Preparing Emergency Physicians for Acute Disaster Response: A Review of Current Training Opportunities in the US

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Abbreviations:
FEMA: Federal Emergency Management Agency
ICS: Incident Command System

Abstract

Study Objective: This study aimed to review available disaster training options for health care providers, and to provide specific recommendations for developing and delivering a disaster-response-training program for non-disaster-trained emergency physicians, residents, and trainees prior to acute deployment.

Methods: A comprehensive review of the peer-reviewed and grey literature of the existing training options for health care providers was conducted to provide specific recommendations.

Results: A comprehensive search of the Pubmed, Embase, Web of Science, Scopus, and Cochrane databases was performed to identify publications related to courses for disaster preparedness and response training for health care professionals. This search revealed 7,681 unique titles, of which 53 articles were included in the full review. A total of 384 courses were found through the grey literature search, and many of these were available online for no charge and could be completed in less than six hours. The majority of courses focused on management and disaster planning; few focused on clinical care and acute response.

Conclusion: There is need for a course that is targeted toward emergency physicians and trainees without formal disaster training. This course should be available online and should utilize a mix of educational modalities, including lectures, scenarios, and virtual simulations. An ideal course should focus on disaster preparedness, and the clinical and non-clinical aspects of response, with a focus on an all-hazards approach, including both terrorism-related and environmental disasters.

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Introduction

Due to an ever-growing number of domestic and global threats, disaster preparedness and response have garnered substantial attention in recent decades. By virtue of their role in the health care system, emergency physicians are uniquely positioned to be experts and leaders in the realm of disaster management.[1] Disasters are large-scale emergencies, and emergency physicians are trained to work as part of a team in the face of uncertainty and chaos.[2]

Although emergency physicians frequently deploy to national and international disasters, formal disaster education directed specifically toward emergency physicians either is lacking or inconsistently delivered in the current United States residency training model.[2-4] Experience from recent disasters demonstrates that responders who are

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untrained and unprepared for disaster response may do more harm than good.[5] The ability of physicians to understand and work together with local emergency preparedness systems is critical, and a rule mandating virtually all US health care providers to be trained in disaster preparedness and response recently has been proposed.[6,7] The development of a standardized, validated educational curriculum is an essential step in preparing emergency medicine physicians without disaster training to respond appropriately to future disasters.[7-9] In order to identify the core components for such a curriculum, a comprehensive review of the training programs related to disaster response that are currently available to health care providers was performed. Training programs were evaluated on five criteria: target audience, core competencies covered, length, delivery modality, and means of performance evaluation. This study did not include fellowships, master's programs, or trainings for disaster medical teams, as it was felt that individuals involved in these have a higher level of knowledge and different educational needs from the vast majority of physicians with no formal disaster training.

Methods

Study Design

This study used two different searches: a review of the published peer-reviewed literature and a review of the grey literature.

Published Literature Review Search Strategy

A comprehensive search strategy to identify descriptive articles and research studies that focus on disaster preparedness and response training for health care professionals was developed with the assistance of a methods-trained research librarian. A list of key disaster search terms was identified, including: disaster, disaster medicine, earthquake, tsunami, volcanic, avalanche, and terrorism. These terms were combined with key educational search terms, such as medical education, teaching, patient simulation, problem-based learning, and computer-assisted instruction. The search was conducted in the following databases: Pubmed (National Center for Biotechnology Information; Bethesda, Maryland USA); Embase (Elsevier; Amsterdam, Netherlands); Web of Science (Thomson Reuters; New York, New York USA); Scopus (Elsevier; Amsterdam, Netherlands); and Cochrane (The Cochrane Collaboration; Oxford, United Kingdom). The full search strategy for each database is detailed in Appendix 1 (available online only). The search findings were collated and, following elimination of articles published before January 01, 2000 and duplicate articles, a list of 7,681 titles remained.

Published Literature Review Study Selection and Data Collection

Two independent, blinded reviewers evaluated each title for mention of disaster training, disaster education, disaster training evaluation, or disaster preparedness for inclusion in the study. At the conclusion of this process, 381 titles were selected for abstract review.

These 381 abstracts were examined to include descriptive articles or studies that focused on specific disaster response or preparedness training for health care professionals. Studies were excluded if they were written in languages other than English or were published prior to 2004. Additional exclusion criteria included interventions for community members, lay responders, or other non-health care workers. Finally, philosophical papers without a specific education and studies on international emergency medicine training without mention of disaster response were excluded. Two independent reviewers performed abstract review, while a third reviewer further evaluated titles with discordant decisions. At the end of this process, 53 articles met criteria for full-text review (Figure 1; the full list of articles is available in Table 1 [available online only]). Data were extracted on the institution conducting the training, its geographical location, the target audience, the modality and length of the training, and core competencies. In addition, it was noted if the paper mentioned any pre-/post-training evaluation.

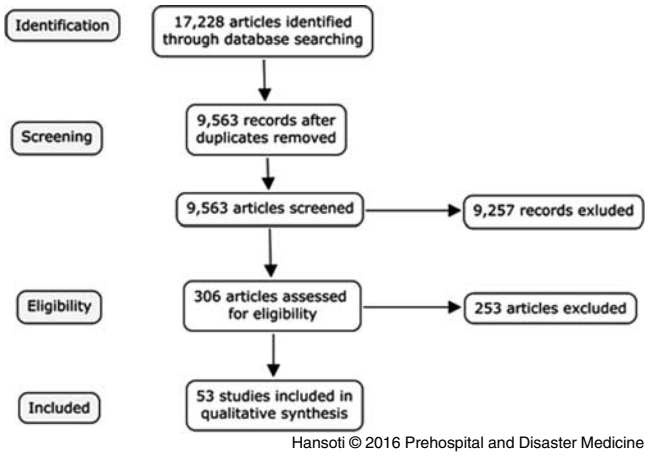

Figure 1. Published Literature Review Search Strategy.

Grey Literature Review

A web-based grey literature search was conducted to identify and examine the existing online courses in disaster preparedness and response available to US physicians. For the purposes of this study, grey literature is defined as academic literature that has not been formally published, in addition to online resources and catalogues. Categories of groups that offer such training were identified and then listed by the major institutions or organizations within those primary categories (Table 2). Each institution/organization was explored online and searched specifically for any course listings. After a course listing/catalog was identified, each course was evaluated for its relevance to disaster preparedness and response training for emergency physicians. Applicable courses were listed in a spreadsheet, and information was collected about each course's scope, length, cost, educational modality, content, target audience, evaluation methods, prerequisites, and clinical relevance.

Results

Published Literature

Only four courses targeted specifically to physicians were described in the peer-reviewed literature. Seventeen courses included physicians amongst other health care professionals, including nurses, residents, students, and paramedics/emergency medical technicians. Some participants in courses involving multiple types of providers commented on the value of understanding integrated roles,[10] while others cited concerns that more specialty-focused information would have been extremely valuable.[11] Most of the courses in the literature were offered from academic medical centers in the United States; only 15 came from outside of the United States, including three from Canada.

The most common delivery method was lecture-based didactic teaching. The lectures often were supplemented by

Category	Institutions and Organization
National/Governmental Groups	Centers for Disease Control (CDC Train); Federal Emergency Management Agency; Center for Domestic Preparedness.
National/Non-Governmental Groups	American Red Cross; Salvation Army.
State Health Departments	Minnesota (USA); North Carolina (USA).
University-based Groups	Harvard; Johns Hopkins; Columbia; University of Minnesota; University of Pittsburgh; University of Washington.
Disaster Course Compendiums	National Center for Disaster Medicine and Public Health.
Specialty/Focused Groups	American Academy of Orthopedic Surgeons; American Academy of Pediatrics; Substance Abuse and Mental Health Services Administration.

Table 2. Categories for Grey Literature Search and Corresponding Organizations

computer-based or tabletop exercises to reinforce learning, and participants responded favorably to these multimodal activities. Similar to the grey literature, many courses could be completed in less than six hours (36%). There did not appear to be a relationship between the length of the course and the results of post-course knowledge assessment.

The core competencies that were emphasized most commonly included: general disaster management (57%); preparedness (47%); biological, chemical, and hazardous materials (38%); terrorism (34%); and communication (30%). Significantly fewer courses included environmental disasters (8%), ethical concerns (2%), and special populations (two interventions specifically addressed pediatric issues in disasters, accounting for 4% of courses). In terms of the phases of the disaster cycle, most courses focused on disaster response (92%). Fewer courses covered disaster preparedness (43%), and only one intervention targeted recovery. The most commonly covered topics included: triage rules; the Incident Command System (ICS); patient care in mass casualties; and chemical, biological, radiological, and nuclear threats.

Only 17 studies (32%) objectively evaluated participant knowledge before and after educational intervention. Pre-intervention scores tended to be poor, demonstrating low-to-moderate knowledge of disaster management principles among health care professionals. As expected, studies that evaluated pre- and post-intervention knowledge almost universally demonstrated a statistically significant increase in participant knowledge following intervention. Studies that evaluated delayed knowledge recall (up to one year) after intervention showed variable loss of knowledge.[12-14] Post-intervention evaluation in several courses found that single modality, specifically online-only, education was perceived as less valuable to the learner than mixed-modality training interventions. However, one study found no significant difference between instruction with lectures alone and the addition of a tabletop exercise to the lecture curriculum.[15]

Grey Literature

Hundreds of disaster preparedness courses were available to health care providers. A total of 384 courses were found through this grey literature search. Many of these courses were available online, and many focused on emergency and disaster preparedness and response. A breakdown of the core content areas covered in these courses is depicted in Figure 2.

Most online courses were free for the learner, except for an occasional small fee that could be paid to obtain a certificate of completion. Courses ranged from 30 minutes to 40 hours in estimated time to completion, with an average of approximately 5.73 hours. Less than 10% of the courses had prerequisites (9.4%), and many of those required completion of either prior online module(s) or basic level ICS courses from the Federal Emergency Management Agency (FEMA; Washington, DC USA). The online courses varied in delivery modality, including individual lecture, group seminar/webinar, quiz, case-based, or the more novel "virtual towns" and simulation-based formats.

The large majority of these courses were directed toward a general audience, or public health or emergency management personnel, rather than targeting health care providers. Only nine of the courses (2.3%) were designed specifically to educate health care providers. Many of these did not have a clinical emphasis, but instead focused on where providers fit into the ICS.[16] An additional three courses (0.8%) from FEMA were designed as general pre-deployment courses and could be useful for health care providers as well as other types of responders.

Thirty-one courses (8.1%) had a more clinical focus, regardless of the target audience. Disaster courses with a clinical focus included those that teach triage for disasters and epidemics, and those that prepare health care providers to respond to hazmat emergencies including chemical, biological, radiological, nuclear, or explosive attacks. One course from the American Red Cross (Washington, DC USA) was created specifically for nurses, and it prepared participants to respond clinically to public health emergencies by focusing on disaster triage and health care needs in shelters.[17]

Competencies referred to in course descriptions include the Centers for Disease Control and Prevention's (CDC; Atlanta, Georgia USA) Public Health Preparedness and Response Core Competencies and Public Health Preparedness Capabilities, as well as those listed by Schultz et al. in their article, "Development of National Standardized All-Hazard Disaster Core Competencies for Acute Care Physicians, Nurses, and EMS Professionals."[18-20]

Discussion

There is a paucity of disaster medicine educational training courses that have been evaluated rigorously for quality and effectiveness.[6,21] This review identifies a need for educational courses that prepare physicians to respond to disasters. While many current courses are directed toward the disciplines of emergency management and public health, there are few courses that provide specific recommendations for emergency providers engaging in direct clinical care. Training programs that target pre-departure preparation for this provider group should be available for future domestic or international disaster deployment.

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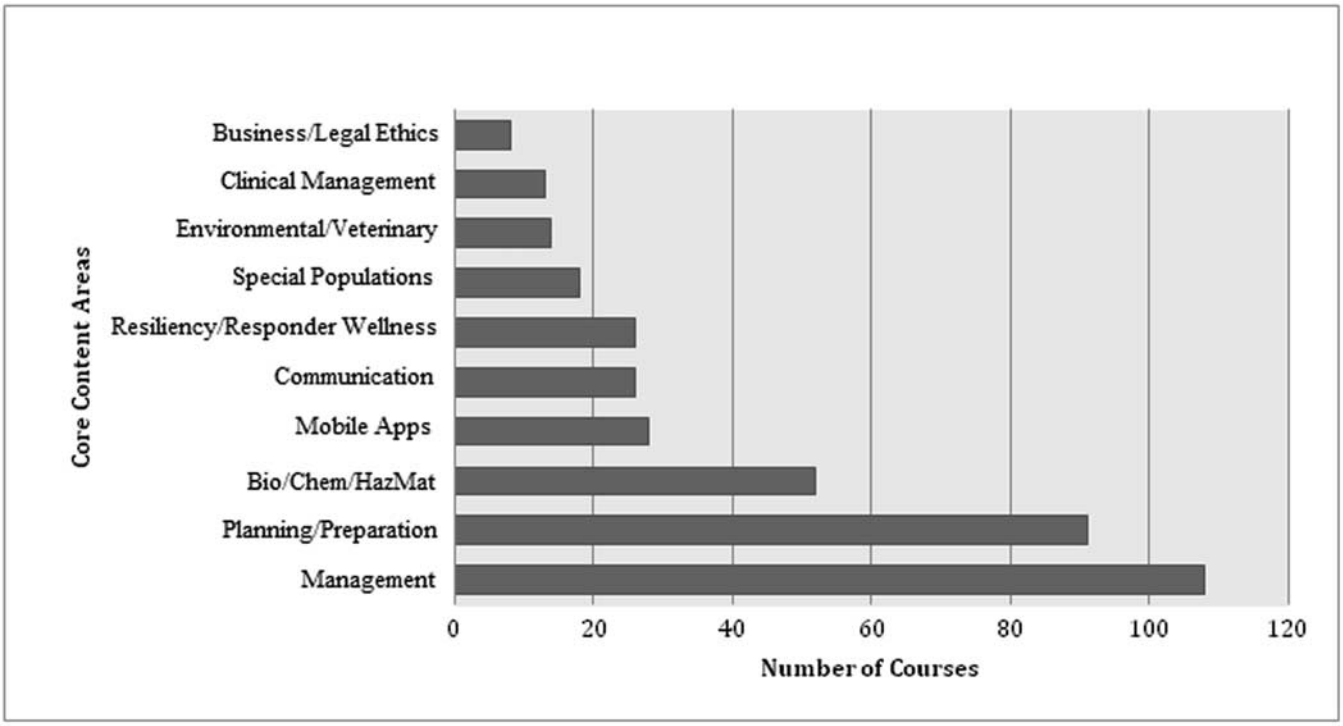

Figure 2. Grey Literature Core Content Areas.

Simulation using virtual world environments has become a popular modality for disaster preparedness and response education. Most physicians have not been exposed to a true disaster response during medical school or residency, and the nature of disasters makes it difficult to gain experience in daily practice. Disasters require a multi-agency response, and physicians and other health care providers are only a small part of a larger multidisciplinary collaboration. A disaster-training course must inform learners about the roles of other responders during disasters, including those outside of the health care sector. While live exercises with multiple participating agencies may be an effective training tool, they are difficult to organize and require significant resources and time.[22] For these reasons, virtual simulation has been used successfully by several courses to train health care providers in disaster response.[22-25] Some of the more successful courses combine educational modalities, supplementing simulation with more traditional didactic lectures. Both virtual simulation and didactic lectures are amenable to distribution through an online educational platform. Online training allows education to be standardized for physicians across the country and might allow participants to complete the training without interrupting their clinical duties. Online educational platforms have been used by several courses already to train health care providers in disaster preparedness and response.[26,27]

The courses found in this review covered a wide variety of content. To prepare a physician for disaster response, a course must cover planning, the Incident Command structure, the clinical management of injuries and illnesses specific to disaster settings, weapons of mass destruction, and personal safety. Many of the existing courses focus on terrorism while neglecting more common events such as severe weather and natural disasters. In designing future training interventions, attention should be directed toward standardized competencies, ensuring a consistent educational experience, and allowing for analysis of training efficacy. One such proposal involves 11 core competencies.[28] While most of the reviewed studies meet a majority of these competencies, there is a near-universal exclusion of education on personal and family preparedness, management of special populations, legal principles, and disaster recovery.

The authors believe that multiple short modules with a capstone simulation experience will best satisfy the need to cover a variety of topics. The trend in education is toward shorter didactic sessions, as most adult learners cannot focus on a lecture for more than 20 minutes.[29] Online learning platforms should adhere to this the 20-minute length and should incorporate a mix of lectures, scenarios, and virtual simulations to keep learners engaged. Additionally, short courses lasting one day or less seem to be most effective; this finding is consistent with the current offerings online as found within the grey literature review. As knowledge retention over time is poor, continuing disaster medical education should be a priority when designing courses targeted to emergency medicine physicians.

Limitations

As with any literature search, some references may have been overlooked. International training courses and others that are not well known or readily advertised may not have been included. Additionally, non-indexed journals may have been missed.

It should be noted, however, that almost none of the courses in the grey literature review provide full information regarding course content or format. Therefore, making a complete assessment of these courses without actually having taken the courses in question is impossible.

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Conclusion

This extensive review of the current training options for disaster response suggests that there is a need to provide an online disaster response and preparedness training curriculum for emergency physicians. This could be accomplished through a course that is targeted to resident-level learners, is available online, and utilizes a mix of educational modalities including lectures, scenarios, and virtual simulations. The course should focus on disaster preparedness and the clinical and non-clinical aspects of response with attention to both terrorism-related and environmental disasters. Further work is required to define the core competencies for this learner group.

Author Contributions

All authors conceived the study and designed the study. BH drafted the manuscript, and all authors contributed substantially to its revision. BH takes responsibility for the paper as a whole.

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Supplementary Material

To view supplementary material for this article, please visit http://dx.doi.org/10.1017/S1049023X16000820

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