Public Health Department Training of Emergency Medical Technicians for Bioterrorism and Public Health Emergencies: Results of a National Assessment

David Markenson, Michael J. Reilly, and Charles DiMaggio

Hypothesis: The public health system has a specialized body of knowledge and expertise in bioterrorism and public health emergency management that can assist in the development and delivery of continuing medical education programs to meet the needs of emergency medical service providers. **Methods:** A nationally representative sample of the basic and paramedic emergency medical service providers in the United States was surveyed to assess whether they had received training in weapons of mass destruction, bioterrorism, chemical terrorism, radiological terrorism, and/or public health emergencies, and how the training was provided. **Results:** Local health departments provided little in the way of training in biologic, chemical, or radiological terrorism to responders (7.4%–14.9%). State health departments provided even less training (6.3%–17.3%) on all topics to emergency medical services providers. Training that was provided by the health department in bioterrorism and public health emergency response was associated with responder comfort in responding to a bioterrorism event (OR = 2.74, 95% CI = 2.68, 2.81). **Conclusions:** Local and state public health agencies should work with the emergency medical services systems to develop and deliver training with an all-hazards approach to disasters and other public health emergencies.

KEY WORDS: bioterrorism, emergency medical services, public health, training, weapons of mass destruction

Emergency medical providers are called upon every day to deliver lifesaving care to millions of Americans experiencing medical crises. In addition to this key day-to-day role, the emergency medical services (EMS) system is one of the key components in disaster, terrorism, and public health emergency preparedness and response. The EMS system has developed over the past 30 years into an effective means of delivering prehospital medical care, and often serves as the point of entry for millions of uninsured Americans into the health

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system. Although the original goal of the EMS system was primarily to deliver rapid care and transportation to trauma victims, the expanded scope of practice has allowed the EMS system to effectively manage a variety of life-threatening medical conditions as well.[1–5]

In some recent reports, the role of EMS within the public health system has been described.[6–8] Walz and colleagues describe the feasibility of using paramedics to administer vaccinations. They conclude that paramedics have adequate training to provide this service and outline reports of paramedics being used to administer hepatitis B, influenza, childhood immunizations, rabies vaccines, and tuberculosis tests.[6] MacDonald and colleagues detail a system that was put in place during the 2003 Toronto severe acute respiratory syndrome outbreak, which utilized paramedics, EMS communications professionals, and physicians to implement an EMS-based interfacility transfer control and tracking center. This helped contain infectious severe acute respiratory syndrome patients to noncontaminated medical facilities throughout the metropolitan Toronto area.[7] Furthermore, in a report by McKenna et al, Boston's bioterrorism surveillance system is detailed and the close relationship between Boston's EMS agency and the Boston Health Commission's Communicable Disease Control Division is highlighted as a critical partnership in the success of the surveillance system.[8]

Despite the importance of EMS in public health and their key role in emergency preparedness and response, recent reports have highlighted major weaknesses in the overall preparedness of EMS agencies in responding to chemical, biological, and radiological events and public health emergencies.[2,9–15] In a 2002 survey of state trauma and EMS systems, the Health Resource Services Administration reported that preparedness training nationwide, particularly in the areas of chemical and biological incidents and disaster response, were inadequate.[2,14] This survey highligted the lack of training and education among EMS personnel. Only six (12%) states required prehospital providers to have education on disaster-related topics, only one (2%) state required biological agent training, and three (6%) required education on chemical agents.[2,14]

Within the past several years, the US Congress has passed a number of acts calling for a national level of readiness that specifically addresses the need for well-trained and well-prepared healthcare professionals. Among these are the 2003 Homeland Security Bill and the Nunn-Lugar-Domenici Amendment of 1997. In 1999, the Centers for Disease Control and Prevention (CDC) started the Bioterrorism Preparedness Response Program, which made $40 million available to state health departments for the development of preparedness initiatives.[12] Although Focus Area "G" was designed to bolster the preparedness education and training programs offered by health departments, EMS agencies were not specifically mentioned in this funding program, which continues today.[12] In 2002, the congress enacted the Public Health Security and Bioterrorism Response Act (HR 3448), which provides funding assistance to ensure state and local public health preparedness for bioterrorism threats and public health emergencies, but nevertheless does not specifically list EMS training or education as a target of this funding.

In the fall of 2003, The Hazardous Site Response Act provided funding to several academic sites throughout the country to develop curriculum-based enhancements for the education of health professionals on the response to disasters and public health emergencies.[16] In addition, they allocated funding to develop medical and allied health continuing education programs on the subject of disaster and public health emergency response. These initiatives are designed to influence the future training of healthcare professionals, and they attempt to ensure that throughout the public health workforce there is a baseline level of knowledge regarding the medical and public health management of disasters.

The CDC through their Centers for Public Health Preparedness and the Public Health Training Network (PHTN) have developed a variety of training and education programs designed to increase the knowledge of the practicing health professional in the area of emerging infectious diseases, bioterrorism, and public health emergencies. These programs, however, have largely targeted the health professionals already in the practice setting. To ensure preparedness on a national level, health professionals at all levels need to be prepared to participate on an interdisciplinary level as soon as they graduate and enter the healthcare workforce.

In addition to the increase in federal funding to public health agencies to develop and enhance the capabilities of the health system to respond to bioterrorism events and other public health emergencies, most health departments at the state and local level have regulatory oversight of the EMS systems. In addition, health departments have internal subject matter expertise in areas that specifically relate to preparedness issues, including infectious and communicable diseases, epidemiology and outbreak investigation, toxicology, radiation safety, food and water safety, vaccination programs, hazardous materials emergencies, environmental sampling, and monitoring, etc.

Health departments are in a unique position through their expertise, regulatory authority, and recent funding provisions to assist the EMS system by developing and delivering education and training programs to increase the capacity of the prehospital workforce to respond to a bioterrorism event or other public health emergency.

Methods

A nationally representative sample of basic and paramedic EMS providers in the United States was surveyed (N = 1,919). The study employed a sampling methodology that had been developed and validated by the National Registry of Emergency Medical Technicians (NREMT). The current study was an extension of an earlier prospective survey of a random population of prehospital providers certified at either the emergency medical technicians (EMT)-Basic or EMT-Paramedic level. This sample had been created to be representative of the national population and for use both in a longitudinal study and in periodic surveys related to specific areas of interest regarding prehospital providers and prehospital care. The details of this sample and its use for longitudinal and snapshot analyses have been previously described.[17–19] This study was approved by the Columbia University Medical Center Institutional Review Board.

Eight hundred twenty-three (42.9%) completed questionnaires were returned. Sampling was stratified by both EMT status (ie, EMT-Basic versus EMT-Paramedic) and duration of continuous registration at each level (less than 1 year [new] or greater than 1 year [old]). The sample was further stratified by race to allow oversampling of minorities. Participants were categorized as "minority" if they identified themselves as Asian, Black, Hispanic, or Native American and were categorized as "white" if they identified themselves as white or other, or if they did not provide information on race. Sample size was intended to maximize the efficiency of the sample for comparing different types of EMTs, as well as for estimating population parameters. Sampling probabilities (ie, weights) within strata were adjusted to reflect nonresponse. A two-stage systematic random selection sampling process was employed based on state use of national EMT registrations as either the sole basis for, or as part of, their initial licensure/relicensure requirements and levels of EMT-Basics and EMT-Paramedics. The precision of the estimates for the sample was calculated to be ±4.2 percent as has been previously described.[17–19]

Individuals were asked to indicate whether they had received training in the areas of general weapons of mass destruction knowledge, chemical, biological, radiological, decontamination, or pediatric terrorism considerations in their initial EMS provider course, or in any continuing medical education (CME) within the last 24 months. The source of this training and the providers training in mandatory infectious disease reporting, public health emergencies, and suspicious case reporting were also surveyed to determine whether the local or state health department had provided the training. In addition, providers were asked to indicate whether any training involved "hands-on" components or simulations as a part of the curriculum. In addition to trainings, providers were also asked whether their agencies have the necessary equipment to respond to these specific emergencies.

Providers were asked to gauge their comfort level in responding to various types of disasters based upon four levels of comfort (very comfortable, comfortable, uncomfortable, very uncomfortable). To calculate odds ratios, these four choices were split into two categories. Responses "very comfortable" and "comfortable" were considered comfortable, and responses "uncomfortable" and "very uncomfortable" were considered uncomfortable. Odds ratios are presented with 95% confidence intervals.

All statistical analyses were conducted using SPSS version 13.0. Tables and figures were created using Microsoft Excel 2002.

Results

Few responders had received training in chemical, biological, or radiological terrorism from a health department (6.3%–14.9%) (Figure 1). Health departments that did conduct training for EMS providers did so in the areas of mandatory infectious disease reporting (17.3%–31.8%), public health emergencies (15.1%–25.6%), and suspicious case reporting (13.5%–22.5%) (Figure 2). Of providers who did receive training in public health-related topics, 38.9 percent had received this as part of a CME program, 21.5 percent had this as part of their initial provider training, and less than two percent received public health training from the health department (Figure 3).

Training that was performed by the health department in the area of bioterrorism emergency response was associated with provider comfort in responding to these incidents (OR = 2.74, 95% CI = 2.68, 2.81) (Table 1). In addition, training that was performed by the health department in the area of public health emergency training was also associated with provider comfort in responding to these incidents (OR = 2.9, 95% CI = 2.8, 3.0) (Table 1). Local health departments provided more training to EMS providers than state health departments (Figures 1 and 2).

Regardless of whether training had been provided, when questioned about whether they had the time to perform public health activities while on-duty, 62.5 percent stated they could accomplish disease reporting, and 42.6 percent and 47.6 percent stated they would be able to accomplish symptom cluster recognition and reporting and public health education, respectively (Figure 4).

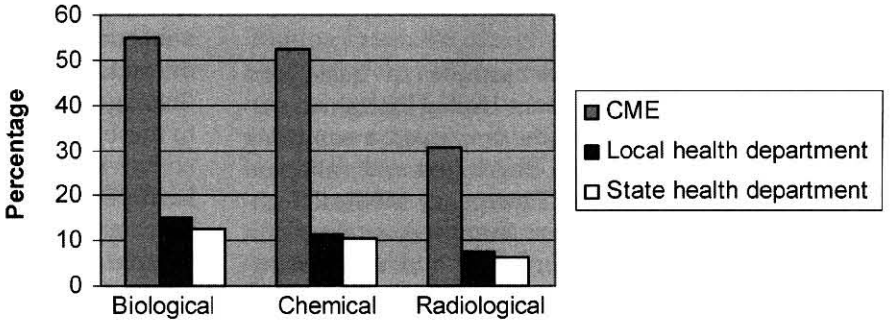

FIGURE 1. Sources of emergency medical services provider training in biological, chemical, and radiological terrorism.

Discussion

There is no shortage of evidence described in the literature that EMS professionals lack training in public health emergency and disaster response.[2,9,20–23] Reasons for this include lack of national standard EMS curricula components addressing disaster and/or the terrorist response, lack of an accepted role for EMS during a public health emergency, and lack of education/training and equipment grants to assist in the procurement of educational and operational resources and technology.[12]

Throughout the United States, state health departments provide most of the regulatory oversight for EMS systems and either approve EMS CME or provide it themselves in areas such as pediatrics, infection control, compliance, and ambulance operations. Despite EMS being in the public health community's "backyard," regulated by public health and having their CME approved by public health, very little training is being provided to EMS providers by the health department in the area of public health, emergency preparedness and response to disasters, terrorism, and public health emergencies. Training that is delivered to EMS by the health department is largely compliance based and not necessarily emergency response oriented (Figure 2). Yet, this study has shown that when state or local health departments provide such training, first responders are more comfortable providing care. This increased comfort level may translate into a greater willingness to report to duty during biological, chemical, or radiological events. As such public health needs to focus additional resources to in this area of EMS education to help improve our first responder preparedness and response for disasters, terrorism, and public health emergencies.

It has been argued that public health agencies have not sought out EMS providers for training or continuing education because of the notion that the public safety and first responder community is not within the purview of the health department.[12] This is inaccurate in that at a minimum in all states EMS is regulated by public health. Even more compelling is the fact that there has been good evidence that an EMS-public health partnership can work to enhance the overall ability of the health system to deliver the necessary emergency medical care to the public during many types of disasters and public health emergencies.[6–8,24,25] Specifically, through paramedic-administered vaccinations and immunizations, decontamination, case and contact tracing, prehospital syndromic surveillance systems, and emergency communications, EMS can offer the public health emergency management community a wealth of resources to bolster public health preparedness.[6–8,24,25]

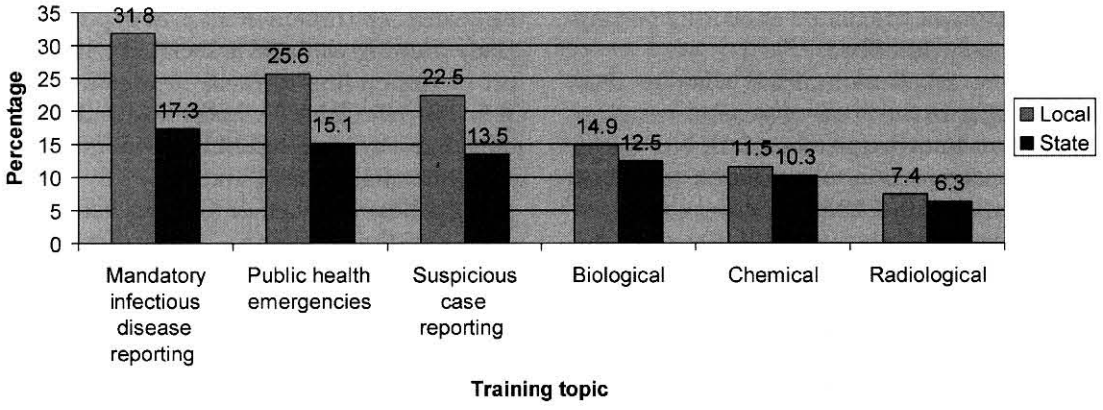

FIGURE 2. Types of training provided by local and state health departments to emergency medical services personnel.

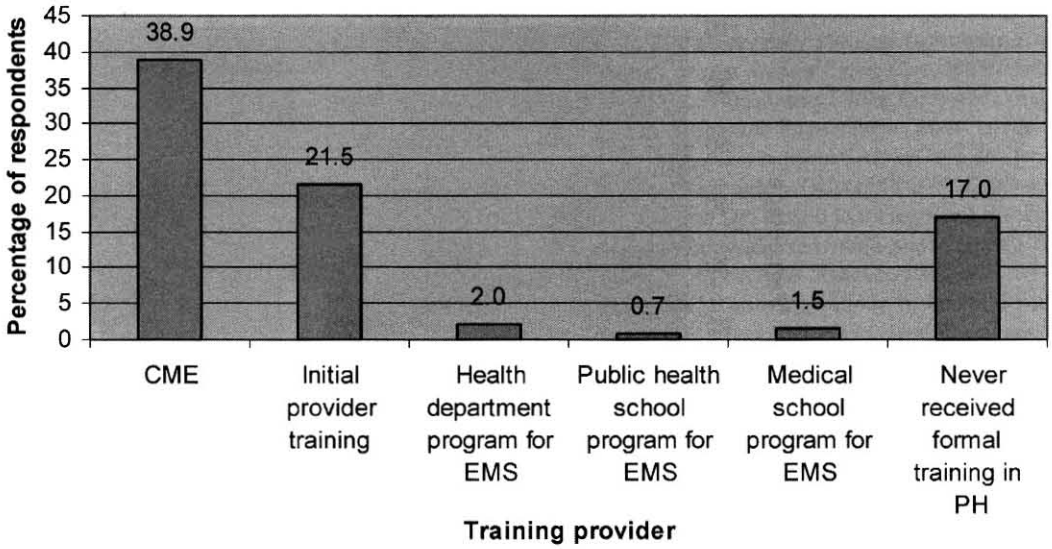

FIGURE 3. Where emergency medical services (EMS) providers receive training on public health topics. CME indicates continuing medical education.

Furthermore, as seen in this study, most prehospital personnel are willing to take on public health-related activities while on-duty.

Health departments at the state and local level are able to assist EMS agencies develop and enhance the capacities of EMTs and paramedics in responding to acts of terror and public health emergencies by contributing valuable content and subject matter expertise to EMS educators who can design and implement effective training programs. By using existing model emergency response competencies for health workers and emergency responder operations guidelines, health educators can ensure that EMS professionals are learning the skills necessary to be effective in responding to large exposures or outbreaks and other public health emergencies.[26,27]

Limitations

There were a few potential limitations in our study. Previous investigators using this sampling methodology and cohort have found no significant demographic or socioeconomic differences between respondents and nonrespondents. Although our sample size was robust at 1,919 responders, response rate of 42.9 percent may introduce bias. This sample may be more motivated than the general population of EMS providers, and it could be argued that providers who felt more comfortable with responding to these incidents may be more willing to answer this survey than their colleagues who were not as comfortable.

Responses in this survey were not controlled or stratified for the type of EMS system that the provider

TABLE 1 Univariate odds ratios of the association between the type of training provided by the local health department and emergency medical services providers' comfort level responding to such an incident

		95% CI	
Variable	Odds ratio	Lower	Upper
Received bioterrorism training from local health department			
Comfort handling multiple biological patients	2.743	2.676	2.812
Comfort handling a public health emergency patient	2.686	2.594	2.782
Comfort handling a biological patient	2.395	2.336	2.456
Received public health emergency training from local health department			
Comfort handling a public health emergency patient	2.917	2.837	2.998
Comfort handling multiple biological patients	2.254	2.208	2.300
Comfort handling a biological patient	2.019	1.978	2.060

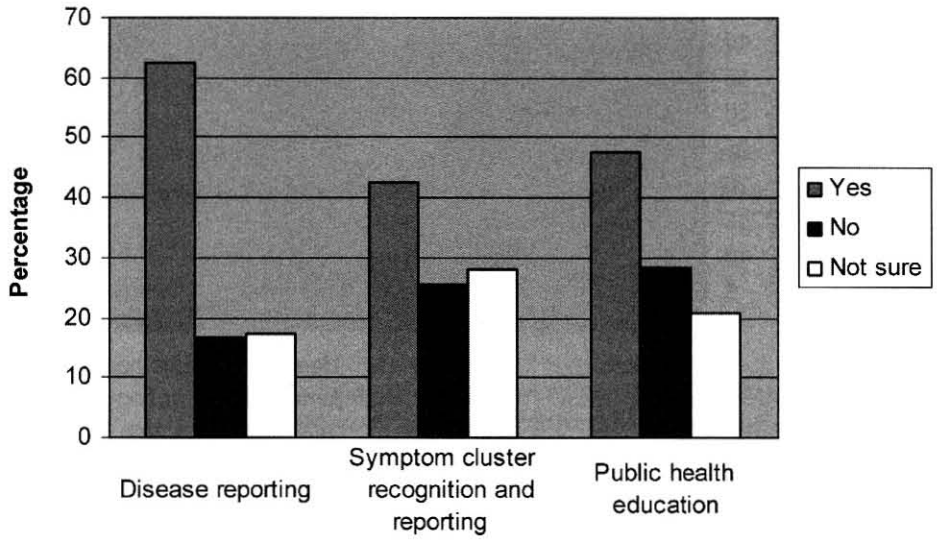

FIGURE 4. Activities emergency medical services providers indicate they would have time to accomplish while on-duty.

worked in. This could introduce information bias as one would expect that in certain EMS systems (fire based, hospital based) they may have access to specific equipment or training grants, which make it more likely that the workers in these systems have certain equipment or training that those in other EMS systems (private, third-service) would not have access to, simply based on funding and training opportunities.

Conclusion

On the basis of this study, EMS providers who were trained in bioterrorism and/or public health emergencies by the health department were two to three times more comfortable with responding to these events than their colleagues who did not receive training. In addition a significant number of providers have received no training on critical issues such as terrorism response and public health emergencies. The public health community is uniquely positioned, particularly at the state level, with regulatory authority over EMS systems and the funding opportunities to design training programs for this branch of the public health workforce. The health department has internal subject matter experts in the areas of infectious diseases, environmental health, and radiation safety that enables it to provide valuable resources to medical first responders in preparing to respond to a public health emergency. Health departments must collaborate at the local and state level with EMS agencies and training centers to assist in the development and delivery of terrorism, public health emergency, and disaster-related public health emergency preparedness and response education. This will assist in ensuring that trained and prepared EMS workforces that can effectively respond to emerging medical crises and maximally participate in the public health emergency response.

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