Emergency Preparedness: Addressing a Residency Training Gap

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Abstract

As the importance of physician involvement and leadership in crisis preparedness is recognized, the literature suggests that few physicians are adequately trained to practice effectively in a large-scale crisis situation. A logical method for addressing the emergency preparedness training deficiency identified across several medical specialties is to include disaster and emergency preparedness training in residency curricula.

In this article, the authors outline the development and implementation of an emergency preparedness curriculum for the Johns Hopkins General Preventive Medicine Residency (JHGPMR) from 2004 to 2006. The curriculum consists of two components. The first was developed for the academic year in the JHGPMR and includes didactic lectures, practical exercises to apply new knowledge, and an opportunity to integrate the knowledge and skills in a real-world exercise. The second, developed for the practicum year of the residency, includes Web-based lectures and online content and culminates in a tabletop preparedness exercise. Topics for both components include weapons of mass destruction, risk communication and personal preparedness, aspects of local emergency response planning, and mental health and psychological aspects of terrorism.

On the basis of the emergency preparedness training gap that has been identified in the literature, and the success of the three-year experience in implementing a preparedness training curriculum in the JHGPMR, the authors recommend incorporation of competency-based emergency preparedness training for residencies of all specialties, and offer insights into how the described curriculum could be adapted for use in other residency settings.

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The all-hazards model of emergency preparedness for physicians is a novel approach that uses comprehensive training for multiple hazards such as acts of terror, spread of emerging infectious diseases, natural disasters, and other crisis situations. However, this model had not been widely applied in training residents for emergency preparedness, even in the field of preventive medicine. To address the identified training gap, in this article we describe a formalized all-hazards emergency preparedness curriculum developed and implemented for training residents in the Johns Hopkins General Preventive Medicine Residency (JHGPMR).

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Background: Physicians' Roles in Disaster Management

Physician leadership in disasters is vital for increasing the effectiveness of the health system's large-scale crisis response efforts. This is especially true as the emphasis has shifted from responding to health crises toward more proactively anticipating and preparing for them. Kahn[1] found that outcomes of public health emergencies improved as physicians' involvement increased in the context of three communicable disease outbreaks: a 1947 smallpox outbreak in New York City (with complete physician leadership), the cryptosporidium outbreak in Wisconsin, in 1993 (with partial physician leadership), and the anthrax attacks in Mercer County, New Jersey, in 2001 (with no local physician leadership).[1]

Published literature on the health care impacts of Hurricane Katrina underscores the need for disaster preparedness in the medical community.[2,3] During and after Katrina, physicians of all specialties, including internal medicine,[4] nephrology,[5] neurosurgery,[6] obstetrics–gynecology,[7] ophthalmology,[8] and neonatology[9] faced the reality of providing care in dire circumstances. Challenges for physicians included the safety and security of patients in the resource-poor setting created by the flooding, as well as the lack of power and communication,[4–9] delivering health care in shelters,[2,10,11] and managing a surge of patients often 10-fold higher than their usual load.[12]

However, as the importance of physician involvement and leadership in crisis preparedness is recognized, the literature suggests that few physicians are adequately trained to practice effectively in a large-scale crisis situation.[13–16] A logical method for addressing the emergency preparedness training deficiency identified across several medical specialties is to include disaster

and emergency preparedness training in residency curricula.[13–16] Although there is a growing body of literature on emergency preparedness training for nurses,[17,18] the general public health workforce,[19,20] medical students,[21,22] public health students,[23] volunteers,[24] and the general public,[25] to our knowledge there are no published reports of public health and emergency preparedness training for residents based on the all-hazards model.

The current literature on residency-based preparedness education reveals a gap across a spectrum of residency specialties. In their analysis of National Hospital Ambulatory Medical Care Survey data from 2003,[26] researchers from the Centers for Disease Control's (CDC's) National Center for Health Statistics found that although most hospitals trained nurses and staff physicians for terrorism-related conditions (92% and 82% respectively), only 49% trained resident physicians for terrorism-related conditions. This assessment of hospital preparedness and reports from those on the front lines of health care provision during Hurricane Katrina[4–12] have emphasized the lack of preparedness training for physicians and residents, and the need for training in both personal preparedness[8,9] and decision making in resource-poor settings.[5,6,9] As the importance of physician involvement and leadership in preparedness is recognized, the literature suggests that residencies of various specialties, including surgery,[5,6,9] anesthesiology,[13,15] emergency medicine,[15,16] pediatrics,[16] and family medicine,[16] are not addressing this training need adequately. This was the rationale behind the development of the all-hazards preparedness curriculum as a component of the JHGPMR.

Preventive Medicine Defined

Preventive medicine physicians at Johns Hopkins are trained in clinical medicine, population-based medicine, and leadership and management. This residency program has been in existence since 1964. Preventive medicine residency begins in PGY-2 after completion of a minimum of a PGY-1 year in any specialty or rotating internship. The preventive medicine residency includes course work for a master-level degree in public health (MPH) and the equivalent of 12 months of practicum rotations in organizations involved in population-based medicine, during which residents hone the population-based skills acquired during their public health training by applying and integrating public health competencies under the supervision of qualified instructors.[27] Many preventive medicine residency graduates are employed in positions conducive to directing organizational preparedness efforts.[28] Preventive medicine physicians will, therefore, play an integral role in the emergency preparedness of our public health agencies. Analogous to the role preventive medicine physicians play in public health preparedness, physicians from other specialties will be integral to the emergency preparedness of our health care institutions.

The Genesis of the JHGPMR Emergency Preparedness Curriculum

By 2003, as internal and external sources had begun to call increasingly on the JHGPMR for expertise in public health emergency response, it became apparent that the program needed to train its residents to become proficient in emergency preparedness. At the request and recommendation of the school's graduate medical education committee and the program's residency advisory committee, the residency program faculty approached the faculty from the Johns Hopkins Center for Public Health Preparedness (JHCPHP) and invited them to develop a curriculum tailored to the residents' needs. The JHCPHP is a part of a CDC-sponsored preparedness program[29] linking public health academia and practice. The main focus of the CDC's Centers for Public Health Preparedness program is to provide emergency preparedness education and training, and to disseminate information to enhance preparedness efforts and improve crisis response. There are 36 centers within accredited schools of public health that serve the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands.

The JHGPMR emergency preparedness curriculum was developed and first implemented in 2004. The planning team for this curriculum included the residency director, a representative from the residency advisory committee, and faculty from the JHCPHP who had created preparedness curricula for a variety of public health audiences. In formulating the curriculum, the planning team decided that an all-hazards training approach would be most appropriate, given the all-hazards emphasis of the National Response Plan[30] formulated by the U.S. Department of Homeland Security. Consistent with this model, the resulting curriculum addresses emergent naturally occurring outbreaks, weather-related disasters, and a variety of terrorism modalities involving weapons of mass destruction. Given the role of preparedness in strengthening the public health infrastructure by capacity building[31] and by improving delivery of both routine and emergency services,[32] the program addresses dual-use applications of preparedness knowledge and skills, such as risk communication, that can enhance operations in both nonemergent and emergent settings. This dual-use concept informed the inclusion of a variety of related topics, including crisis communication, mental health trauma, and personal/family preparedness.

The first year of the overall JHGPMR program is primarily academic, focusing on the coursework for an MPH degree. During the second year of the program, residents participate full-time in practicum rotations. Accordingly, the emergency preparedness curriculum was fashioned into two programs: one for training during the academic year, and a compressed program for the practicum year, because these residents have full-time responsibilities at their rotation sites. On occasion, there are residents who join the JHGPMR in the practicum year. These residents have previously completed the MPH program at the Johns Hopkins Bloomberg School of Public Health and apply for admission only for the practicum year training. Thus, the practicum year classes are often larger than the academic year classes. Through June 2007, a total of 37 residents during three academic years have completed the academic year program. The practicum year program was administered only during the 2004–2005 academic year; a total of 15 residents have completed that program. The compressed program was only offered to the second-year residents during the initial year of implementation, because these residents had not participated in any emergency

preparedness training during their academic year. After the 2004–2005 academic year, the practicum year residents had the opportunity to participate in the comprehensive academic year program during their first year of residency.

Description of the Curriculum

The resulting competency-based emergency preparedness curriculum incorporates didactic learning, practicum sessions, and, for the academic year residents, a final integrating project. The curriculum's incorporation of experiential learning and competency development in an all-hazards framework was informed by the Road Map to Preparedness,[19] a public health department readiness curriculum that the JHCPHP developed in 2003 in partnership with the Montgomery County, Maryland, Department of Health and Human Services. The CDC-adopted emergency preparedness competencies for public health leaders/administrators[33] formed the heart of the JHGPMR all-hazards curriculum, because these competencies are congruent with the expected leadership roles of JHGPMR graduates in the public health workforce. Table 1 lists the components of the academic year program.

The academic year program

The presentation on introduction to weapons of mass destruction employs a live lecture format and deals broadly with the public health dimensions of chemical, biological, and radiological terrorism. Comparisons and contrasts between these different categories of agents—and the unique challenges to public health posed by each—are stressed. Risk perception, risk communication, physical impacts, and mental health sequelae of these different categories of weapons of mass destruction are discussed.

The lecture on personal preparedness planning describes the critical relevance of personal/family preparedness planning for public health workers and the community at large. Topics include the three core elements of personal preparedness planning: making an emergency kit, making an emergency communication plan, and knowing where and how to learn more about personal and family readiness. The content is consistent with guidance from the U.S. Department of Homeland Security on personal and family preparedness.[34]

As a cornerstone of effective public health readiness and response, crisis communication receives significant attention in the curriculum. An interactive lecture on crisis communication concepts is supplemented by an experiential crisis communication role-playing exercise, in which residents are given an anthrax exposure scenario and then paired off to simulate both a conversation between a concerned citizen and the health department and a conversation between a health department employee and his or her supervisor.

The mental health aspects of public health emergency readiness and response are discussed, including preevent, crisis phase, and consequence phase intervention strategies to address the psychological impacts of terrorism and other large-scale public health emergencies. There is also a lecture session that explores the roots of terrorism, providing an important sociopolitical perspective on intentional threats to the public's health and a contextual background to the competency-based training.

Disasters begin locally, and this poses unique challenges for local public health departments. The lecture on local health department readiness for emergencies focuses on key issues facing local health departments in their post-9/11 public health readiness and response efforts, including how health departments and health care facilities fit into the national incident command system. To accompany this lecture, faculty from the JHCPHP conduct an interactive workshop, applying basic epidemiology concepts in the scenario of an intentional food-borne outbreak. Concepts of forensic epidemiology—linking public health and law enforcement investigative resources to respond to an outbreak—are also addressed.

The preparedness tabletop exercise, where residents role-play real-life public

Table 1

Components of Johns Hopkins General Preventive Medicine Residency Emergency Preparedness Curriculum, Academic Year

Title	Type of instruction	Length
Roots of Terrorism	Live lecture	1 hour
Introduction to Weapons of Mass Destruction	Live lecture	1 hour
Personal Preparedness Planning for Public Health Workers	Live lecture	1 hour
Local Health Department Readiness for Emergencies	Live lecture	1 hour
Crisis Communication: How to Talk to People During a Disaster	Live lecture	1 hour
Public Health Preparedness Exercise Design and Evaluation	Live lecture	2 hours
Mental Health Perspective of Public Health Readiness	Live lecture	2.5 hours
Crisis communication role-play	Role-play exercise	1.5 hours
Case-based exercise of an intentional food-borne outbreak	Simulation of public health investigation and response to outbreak	1.5 hours
Tabletop exercises	Creation and implementation of public health event response scenarios	4 hours
Final culminating project	Integrating all knowledge and skills into implementation of real-world process	Variable

health leaders involved in dealing with a disaster scenario and talk through how they would handle each facet of the disaster as if it were occurring at that time, is designed as an experiential learning activity, to incorporate the first-year residents' new preparedness knowledge. As likely future public health leaders, these residents will not only need skills in participating in preparedness tabletops, but also in knowing how to create, implement, and evaluate such exercises for their agencies. To provide these skills, residents divide themselves into two teams, and each team is required to develop, administer, and evaluate a tabletop exercise for the other team. The teams create their own exercises, objectives, scenarios, and evaluation checklists with guidance from the JHCPHP faculty.

Each year, the academic year preparedness training curriculum culminates in a project that integrates the knowledge and skills acquired through the training. The goal is for the residents to create a meaningful product, not just experience an academic exercise. In 2004, the residents developed a much-needed shelter-in-place plan for the main building of the Johns Hopkins Bloomberg School of Public Health. This plan was presented to the school's support services leadership and is being considered as a template for other Johns Hopkins buildings as well.

In 2005, the academic year residents participated in the evaluation of a real preparedness exercise and the creation of the follow-up "After Action Report" that highlighted the strengths and weaknesses of a local county's performance in the Baltimore-area regional bioterrorism drill, Harbor B.A.S.E. (Biological Attack Simulated Exercise) III. In 2006, the residents evaluated a local health department's performance in a drive-through influenza vaccination clinic. The residents then developed a written After Action Report for the health department.

The practicum year program

The compressed program for the practicum year residents uses primarily Web-based lectures and online monographs to deliver the curriculum content. Like the academic year, this program also covers the topics of weapons of mass destruction, risk communication and personal preparedness, aspects of local emergency response planning such as the incident command system, mental health and psychological aspects of terrorism, and the development and implementation of tabletop preparedness exercises.

Each component of this program concludes with a series of questions to which residents submit written responses in an effort to encourage more active learning and to allow for faculty evaluation of the residents' knowledge of the material. Additionally, just as the academic year program culminates in an experiential learning activity, the practicum year program also concludes

Table 2

Components of Johns Hopkins General Preventive Medicine Residency Preparedness Curriculum, Practicum Year

Title	Type of instruction and source	Length
Emergency response planning	Web-based lecture Available at: (http://www.jhsph.edu/preparedness/training/online/response_planning.html)	0.75 hours
Psychology of terrorism	Web-based lecture Available at: (http://www.jhsph.edu/preparedness/training/online/psych_of_terror.html)	0.5 hours
Introduction to weapons of mass destruction	Web-based lecture Available at: (http://www.jhsph.edu/preparedness/training/online/intro_to_wmd.html)	1.25 hours
CDC's bioterrorism and emergency readiness competencies for all public health workers	Reading of monograph Available at: (http://www.cumc.columbia.edu/dept/nursing/chphsr/pdf/btcomps.pdf)	NA
Public health preparedness exercises: From design to evaluation	Web-based lecture Available at: (http://www.jhsph.edu/preparedness/training/online/ph_prep_exercises.html)	1.0 hours
Communication in risk situations (by the association of state and territorial health officers)	Reading of monograph Available at: (http://www.astho.org/pubs/ASTHO%20Risk%20Communication%20e-Workbook.htm)	NA
Ready America (personal preparedness information from the Department of Homeland Security)	Reading of monograph Available at: (http://www.ready.gov/america/index.html)	NA
Tabletop exercise	Face-to-face exercise Many tabletop exercise templates are available online. One example of such a template is available at: (http://www.rand.org/pubs/technical_reports/2006/RAND_TR319.pdf)	3 hours

with an experiential learning activity, a live tabletop preparedness exercise. Table 2 describes the practicum year program.

Curriculum Evaluation

In each of the three years of the academic year program, all participating residents have completed evaluations. Also, faculty evaluated residents' academic year participation, and practicum year residents evaluated their experiences. The mean rating of the overall training program by the 13 academic year residents who participated in 2004, the first year of the program, was 3.37 on a Likert scale of 1 to 5, where a rating of 1 = poor and 5 = excellent. The qualitative comments suggested that the residents found much of the information valuable, but they perceived that the training was too focused on bioterrorism. The program was then adjusted to better emphasize an "all-hazards" approach.

In 2005, the 12 academic year residents participating in the program gave it an overall rating of 3.67 on the same Likert scale. Residents rated the overall quality of each of the presentations and activities and also recommended whether the session should be kept for the next year's group. Two thirds of the presentations received scores over 4 consistently. Additionally, residents overwhelmingly recommended that all the curricular presentations and activities be continued for following years. The high ratings for the didactic portions of the curriculum indicate that residents found the content to be useful, timely, engaging, and of high quality.

In 2006, the mean overall rating of the training by the 12 participating residents was 4.02, using the same Likert scale. More than two thirds of the sessions also received scores greater than 4. The qualitative comments by the residents suggested that they found the lecture topics valuable and also found the interactive sessions useful.

The rating of the training program has improved with each year of implementation. The content of the program during the last two years of administration has not been significantly altered, but faculty decided to begin the curriculum with a short presentation on the training program's objectives and a demonstration of the curriculum's relevance, a factor that is likely reflected in the improved rating of the program by the residents. Furthermore, the faculty incorporated residents' feedback, which resulted in improved organization of the course and a higher quality of presentations. For example, residents recommended that sessions be held on days when MPH exams were not being given and that sessions be distributed more evenly through the academic year. In addition, presenters who were judged to be ineffective by the residents and faculty were not invited to return.

Faculty evaluated residents as they participated in activities, discussions, experiential exercises, and the culminating project during their residency time. The high caliber of residents' work as reported by the faculty and the final project evaluators each year demonstrates that the residents have absorbed the content, processed it, and verified mastery in applying what they learned.

The 15 practicum year residents also gave positive feedback about their training. The residents as a group believed that the preparedness training was useful in their practicum rotations and careers, and they said they would recommend the training for all general preventive medicine residents. They appreciated the format of combined online and face-to-face training for the tabletop exercise, and they felt that the personal preparedness topic was especially useful. Additionally, all the practicum year residents who participated in the training satisfactorily completed the self-study questions found at the end of each session.

Observations, Challenges, and Future Directions

Although originally designed for a nonclinically based residency, the emergency preparedness curriculum does address all of the Accreditation Council for Graduate Medical Education competencies of patient care, medical knowledge, interpersonal and communication skills, professionalism, practice-based learning and improvement, and systems-cased practice, as summarized in Table 3. Because the entire curriculum was developed for preventive medicine residents, who are training to manage the health of populations, the curriculum is geared towards a systems-based approach to health; this approach necessitates an ability to understand and demonstrate the importance of professionalism. The curriculum provides a significant knowledge base with plenty of time for skill acquisition through the four experiential learning activities and the final culminating project. A major goal of this curriculum is to train residents in communication on an interpersonal and population level. Finally, the culminating project allows the residents to synthesize and demonstrate the integration of all the competency areas.

We believe that this program is effective because it uses a competency-based, multifaceted approach to learning, including didactic sessions with experiential activities; this approach allows the residents not only to demonstrate their acquisition of the new knowledge but also to synthesize and appropriately apply this knowledge to solve practical problems. This is confirmed by external stakeholders who evaluate the products resulting from the projects (e.g., After-Action Reports, shelter-in-place plan) and have found them consistently high in quality.

The curriculum we present in this article designed for preventive medicine residents may be adjusted to align with the competencies for clinicians[35] for use with residents of other specialties. The modular design also allows for ready addition, deletion, or substitution of sessions that may be appropriate for more clinically based specialties. This adjustment may include the addition of sessions on toxicology; recognizing and initiating care for illnesses or injuries from biological, chemical, or radiological agents; hospital preparedness; and clinical decision making in resource-poor situations. Trainings such as Basic Disaster Life Support[36] and Advanced Disaster Life Support[37] could also be added to provide a further patient-based clinical complement to the existing curriculum's population-based approach. Along with these additions, the topics of personal preparedness, use of the incident command system, crisis communication, and mental health aspects of emergency and disaster situations could be maintained. Other adjustments for more clinically based residencies might also place less emphasis on the roots of terrorism, local health

Table 3

Comparison of Johns Hopkins General Preventive Medicine Residency (JHGPMR) Emergency Preparedness Curriculum to Accreditation Council for Graduate Medical Education (ACGME) Competencies

	ACGME competency					
JHGPMR course or component	Patient care	Medical knowledge	Practice-based learning and improvement	Interpersonal and communication skills	Professionalism	Systems-based practice
Mental Health Perspective of Public Health Readiness	X					
Introduction to Weapons of Mass Destruction		X				
Crisis Communication: How to Talk to People During a Disaster				X	X	
Crisis communication role-play			X	X		
Personal Preparedness					X	X
Local Health Department Readiness for Emergencies						X
Public Health Preparedness Exercise Design and Evaluation			X			X
Case-based exercise of an intentional food-borne outbreak			X			X
Tabletop exercises			X			X
Final culminating project		X	X			X

department preparedness, and design and evaluation of preparedness exercises.

As noted by Martin et al,[16] finding time for the addition of new topics during residency training is challenging because of the tight schedules of most residency programs. The use of an online module with a culminating face-to-face session such as that used by the practicum year residents in the JHGPMR program may be feasible for other clinical programs. The modular design of the curriculum permits the training to be compressed into a few days, so that it may be implemented during a residency orientation period, for example. The online training could also be spread out over weeks or months, such that residents with full-time clinical responsibilities could participate as their time allows. The final experiential activity of the training session could be adjusted according to institutional needs; for example, residents could participate in tabletop exercises created for them, participate in an institutional disaster drill, or assist in creating disaster plans for their department. Partnering with other organizations specializing in preparedness training, such as the Centers for Public Health Preparedness, may also facilitate curriculum development and provide faculty expertise for other residency programs, as part of a vital effort to train a generation of future physicians to meet the complex challenges of all-hazards emergency preparedness and response.

Conclusion

This paper describes the content and implementation of an all-hazards emergency preparedness curriculum for preventive medicine residents during both their academic and practicum years. Emergency preparedness training has been overlooked in not only preventive medicine training, but also in other specialties.[13–16] Including residents in the preparedness training plans of hospitals is important for their education; moreover, it is integral to the success of emergency response planning. The Joint Commission released Emergency Management Standards[38] requiring orientation of staff to response actions and implementing facility-wide drills. Residents provide much of the day-to-day care in the larger teaching institutions and are on the front lines of providing clinical care. Moreover, residents are often the only physicians present in the hospital after hours. Having residents across all specialties trained in disaster response will go a long way toward ensuring the safety and well-being of patients and communities everywhere.

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