Chapter Seven

RESPONSES, RELIEF, AND RECOVERY

ABSTRACT

All damage requires some response. Responses are directed towards the mitigation of further damage once the impact of an event has begun and/or correcting the functional deficits created by the primary and secondary events, and restoring the functionality of the damaged elements to their respective pre-event state. Disaster responses are directed towards search and rescue, relief, recovery, and/or rehabilitation. Responses must be directed at satisfying all or part of defined needs. Implementation of responses must be coordinated through a Coordination and Control Center. Thus, all responses must be driven by clearly stated goals and objectives directed towards specific needs. The Disaster Critical Control Point (DCCP) is the time at which the available supplies balance all of the needs. Selection of appropriate indicators that reflect the severity of the damage and the effectiveness of the response in meeting its goals and objectives and the benefit to society that results is crucial. Use of appropriate indicators eventually will result in the evolution of minimum and optimum standards, and definition of functional and critical thresholds. Evolution of such standards and thresholds will lead to the development of critical pathways (process evaluation) and guidelines to be used in optimizing future responses. All of the steps from preparedness to recovery that are undertaken to minimize the damage and restore the pre-event status are the tasks of disaster management.

Keywords: critical pathways; damage, disaster; function; goals; impact; indicators; management; objectives; preparedness; recovery; rehabilitation; relief; rescue; response; severity; standards; thresholds

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ALL DAMAGE, regardless of its magnitude, requires some type of response. Responses are directed towards the mitigation of further damage once the impact of an event has begun and/or at correcting the functional deficits created and restoring the functionality of damaged elements to their pre-event state. For most damaged elements, the latter is a reasonable goal. However, this may not always be possible, i.e., when the damage is sustained by biological entities like humans or animals or, in many instances, the environment. However, the objective of returning the society to its pre-event state remains a primary goal.

RESPONSES

A *response* is an answer, reply, or a reaction to some perceived question or need.[1,2] In the context of this discussion, responses constitute reactions to the damage, whether related to the primary event or to secondary event(s). Thus, *responses are a reaction or a set of reactions.* Responses may be local, regional, national, or international; they may be immediate or delayed. In general, the initial, local responses are part of effecting preparedness. For example, the reaction to the event by the local emergency medical services is part of preparedness. In the case of a disaster, by definition, local resources are overwhelmed, and the responses are supplemented by personnel, materials, and/or equipment from outside of the affected area. Search and rescue teams from other countries that respond to assist the affected society with recovery of trapped survivors or bodies of the dead are examples of such responses.

Disaster Responses may be directed at search and rescue, relief, recovery, and/or rehabilitation**.** *Responses* that elevate the functional status of any BSF or its components beyond rehabilitation (return to pre-event status), are classified as *development.* Responses aimed at improving a society's capability to absorb (mitigate) future events (i.e., new building codes), should be based on evaluations of the factors that were responsible for the damage**.** Search and rescue efforts need no definition. However, the timing of these efforts relative to the primary and secondary events is critical, and their usefulness seems to differ significantly between different scenarios. For example, in some earthquakes, search and rescue activities have provided significant assistance in extricating survivors even on the fifth day after the quake. In other settings, their activity could have been terminated 48 hours after the quake, and the resources could have been redirected towards assisting the survivors.[3-8] Reliable information to guide these different approaches that require deci-

sions by management, as of yet, are not properly substantiated, since all existing reports are differently structured and focused.[3-8]

Relief efforts are directed at the alleviation of pain or distress.[9] They consist of assistance with materials, facilities, and personal needs and services provided to needy persons or communities without which they would suffer.[10] Such relief efforts often receive much attention from the media. The effectiveness, efficiency, efficacy, benefits, and costs of such efforts remain to be demonstrated in the overall context of resource utilization.

During disasters, responses must be directed at satisfying all or part of a need or needs identified by *assessments* of needs. In disaster settings, responses must provide the resources that are *required* to deal with specific needs. A response may be directed at decreasing a need (e.g., proper clothing may reduce the consumption of heating devices and fuel) or by increasing the supply of the resources needed. Resources typically come in the form of goods and services (personnel, equipment, supplies, or money). Even in a sudden-onset disaster, ALL responses should be coordinated by a single Coordination and Control Center, and should be directed at specific, identified needs. This may be difficult during the *immediate* response when care is provided by uninjured bystanders, as has been demonstrated repeatedly. All professional responses must be coordinated and controlled through a Grand Pooh-Bah.[i]

In the early stages of a sudden-onset disaster, the ability to respond is a function of the level of preparedness of the local community. Some of the resources required during this immediate period may be greater than the quantities that were required during the pre-event period. For example, the amount of emergency medical services required may increase during and/or following an event due to the number of associated casualties (conditional needs). Thus, preparedness and response plans should delineate how this conditional increase in needs will be managed.[8,14-17] When these local resources (civil society) are insufficient to meet the augmented needs, responses may be provided by regional national, and possibly international sources by governmental, inter-governmental (IGO), and/or non-governmental (NGO) organizations. Some disaster responses have been poorly coordinated, have provided unneeded personnel, equipment, and/or supplies, and the responses actually may have detracted from the ability to meet

[i] a person who holds many offices simultaneously[11]

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the real needs, whereas others have been poorly documented, prohibiting substantiated conclusions.[8,14-17] Such occurrences mandate that the indicators selected must incorporate the ability to assess adequate function even though the requirements are augmented.[18] Indicators should inform both of the appropriateness and timelines of the response provided, and preferably before they can be measured as increased Crude Mortality Rate.

The overall objective of disaster responses is to return the affected society to its pre-event status, and thus, balance available supplies (resources) with defined needs. Interim responses are directed first to saving lives and reducing morbidity. Thereafter, responses are directed toward improving the functional status of the societal elements (recovery) described earlier. Initial efforts are directed towards raising the functional state of all of the elements that have a critical threshold, to levels above their respective critical thresholds. The next priority is to raise the functional states above functional threshold so that they are able to meet their basic roles in the affected society. Lastly, responses are directed to returning the functional status of the society to its pre-event status. However, if this pre-event status includes supplies considered as surplus, external assistance could be terminated at the discretion of Coordination and Control, and the resources redirected to other Basic Societal Functions still operating below their respective functional threshold(s).

It is essential here, to stress that the basic societal functions (BSF) are highly interdependent upon one another. For example, it may not be possible to improve the water supply without the public works and transportation functions first being returned to a higher functional state. Coordination and Control will be unable to establish priorities without communications and accurate and timely information, and so on.

GOALS AND OBJECTIVES

Although any response in a disaster is directed toward increasing the resources to reduce a specific identified need or set of needs, the goals and objectives of the response in meeting the need(s) must be identified in order to define any desired or undesired outcomes of the response. Thus, the purpose and intent of a response must be defined *prior to* the action.[20] This is similar to the definition of end-points in quantitative research projects.

Without clearly stated goals and objectives, it is not possible for the Coordination and Control Center for the disaster to assign any priority to

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the responses. Actually, donation of money often may be the best resource for disaster relief. When financial resources are made available, the Coordination and Control Center can acquire needed resources with the highest priority at a given time, and then direct them to where they are needed, rather than trying to make other donations fit into priorities that may not have temporal relevance. The Independent Commission on International Humanitarian Issues (ICIHI) proposes that during a famine, money should be given directly to the victims as they know their needs even better than do the central authorities.[21] Then, the merchant society would be expected to arrange all of the necessary logistics.

The Coordination and Control Center also must have the ability to request, receive, warehouse, and distribute relief supplies and equipment. Several systems have been developed to assist with this function, the most notable being Supply Management (SUMA), an activity of PAHO/WHO that coordinates the levels of supplies available with the demonstrated needs.[22] The utility of SUMA in such circumstances, has been demonstrated repeatedly during the last decade.

On occasion, some responses may be directed primarily towards meeting needs and goals of the donor organizations rather than the defined needs of the affected populations.[18,19,23-27] Such activities may serve to preserve or enhance the capabilities of the donor organizations, but, in fact, may be deleterious to the overall relief and rehabilitation efforts.[14,18] Careful evaluations of response efforts should detect such situations.

Substantial responsibility falls upon the Coordination and Control agency in terms of selection and prioritization of responses. In its requests for assistance, the Coordination and Control agency must define exactly what is needed, how much, where, and when. Requesting assistance without direction may be responsible for confusion and frustration at both the donor and recipient levels. Requesting assistance has been considered humiliating by some recipient countries.[28,29] In some circumstances, requests for assistance have been made indirectly through distribution of situation reports without directly asking for assistance. Such indirect requests infer that spontaneous gifts would not be rejected and provide little guidance for correct decision-making.[30]

An important key point in time is the *Disaster Critical Control Point* (DCCP). The DCCP is defined as the time at which the available supplies balance all of the needs in terms of the function or sub-function being eval-

uated. Identification of this time is crucial to avoid inappropriate oversupply, and requires accurate and ongoing re-assessment of needs and available supplies. Furthermore, it is important to recognize that the preceding discussion relates to needs and supplies, and does not relate to the demands requested by the stricken community. It has been demonstrated that needs and demands often are non-congruous, and great care must be taken in evaluations to separate the needs from the demands.[31]

Lastly, it is important for responding agencies to have established explicit indicators of effectiveness and benefit for their activities prior to initiating action. Without such indicators, there will be little objective evidence that the assigned task has been accomplished either entirely or in part—the outcome will be elusive.

INDICATORS OF EFFECTIVENESS / BENEFIT

As noted above, the selection of appropriate indicators of effectiveness is of key importance. The effectiveness of any intervention only can be judged by the selection of an indicator or set of indicators that truly reflect the effectiveness of the intervention instituted. The indicators identified for defining the degree of function (Indicators of Function) of a specific component of society may be different from those selected to reflect the effectiveness of an intervention at meeting its goals and objectives. Indicators of effectiveness must reflect the latter. Such indicators may be quantitative or qualitative. Much of the data obtained in disaster research and evaluation are qualitative or descriptive, and thus, cannot be analyzed directly using inferential statistics. If the indicators chosen can be expressed numerically, then the use of inferential statistics may add strength to the internal validity of the data analysis. In order to judge the effectiveness, efficiency, and/or value of an intervention (response) or an element of the absorbing capacity, it is necessary to have other criteria against which the performance and effectiveness can be compared. Initially, such criteria most often are implicitly defined, and the results of an intervention are judged to determine if they have reached the benchmark(s) previously determined within an indicator. Repeated confirmation of an indicator of effectiveness eventually may render the measure an explicit, accepted mechanism for judging the effectiveness and efficiency of a specific intervention. However, indicators of effectiveness only identify to what extent an action is able to provide a certain kind of assistance, whereas indicators of benefit, which often differ from *indicators of effectiveness*, will

provide the extent to which this intervention really assisted the affected population. Identification of indicators that really define the value of an intervention as to its benefit to a population is of critical importance, since such indicators should signal alarm long before a deteriorating function results in an increasing Crude Mortality Rate.

Appropriate indicators often are identified through the development of consensus by a panel or congress of experts in the field. In the process of developing consensus, persons with experience and expertise, "teach" other panel members in the area being studied. Then, discussions are conducted and debate continues until a consensus is reached on the indicator(s) that most likely will express the effectiveness and /or efficiency of the intervention. Such an indicator or indicators then become indicators of *effectiveness*. Indicators that express *value*[32] of an intervention become *indicators of benefit*.

Crude Mortality Rate must be considered the ultimate, hard endpoint indicator for any health disaster severity score, and for any damage, function, intervention, commodity, or supply involved. Therefore sets of indicators

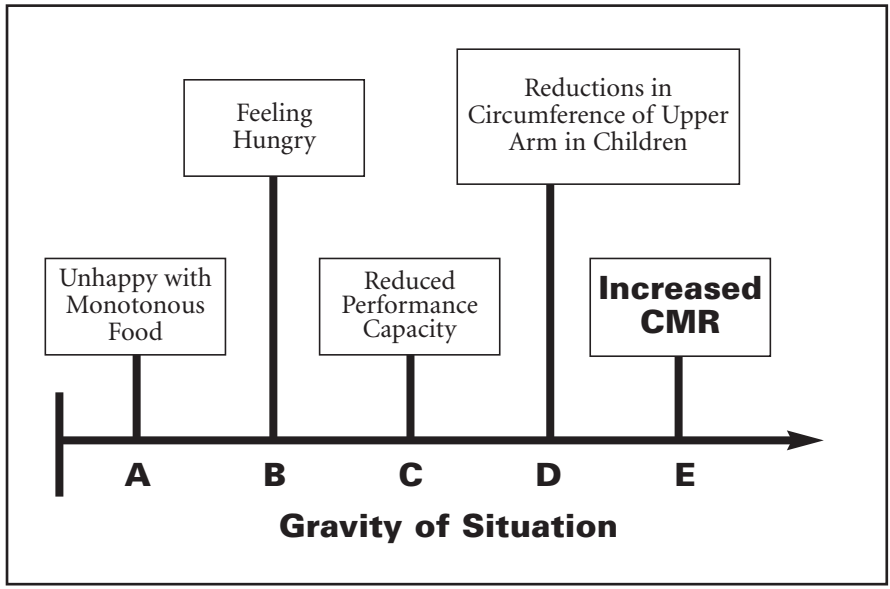

Figure 7.1—Example of applying different indicators for food supply or nutritional status. Crude mortality rate is the ultimate hard endpoint, but the introduction of other indicators will help to identify deterioration before a society reaches the critical threshold. The example uses both qualitative and quantitative indicators.

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must be defined that will enable us to identify any deterioration of functions before it is measured by an increase in CMR. This is exemplified in Figure 7.1 where increasing seriousness is mirrored in different sets of scaled indicators, (A) being the least serious, (B) and (C) are classified as intermediate, depicting, together with level (D), an increasing deterioration until the critical threshold is reached which is depicted as an increasing CMR. For each function or commodity, a similar method for grading of gravity must be developed, level A and B constituting early warning indicators. The indicators suggested do not represent an endorsed scaling process, but serve as an example of how gravity can be scaled through the combined use of qualitative and quantitative indicators. When endorsed, they may be included in a scoring system.

STANDARDS, THRESHOLDS, AND INDICATORS

A *standard* is an object or quality or measure serving as a basis or example or principle to which others conform or should conform or by which the accuracy or quality of others is judged.[33] Given the identification of the indicators(s) used to determine the effectiveness of the intervention, standards for these indicator(s) may be identified from previous research (explicit). If no such standards can be identified, they may be estimated using the same process that was used for identification of the indicator(s). In this manner, minimal and optimal standards or benchmarks (i.e., thresholds) can be defined for each indicator. The results of the research then are compared against these standards. For those standards that have not been derived mathematically, it is not possible to use inferential statistics in their analysis; it only is possible to evaluate the data obtained against the standard.

For example, a group of experts has reviewed the medical literature and reached the consensus that the amount of water supplied per person per day is an important indicator of the effectiveness of an intervention.[34] They note that the available medical literature suggests that a minimum of 15 liters/day of potable water is required to meet *all* of the "essential" needs of a human,[34] and that a minimum intake of 2.5 liters/person/day is required for the average human to survive in a temperate environment. Thus, the indicator selected was the volume of water supplied per person per day, a minimum standard to meet all of the requirements (functional threshold = 15 liters/person/day), and the volume necessary for survival (critical threshold = 2.5 liters/person/day). Thus, damage assessments must determine the actual volume of potable water available per person per day, and compare it

to the established minimum standards. Such a comparison constitutes a needs assessment and identifies the minimum amount of water needed to meet both the critical and functional requirements. In this circumstance, the effectiveness of an intervention whose goal was to bring the average volume of water available to the affected population to the functional threshold, was assessed by determining how close the intervention came to meeting the minimum standard of 15 liters of water per person per day.

In this example, the minimum standard and the functional threshold were the same (15 L/person/day) and the functional indicator and the indicator of effectiveness were identical: the volume of water available per person per day. However, the indicators of function, and of effectiveness may not always be the same. For example, if an intervention had as its goal to increase the available water to 10 liters per person per day, and 10 liters were delivered, then the intervention was effective, it achieved its goal, even though the supply was not sufficient to return to its functional threshold or pre-event state. If only 8 liters/person/day was attained, the intervention would be judged as reaching part of its goal. This was the process used to develop standards and indicators used in the Sphere Project.[34] However, if a specific amount of water is distributed, the degree to which a response is considered to have reached its objective is determined, not only by the average amount of available water per person per day, but the equality of its distribution to persons in need. Although, in this example, numeric values have been used, and hence, inferential statistical analysis of the data could be calculated, such analyses may have little clinical relevance: the statistical results would not reflect the benefit. The issue of whether the intervention being evaluated produced a sufficient supply of water, cannot be determined by whether or not there existed a statistically significant difference between the initial assessment of the water supply and the amount available following the intervention. Furthermore, the objective of the intervention may have been the prevention of the supply of potable water per capita from falling below the minimum!

It is noted that the standards selected also may represent the *thresholds* described in previous sections of this document. Some of these standards (or thresholds) may need to be defined experimentally, while others may be defined only through experience. In the example used above, it would be both unethical and immoral to conduct a study to define accurately the minimum amount of potable water necessary to sustain life. However, the use of

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retrospective, case-controlled methods to study populations in crisis may provide more information about the actual minimum amount of potable water per person per day necessary to sustain human life in a given setting. Thus, future observations as well as conditional factors such as the climate and activity levels of the affected population may lead to modification of these standards.

Many standards already have been developed through use of the consensus process. The American Heart Association and the European Resuscitation Council used such processes to develop some of the measures of effectiveness and "standards" used to judge the adequacy of responses to victims of sudden cardiac death.[35,36] It is worthwhile to note that the standards developed by consensus of experts from these respective associations have differed.

A goal of disaster research/evaluations must be to provide enough information (not just data) to facilitate the development of some indicators and hence, evolve standards for future disaster interventions. Such measures only can be derived by repeated evaluations and observations that lead to the ability to gain consensus about the appropriateness, effectiveness, efficiency, and/or value of disaster responses. For example, a question of the effectiveness of a relief effort could be: "What is the average number of liters of potable water/day/person available to the population affected?"; or even better, "What proportion of the population affected by the disaster has access to the established minimum standards of water per day compared to the standard?" Does the intervention being studied or compared, assist in increasing or decreasing the proportion of the population whose water supply meets the standard?

There is a profound need to develop indicators for the assessment of disaster responses and analyses of the absorbing capacity. Indicators are required for damage assessments, needs assessments, and evaluation of interventions. Very few such indicators have been defined and universally agreed upon. Our ability to understand what we do, how we do it, and the impact produced is dependent upon the identification and validation of appropriate indicators.

DEVELOPMENT OF CRITICAL PATHWAYS (PROCESS EVALUATIONS)

It is important to point out that the two Associations noted above have established "Guidelines" for how resuscitations should be conducted.[35,36]

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These "critical pathways" or algorithms, have become the "standards" to which participants in an Advanced Cardiopulmonary Life Support (ACLS) course have been held. These algorithms are examples of critical pathways.

Critical pathways may be defined by consensus that is obtained from "experts" who combine what they know from the scientific literature with their respective clinical experience. The process of defining pathways based on clinical studies is called "evidence-based medicine" by some. The results of consensus conferences are considered logical pathways through which the majority of patients with a particular diagnosis or set of symptoms and signs should proceed during their respective course of evaluation and treatment. They represent a consensus of the *best practice* for the patient who fits the criteria to be evaluated and treated. Thus, the ACLS algorithms represent the best combination of science and clinical experience, and are especially cogent when quantitative data are insufficient to provide explicit standards. Actual performance then, is compared to the established guideline or critical pathway. If evaluation of the victim's course of recovery reveals a deviation from the consensus-derived pathway, the reasons for the deviation should be explored. A deviation from the critical pathway could result in a better outcome, increased efficiency, and/or decreased cost. Thus, the deviant pathway may become the new critical pathway. As such, the pathways are dynamic processes that are improved continually.

The same type of guidelines could be developed for some aspects of catastrophic events. As information about certain aspects of disaster responses gradually accumulates, critical pathways for some responses may become possible. Evaluation of what actually occurred in a disaster response will be compared with the pathway for the response.

The development of critical pathways should become an objective of future research, since they may assist in evaluation of the responses. Deviations from the pathway could be identified and studied with an eye to improving future responses. Currently, no such pathways formally exist. However, expectations in performance are a reality, and performance frequently is judged by these informal expectations. Perhaps, a first step should be the codification of these expectations.

The bottom line is that some standards and guidelines need to be developed for the evaluation of disaster interventions. The development of such standards must become an objective of future research into the medical responses to disasters.

RECOVERY

Recovery includes returning *all* of the societal components to their pre-event status. In the previous examples, this would entail restoration of the available supply of potable water to the pre-event status. *Rehabilitation* restores function to a "normal" life and pre-event circumstances. Rehabilitation is accomplished through responses (including operations and decisions) that are directed towards restoring the affected area, communities, families, and individuals to the former, pre-event living condition and encouraging and facilitating the necessary adjustments to the changes resulting from the disaster.[37] *Reconstruction* includes reorganization of the affected territory and may involve the removing of persons out of harm's way, reconstruction of the built environment, restoration of basic services, and the development of the economy with a view to re-establishing the pre-disaster conditions.[38] Reconstruction in known hazardous locations does not seem an appropriate investment of resources.

MANAGEMENT

All of the steps (from preparedness to recovery) taken to minimize the damage and restore the pre-event status are tasks of disaster management. Disaster management has its roots in Coordination and Control and is a special skill that requires specialized training and experience. Standards and qualifications for training must be established against which performance can be evaluated.

SUMMARY

Responses to disasters are directed at meeting some defined needs detected by needs assessments. All responses must be requested and coordinated by a central Coordination and Control Center that is responsible for the overall management of a disaster. Immediate relief efforts (responses) are directed at providing those resources necessary to maintain or bring the supplies above critical thresholds. Further responses aim at supporting the recovery processes directed to restoration of the affected society as close as possible to its pre-event status. A disaster no longer exists when the functions of the stricken society have returned to their pre-event status. Rehabilitation services may be required to restore some functions back toward their pre-event status. However, deaths and disabilities elude this objective.

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