many participants in humanitarian assistance has been both a blessing and a curse. The independence, autonomy, and flexibility of some relief agencies, particularly the nongovernmental organizations, have been critical in many situations, but the lack of overall strategies and poor coordination among the various participants have hampered many relief efforts.^{9,53} There is a need for much-improved strategic planning, coordination, and cooperation among the major responders.⁶³ Without an overarching strategy that most participants support, it is impossible to address the almost intractable causes and consequences of complex disasters. Within the United States, the Federal Response Plan and related efforts have improved domestic disaster response coordination substantially. While progress has been made on the international scene, much more work needs to be done.

Improved Emergency Response

Even though much of the science of good relief is well delineated, problems still remain in implementing effective emergency relief programs. Despite a massive international relief effort in northern Iraq during the Kurdish refugee crisis, many deaths occurred due to preventable diarrheal disease. This was in large part a failure to implement basic environmental health interventions and diarrhea control programs early enough in this crisis.⁴⁵ The Goma (Zaire) Epidemiology Group reported after

the Rwanda refugee crisis that there is an urgent need for more intensive and focused training of relief workers in the prevention and management of diarrheal diseases and other essential relief programs, such as measles immunization, public health surveillance, community outreach, and nutritional rehabilitation.⁴³

Recent emergencies have fueled considerable discussion about how relief workers are trained and whether there should be standards of practice or even some type of certification for relief workers. Disaster medicine is still in its infancy as a recognized field of medical practice, and its training lacks uniformity and a curriculum that covers the range of knowledge needed to cope with disasters.^{20,64,65} Many relief workers, although well-intentioned, are often recruited and sent out on short notice with little preparation or training. In many disasters, responders are also burdened with large quantities of unneeded and unwanted supplies.^{66,67} Well-intentioned but inappropriate relief supplies actually hinder rather than help relief efforts.

Need for Research

Despite many advances in the discipline of disaster medicine, much research is still needed to better elucidate the health effects of disasters and ensuing medical needs. Much disaster planning and response is based on anecdotal reports, which are sometimes valuable but are often sources of non-uniform, nonobjective, and nonspecific data. An improved understanding of the epidemiology of disasters is clearly needed so that more appropriate choices can be made about relief supplies, equipment, and personnel.^{20,68} Many questions still remain about the role and effectiveness of different interventions. An example is the considerable discussion following the Rwanda crisis on the best use of new cholera vaccines in emergency situations.⁶⁹ Research is needed to develop standardized and valid assessment tools, reliable surveillance programs, low-technology environmental health interventions, and more effective intervention strategies.^{20,34}

Very little work has been done to evaluate the cost-effectiveness of various relief efforts. Only rarely have relief organizations or the military been held accountable for the money they spend in relief efforts, but measuring outcomes and effectiveness of relief interventions is increasingly demanded by donors, politicians, and commanders. The cost-benefits of investing in emergency response, as opposed to prevention, conflict resolution, and development, are not well delineated.^{53,70}

New Threats: Land Mines, Laser Weapons, and Terrorists

One of the most pressing and overwhelming challenges ahead is coping with land mines.⁷¹⁻⁷⁴ The 100 million to 200 million land mines that are in the ground in more than 65 countries, with almost no records of their location, are a massive public health emergency.⁶⁰ Many mines have been placed as instruments of terror in areas of no military strategic value. Livestock, herders, and children are at great risk. Mines are not only immediately devastating to victims but also impose tremendous burdens in the rehabilitation of survivors. In Cambodia, approximately 1 in 250 persons is a land-mine amputee. The health care system of Cambodia is overwhelmed with caring for and rehabilitating these victims.⁷² Other places, such as Eritrea, Afghanistan, Egypt, and the former Yugoslavia, have literally millions of land mines in place.⁶⁰

An emerging concern is the development of laser weapons as a weapon of terror. The technology of lasers for military use on the battlefield has progressed markedly since 1980. Because lasers have now become lightweight and portable and require only low-energy sources to operate, it is possible for an individual to carry a small laser rifle that is silent, is easily hidden, and has the potential to permanently blind large numbers of persons indiscriminately. Protection against these weapons is very difficult. Although such blinding weapons have not yet been employed, some fear they will appeal to some military commanders and terrorists alike.⁷⁵

Terrorism itself is not new. What is new, however, is that terrorists today have unparalleled access to highly destructive weapons. Conventional explosives, nuclear devices, and chemical and biological weapons are all potential terrorist weapons. Information on how to construct bombs and weapons of mass destruction is readily available through public libraries and the Internet. The materials to build most weapons are available from a variety of commercial sources. Some observers have argued that terrorism is appealing to many groups unable to achieve their goals by conventional military or political means, and the world is unprepared to cope with the increasing threat posed by terrorist actions.⁷⁶⁻⁷⁸

Vulnerable Populations

The unique concerns of women, particularly those who are pregnant or lactating, are an important focus of disaster relief. Epidemiologic studies^{22,43}

document that in some disasters women have less access to medical care and other relief services. And while data are limited, pregnancy, sexually transmitted diseases, sexual abuse, and human immunodeficiency virus infection are believed by some investigators to be common issues in many disaster-affected populations, especially refugees and internally displaced populations.⁷⁹⁻⁸¹ Few relief programs have yet addressed these issues.

The special problems of children have been increasingly recognized. Children are more vulnerable than adults to many of the adverse health effects of disasters, such as malnutrition and infectious diseases. Additionally, the plight of unaccompanied children in Rwanda illustrated a problem common to many complex emergencies.⁸² The psychological impact of disasters on children has only just begun to be documented but is clearly profound. The appalling practice of using children as soldiers in many countries of the world is a crisis of unprecedented proportions.^{83,84}

International Humanitarian Law

Relief workers face many difficult challenges in the realm of international humanitarian law. Under current law, internally displaced persons and nondisplaced persons do not have the same right to protection as those who cross international borders and thereby become refugees. The provisions of international humanitarian law that were written principally to deal with conflict between sovereign nations are difficult to apply to conflicts that occur within a country's borders.⁸⁵⁻⁸⁷ Contradictory interpretations of the Geneva Conventions and how they apply to complex emergencies have complicated some relief efforts.⁴⁶

Recent disasters in Rwanda, Somalia, and the former Yugoslavia are characterized by profound human rights abuses, such as torture and genocide. Issues of education of combatants regarding international humanitarian law, enforcement of humanitarian laws, and prosecution of war criminals remain extremely difficult but critical problems.⁸⁷

MILITARY INVOLVEMENT IN DISASTERS

Disaster relief is not a new mission for the military forces of the United States or for many other developed nations. Gaydos⁹³ describes many of the reasons military forces often become involved in humanitarian assistance, such as the ready availability of highly capable forces, the similarities between traditional military missions and disaster response,

Using Information Technologies

How to best use information technologies is an important issue in disaster relief. Epidemiologists and other responders have used computers to gather and analyze data rapidly. Disaster responders are also learning to take advantage of global positioning systems, electronic mail, and satellite and cellular phones. They are learning to use computers to improve management of other aspects of relief efforts, such as the Pan American Health Organization's computer program that helps manage relief supplies.⁸⁸ Computer-based models have been developed that predict environmental effects of natural disasters.⁸⁹ A variety of bulletin boards and home pages on the Internet have been established to facilitate training and information exchange, such as the Federal Emergency Management Agency's website at <http://www.fema.gov>. Computers and distance-learning technologies are increasingly used in training of relief workers, but their full potential has yet to be understood or reached.⁹⁰⁻⁹²

Expanding Professional Boundaries

Preventive medicine is fundamentally concerned with improving and protecting health. Accomplishing this after disasters requires a multi-disciplinary approach that may go well beyond usual preventive medicine practice. Preventive medicine personnel are likely to become involved with logistics, communications, triage, evacuation, and other areas. The preventive medicine professional may have to work closely with a confusing variety of local, state, federal and international agencies. Wasley notes that in the aftermath of natural disasters, epidemiologists must work not only with health care personnel but also with engineers, seismologists, meteorologists, sociologists, and anthropologists.⁵ In complex emergencies, the media, politicians, human rights organizations, local health officials, and other militaries may be added to the list. Preventive medicine personnel involved in a complex emergency must expand their professional boundaries to effect the greatest good in disaster-affected populations.²⁵

and the training opportunities.

Military forces of many nations are likely to continue to play a role in disaster response both within their own countries and abroad. As the problem of responding to the use of chemical or biological agents grows, some militaries are likely to have a particular role in this area, given their unique ca-

pabilities.^{37–39,94} Subsequent chapters in this section describe in more detail many of the important considerations of using military forces in various types of disaster response.

In regard to the military's response to complex emergencies, the predominant and most devastating type of disaster in the post-Cold War era, the Kurdish relief effort in 1991 was in many respects a watershed. In this crisis, the militaries of the United States and a number of other developed countries were called on to deal with over half a million displaced persons, a formidable problem. However, conditions were almost perfect for a successful military intervention.⁹⁵ The US military and other participating militaries were quickly able to establish a safe haven in northern Iraq. With security established, the military filled what was then an important void in the international humanitarian response system by organizing and orchestrating relief efforts on the ground. Solutions to the crisis, primarily establishing security, providing emergency relief, and then facilitating the return of the displaced persons to their homes, were attained in a short period of time.

Based on this success, the militaries of developed nations were regarded by many as critical future participants in responding to the marked increase of complex emergencies in the post-Cold War world. Outside military intervention in complex emergencies was viewed as a solution to security issues, as well as a way to provide critical emergency logistical support in dangerous or remote areas.⁹ The initial wave of enthusiasm for military intervention in complex emergencies was quickly tempered, however, by events in Somalia in 1993 when a number of US peacekeeping personnel were killed. In addition, there were serious problems with coordination between the military and the relief organizations, which, in contrast to the situation in Kurdistan, had been in Somalia for many years prior to military intervention.^{96,97} Other large international relief missions that followed the Kurdish crisis, such as those in the former Yugoslavia and in Rwanda, in which relief problems were also much more complex, perhaps even intractable, also showed that using military forces in a humanitarian role would not always be so easy.

How the military best fits into international humanitarian response remains an area of much discussion and controversy. Military forces clearly have many positive attributes in the emergency provision of humanitarian services. In addition to

providing security, which sometimes may be their most important contribution, militaries can add critical transportation assets, logistics expertise, command and control systems, deployable medical facilities, and intelligence capabilities.^{9,26}

Military forces have significant constraints as well. Some have questioned the effectiveness of using military forces for humanitarian relief.⁹⁸ There is little evidence to show that much is accomplished for the often tremendous amounts of money and resources expended to deploy servicemembers. Using a medical organization that is staffed, trained, and equipped to support combat operations for a humanitarian mission can be problematic. Military medical staff are often ill-trained and equipped to cope with disaster relief situations.²⁶ Line commanders may not fully appreciate the public health issues in disaster response or their solutions. Some have argued that the use of armed forces is fundamentally incompatible with and may even be detrimental to accomplishing humanitarian objectives.⁹⁸ Armed forces usually support only some factions in the conflict or will be perceived as supporting only certain interests,⁴³ which can make neutral, impartial relief problematic. Some have argued that the use of military force in complex emergencies is symptomatic of a failure of political will, and while it may offer a respite, military intervention is unlikely to result in long-term solutions.^{97,98}

The US government and military must resolve a number of difficult issues. Other nations face similar dilemmas. One of the most important is the role of military forces in the post-Cold War era, and whether armed forces should embrace disaster relief and humanitarian assistance as one of their principal missions. If humanitarian assistance is indeed a core mission, strategies to determine which crises warrant intervention need to be elaborated. Much effort has been expended in developing mechanisms for the military to work effectively with other relief agencies.^{99,100} The Federal Response Plan is an excellent template for the role of the military in domestic disaster response. On the international scene, though, how military forces relate to other disaster responders and where they fit into an overall disaster response architecture are still contentious issues. In addition, as the military continues to downsize and resources to support more traditional combat missions are increasingly limited, there will continue to be problems regarding adequate staffing, training, and equipment for these missions.

SUMMARY

The world of disasters and disaster relief is quite complex. The military preventive medicine officer involved in these types of efforts must understand not only the public health consequences of disas-

ters but also the intricacies of the existing disaster response systems, the challenges facing disaster responders, and the US military's role in this often chaotic environment.

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