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*Chapter Two*  
**METHODS USED  
FOR DISASTER MEDICAL RESEARCH**

**ABSTRACT**

The purpose of research is to discover or change laws and theory while the purpose for evaluations is to affix a value to the process or outcome. Research is used to define a cause:effect relationship between independent and dependent variable(s). Currently, such experimental studies either are impossible to conduct in the setting of a disaster or are considered unethical. Until recently, reports of disaster responses primarily have been anecdotal and descriptive with little or no structure. They have had little value in the elimination of hazards, reduction of risks, improvement in the absorbing and/or buffering capacities, reduction in vulnerability, and or enhancement of disaster preparedness. They have served to shape our perceptions of the medical and public-health needs associated with certain events. During the last two decades, methodologies used in the social sciences gradually have been adapted to the study of disasters. Such studies have contributed greatly to our understanding of the pathophysiology of disasters and the effects of specific interventions on the affected populations or populations at risk for an event. Not all aspects of such interventions can be measured, but most can be assessed using qualitative methodologies. The importance of using both qualitative and quantitative assessments of effects is discussed.

**Keywords:** descriptions; designs; disaster; effects; evaluations; experiments; guidelines; interventions; methods; pathophysiology; research; responses; risks; techniques; templates

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**R** ESEARCH IS defined as: “studious inquiry or examination; to investigate thoroughly; investigation *or* experimentation aimed at the discovery and interpretation of facts, revisions of accepted theories or laws in the light of new facts, or the practical application of such new or revised theories or laws.”<sup>1</sup> To *evaluate* is a verb and is defined as: “to determine or fix a value to; to determine the significance or worth of, usually by careful appraisal or study.”<sup>2</sup> These two terms vary in their purpose: *research* is to discover or change laws and theory; *evaluation* is to affix value to the process or outcome. Evaluation research, therefore, is investigation for the purpose of affixing a value to what is being studied.

The use of experimental research methodologies forms the basis for much of our medical knowledge. Randomized, controlled, experimental studies long have been used as the gold standard in medicine. The purpose of such studies has been to prove that a cause:effect relationship can be established between independent and dependent variables. To many, studies that have not used these methodologies do not constitute true “scientific” studies.

Experimental studies of the effects of an intervention relative to disasters have not been reported. It either has been considered impossible or ethically inappropriate, or both, to identify experimental and control groups essential for the hypothesis testing that is required for the conduct of such studies. Applications for the use of experimental studies in the setting of disasters or events that result in mass casualties may be quite limited, and the design, acceptance, and implementation of such studies in these settings remain as tasks for the future.

Even though the occurrence of some events that result in disasters often may be predictable, they nevertheless strike more or less unexpectedly. Furthermore, disasters may be precipitated by a wide variety of events, never are exactly the same, and involve different geographic areas, populations, and cultures. Until the last decade, disaster medical research had been limited to narrative descriptions of the event(s) that precipitated the disaster, reports of the numbers of persons killed, injured, and/or displaced, and/or descriptions of what medical interventions were or were not applied. The adequacy of the medical interventions has been judged in terms of the response and related to the needs as assessed by the providers or any other external group and not necessarily related to the real needs of the affected population.<sup>3</sup> Generally, published papers consist of anecdotal descriptions with little or no structure. Such reports also may be found in after-action

reports generated by governmental, intergovernmental (IGOs), and non-governmental (NGOs) organizations that have participated in the disaster responses and relief activities. Unfortunately, many of these reports have been biased and self-serving, as they have been performed by the responding agencies themselves. They have had little value in the elimination or modification of hazards, reduction of risks, improvement of the absorbing and/or buffering capacities, reduction of vulnerability, and/or enhancement of preparedness for events for future responses or for the design and implementation of future relief activities. Little in the way of hypotheses that may affect the future have been generated, or much less, tested.

Research into the medical and public health aspects of disasters has two principal objectives: (1) Developing an understanding of the pathophysiology of disasters; and (2) Evaluating the effects of specific interventions on the affected population or populations at risk. Gaining an understanding of the pathophysiology of disasters should facilitate identification of strategies to enhance the absorbing capacity of a society to specific event types and of those factors that seem common to all disasters regardless of their type. Evaluation research should facilitate identification of interventions that provide the highest level of efficiency at the lowest possible cost, and have optimal effectiveness, efficacy, and benefit to the affected population or these populations at risk for a disaster.

Descriptive studies have been valuable in enhancing our overall knowledge about the health consequences of disasters caused by a variety of events and about some of the medical interventions that seem to have made a difference in the outcome.<sup>4-5</sup> However, these studies usually have *assumed* a link between the responses or interventions and some or all of the outcomes. Other studies have described the adverse effects of a disaster on the healthcare system and the kinds of healthcare services that were available or provided to the population affected.<sup>7-10</sup> They have served to shape our perceptions of the medical needs associated with particular sudden-, gradual-, or slow-onset events.

Another approach for research into the medical and public health aspects of disasters has been the use of epidemiological methodologies. Such studies have been used primarily for the purposes of investigating risk factors for injury and death. This particular methodology, while scientific, is limited in terms of its scope and cannot be used readily as a tool for judging or evaluating the effectiveness and adequacy of health services provided dur-

ing disaster medical response. Nevertheless, disaster epidemiological techniques are very useful to answer specific research questions as part of the overall design of an evaluative study.

Quasi-experimental designs such as longitudinal (before-and-after) studies, also have some application in the study of disasters. Although fraught with the danger of inclusion of confounding variables that may occur concurrently with what is being studied, before-after studies may form the basis for assessing the damage caused by an event. Assessment of damage is not possible without knowledge of the pre-event status of the affected society. Furthermore, the goal of disaster responses and relief is the return of the affected society to its pre-event status. Thus, damage assessments are a form of longitudinal studies.

In the 1970s, Peter Safar and his colleagues first began to formulate questions regarding the resuscitation potentials in disaster events through the use of retrospective, unstructured interviews of survivors and responders following earthquakes in Peru (1970)<sup>11</sup> and in Italy in 1980.<sup>12</sup> It became apparent that there was a need for more organized, systematic, and quantifiable research methodologies specifically designed to assess the timeliness and adequacy of life-saving efforts (professional and non-professional emergency medical responses) to disasters. This concept of resuscitation potential in a disaster (disaster reanimatology) culminated in the hallmark studies conducted by an interdisciplinary, inter-cultural research team following the 1988 earthquake that devastated a large area in Armenia, and according to official figures, resulted in more than 25,000 deaths and more than 32,000 persons injured.<sup>14,15</sup> These studies, for the first time, incorporated techniques into Disaster Medicine research that are used commonly in the social sciences.<sup>15</sup> This methodology has been applied many times since this original effort, and has led to enhanced data collection and analysis.<sup>14,16-17</sup> Use of the methodology of unstructured interview has added science to the heretofore anecdotal body of knowledge that previously constituted medical disaster research. This science of Disaster Medicine now is sufficiently developed that the research findings can be used to formulate prevention and mitigation strategies for the damage that results from actualization of a hazard or to enhance the effectiveness and efficiency of medical responses to future events.<sup>18-19</sup>

It is important to recognize that not all of the effects of an event on the population or of the effects of specific interventions can be measured. Measurements require the use of quantitative data techniques to collect such data.

Some aspects of the study of disasters can be quantitated, while others cannot be measured directly. However, many aspects of the study of disasters and the responses to them can be assessed using qualitative data collection techniques. Others can be scaled and analyzed using inferential statistical methods. Combining the different methods may provide a whole spectrum of data collection techniques that can be applied to the study of disasters. The selection of the best technique(s) depends upon the question(s) being posed. Often, combinations of techniques may provide the best answers. Detailed descriptions of all of the available techniques that can be used for the study of disasters are provided within these Guidelines using Templates to assist investigators in the identification of the problems to be studied, framing the question, selecting the techniques to answer the questions, implementing studies, and analyzing and applying the results. The Guidelines and Templates that follow provide that structure.

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