Critical Challenges Ahead in Bioterrorism Preparedness Training for Clinicians

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Abbreviations:
CME = continuing medical education
DPH = Department of Public Health
VHF = viral hemorrhagic fever
YNHH = Yale New Haven Health

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Abstract

Purpose: A survey was distributed to determine physicians' confidence levels in recognizing potential Category-A bioterrorism disease threats (e.g., smallpox, anthrax), preferred means of obtaining continuing medical education (CME) credits, and their knowledge of the Connecticut Department of Public Health's (DPH) disease reporting requirements.

Methods: Surveys were mailed to all physicians in the three-hospital Yale New Haven Health (YNHH) System (2,174) from January to March 2004; there were 820 respondents for a 37.7% response rate.

Results: A total of 71% of physicians indicated that they were "not confident" that they could recognize five of the infectious agents named; they had higher confidence rates for smallpox (48.8%). Infectious diseases and emergency medicine physicians had the highest rates of confidence. Seventy-eight percent of physicians indicated conferences and lectures as their preferred CME learning modality. Nearly 72% of physicians reported a low familiarity with the DPH reporting requirements.

Discussion: The results highlighted the breadth of perceived weaknesses among clinicians from disease recognition to reporting incidents, which signifies the need for greater training in these areas. As clinicians themselves emphasized their lack of skills and knowledge in this area, there should be a rapid development and dissemination of problem-based learning CME courses in bioterrorism preparedness.

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Introduction

In a new age of potential biological terrorism, outbreaks of severe acute respiratory syndrome, and fears of an avian influenza epidemic, there is an increased need for frontline clinicians to have adequate education and training to meet these threats. Preparedness education and training includes the ability to recognize unusual symptoms as well as knowing proper means of communication and notification from the clinical level to the local, state and federal levels. The catastrophic effects of Hurricane Katrina in the Gulf region of Louisiana and Mississippi further emphasized the need for a clear command system that is well understood.[1,2] Primary care and emergency providers are likely to be the first to encounter patients who have been exposed to biological agents. Thus, their ability to identify cases and activate the public health system is critical to respond to such an attack effectively.

Recent studies suggest that the public health system is not adequately prepared to deal with a large-scale bioterrorism event.[3–7] Weaknesses in the system include infrastructure and the education and training of healthcare providers. Waeckerle described a number of weaknesses in some of the federal plans,[6,8] including the lack of funds to include hospital administrators, limited involvement of healthcare professionals, clinicians' general lack of knowledge of the first responder command system (i.e., Incident Command System), lack of effective surveillance systems, the need for additional education and training for healthcare professionals, and the necessity to centrally coordinate various efforts.[6] To respond to some of these concerns, a task force of the American

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College of Emergency Physicians was formed to identify objectives and training competencies needed for frontline clinicians, including emergency physicians, emergency medical technicians, and emergency nurses.[7,8] The report identified the education and training needs of first responders, the importance of developing an improved communication infrastructure, increasing community-based planning, and improved infrastructure.

During the past two decades, increased attention has been given to the efficacy of different methods for delivering continuing medical education (CME) that enhances physician performance and patient clinical outcomes.[9–17] One of the underlying challenges to delivering CME is the motivation of the clinician. As CME is a requirement for recertification and licensure, many clinicians approach CME as a necessary nuisance. This translates into their choosing a means of CME that best suits their lifestyle: conferences, self-study, satellite-conferences, workshops, etc. Repeated meta-analyses and literature reviews demonstrate that no matter what style is chosen, the most efficacious learning methods employ three primary characteristics: (1) physician self-assessment in the learning area (to recognize a deficiency); (2) an interactive, problem-solving teaching/learning method that allows some practice rather than didactic lecture; and (3) multiple, reinforcing methods.[9–18]

With the advent of the Internet, and its nearly ubiquitous presence in the work force, there is growing attention to the use of Web-based learning tools to deliver CME credits.[19–24] Most of the early Web-based modules were text-based with few interactive characteristics. However, that feature is beginning to change. Casebeer *et al* document the effectiveness of an interactive, Web-based tool used to train physicians in improving chlamydial screening practices.[25] As physicians move through the module, it provides benchmarks of their performance compared to their peers. In essence, the interactive, Web-based tool is able to model the interactive, performance-based learning style that has proven to be most effective in learning. Another important lesson is assuring that the Web-based materials are advertised and easily accessible to the target users.

The Yale New Haven Health (YNHH) System includes private physicians as well as academic clinicians in three Connecticut hospitals: (1) Yale-New Haven Hospital (including the Yale-New Haven Children's Hospital); (2) Bridgeport Hospital; and (3) Greenwich Hospital. In order to develop an appropriate bioterrorism training program for providers, a survey of all clinicians in the three hospital system was conducted to: (1) identify preferred modalities for training and learning; (2) confidence level in recognition of unusual infectious disease cases (i.e., Category-A Bioterrorism Agents as defined by the Centers for Disease Control and Prevention (CDC): anthrax, botulism, plague, smallpox, tularemia, and viral hemorrhagic fever); and (3) familiarity with the state and federal communication and notification system for possible incident cases of bioterrorism.

Methods

Study Design

This was a survey of all physicians associated with the YNHH System in New Haven, Bridgeport, and Greenwich, Connecticut. Address lists for the primary offices of the physicians were collected from each of the hospitals and used to distribute the survey instrument. The study received institutional review board approval.

The surveys were mailed from January to February 2004 and all responses were collected through March 2004. Respondents returned their survey by mail in a pre-paid envelope.

Measures

A 14-item questionnaire was designed to assess the education and training needs in bioterrorism preparedness, preferred training methods for obtaining CME credits, and anticipated first action or communication steps if a patient presented with unusual symptoms. The survey tool was pre-tested using medical residents and was subjected to face and content validity.

The survey primarily contained closed-ended questions covering location of practice, preferred CME methods, confidence in recognition of unusual illnesses potentially caused by a bioterrorism event, and their familiarity with State of Connecticut reporting procedures. An Appendix of the survey tool is included for reference. Most questions used a five-item Likert scale. During the analysis, responses from the two upper and lower extremes were collapsed and the moderate response remained unchanged creating three categories.

Analyses

Data were entered into an Excel database [Microsoft Office Suite 2003, Microsoft, Inc., Redmond, WA], then imported into SPSS version 8.0 [SPSS, Inc., Chicago, IL] to conduct basic descriptive statistics and frequencies. First, survey respondents were compared to non-respondents with 95% confidence intervals to determine if there were any significant differences between groups (Table 1).[26] Descriptive statistics on the respondents' areas of specialty, primary areas of practice, and the key questions of interest were obtained (Appendix). Cross-tabulations were conducted between area of specialty and each of the following: (1) preferred CME methods; (2) knowledge of infectious diseases likely to be used in a bioterrorist event; and (3) potential actions following the identification of a unique case. A relatively large number of physicians were grouped into the "other" category such as pathologists, anesthesiologists, dentists, obstetricians, and psychiatrists, as they were considered to be less likely to be a first responder, and therefore, no correlation analyses were conducted with these individual sub-specialist groups.

Results

A total of 2,312 surveys were distributed; of these, 138 were returned as incorrect addresses and deleted, leaving a total of 2,174 eligible addresses. A total of 820 responses were received for a 37.7% return rate. The respondents' specialties closely matched specialties of the non-respondents (Table 1), and a chi-square test showed no significant differences between groups.

The majority of physicians named conferences/lectures (77.9%) as their preferred means of obtaining CME credits. This preference was followed by seminars at 57.4%, self-study journals and distance learning at 52.3%, computer-based training (CD or disk) and Internet-based training at 36.8% each, and interactive workshops were the least preferred at 30.8%. The interactive workshops and computer and Internet-based training sessions each were split nearly

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Response Status	Specialty	Count	%	Lower Limit 95% CI	Upper Limit 95% CI
Respondents	Emergency Medicine	13	1.59	0.60	3.14
	Family Practice	8	0.98	0.25	2.29
	Infectious Diseases	5	0.61	0.09	1.74
	Internal Medicine	238	29.02	24.71	33.48
	Other	280	34.15	29.61	38.76
	Pediatrics	140	17.07	13.59	20.88
	Surgery	121	14.76	11.49	18.37
	Unknown	15	1.83	0.76	3.46
	Subtotal	**820**			
Non-Respondents	Emergency Medicine	25	1.85	0.97	3.06
	Family Practice	11	0.81	0.28	1.70
	Infectious Diseases	16	1.18	0.51	2.20
	Internal Medicine	427	31.54	28.09	35.05
	Other	485	35.82	32.24	39.43
	Pediatrics	206	15.21	12.62	18.02
	Surgery	171	12.63	10.24	15.25
	Unknown	13	0.96	0.37	1.91
	Subtotal	**1,354**			

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Table 1—Respondents vs. non-respondents by specialty area (CI = confidence interval)

	Seminar		Conference/ Lectures		Self-Study Journal/ Distance Learning		Interactive Workshops		Computer-Based (CD or disk)		Internet-Based	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Low	128	15.6	54	6.5	134	16.3	297	36.2	277	33.8	252	30.7
Moderate	177	21.6	99	12.1	217	26.5	208	25.4	200	24.4	196	23.9
High	471	57.4	639	77.9	429	52.3	253	30.8	302	36.8	302	36.8
No Response	44	5.4	28	3.5	40	4.9	62	7.6	41	5.0	38	4.6

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Table 2—Preferred learning methods for obtaining continuing medical education credits

evenly between low, moderate, and high preferences, showing great variation among the physicians (Table 2).

Overall, the physicians' confidence levels in detecting unusual infectious diseases were low (Table 3). With the exception of smallpox, 48.8% to 71% of physicians stated that they were "not confident" that they could recognize infectious agents such as anthrax, botulism, plague, tularemia, and viral hemorrhagic fever (VHF). Tularemia ranked highest for uncertainty. The second most populated group was "somewhat confident" ranging from 17.4% to 25.2%. There were greater confidence levels for smallpox ranging from 31.5% "not confident" to 21.3% "moderately confident" to 4.6% "very confident". When examined by specialty, infectious diseases physicians felt the most confident in recognizing these diseases, ranging from 75.0% for smallpox to 41.7% for plague, tularemia, and VHF. Emergency medicine physicians followed with high confidence ranging from 57.1% for smallpox to 7.1% for tularemia.

Seventy-one percent of clinicians indicated that they first would turn to an infectious diseases specialist for information on how to treat a patient presenting with an unusual infectious disease, while 13.8% said that they would consult a colleague. Few indicated that they would seek information on-line (8.1%) or consult a textbook (5.6%).

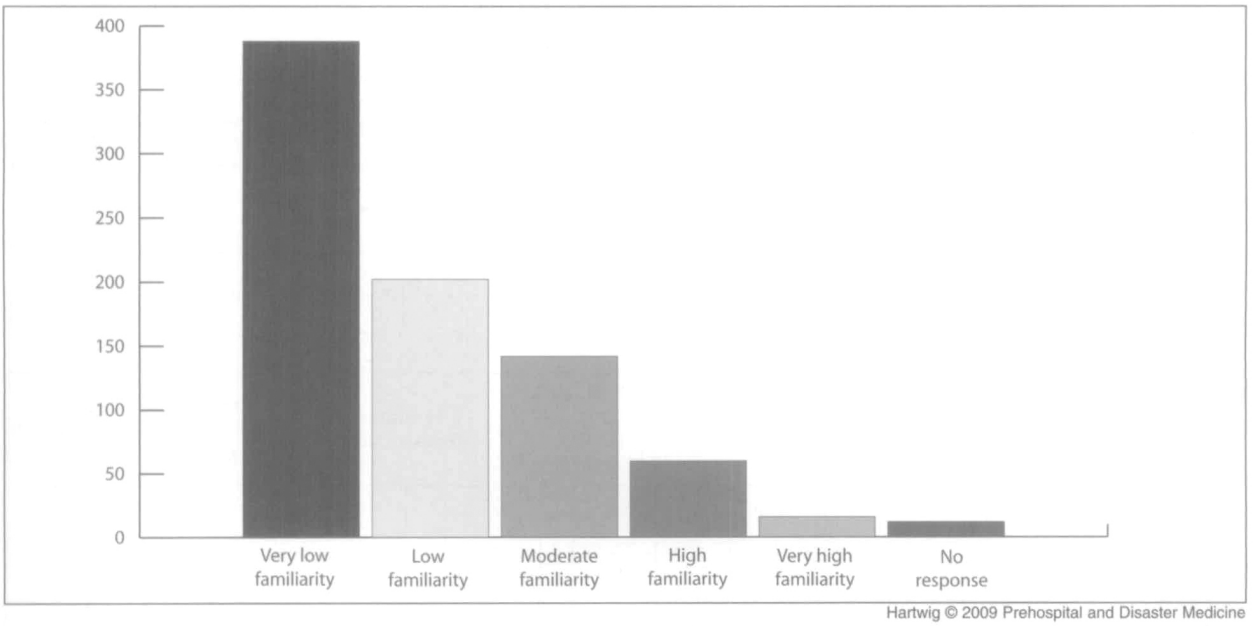
Nearly 72% of physicians reported a very low or low familiarity with Connecticut's DPH reporting require-

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	Anthrax		Botulism		Plague		Smallpox		Tularemia		Viral Hemorrhagic Fever	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Not confident	403	49.1	400	48.8	504	61.5	258	31.5	582	71.0	505	61.6
Somewhat confident	200	24.4	207	25.2	165	20.1	199	24.3	143	17.4	175	21.3
Moderately confident	129	15.7	122	14.9	93	11.3	175	21.3	60	7.3	75	9.1
Confident	62	7.6	72	8.8	33	4	130	15.9	19	2.3	38	4.6
Very confident	12	1.5	5	0.006	1	0.001	38	4.6	2	0.002	10	1.2
No response	14	1.7	14	1.7	24	2.9	20	2.4	14	1.7	17	2.1

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Table 3—Physicians' confidence level in recognizing infectious agents



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Figure 1—Physicians' familiarity with the Department of Health's reporting requirements for an bioterrorist incident

ments for a bioterrorist incident (Figure 1). When analyzed by sub-specialty, 50% of infectious diseases physicians and 28.6% of emergency medicine physicians ranked their confidence levels as "confident" or "very confident". None of the other specialty physicians provided a high confidence ranking.

Discussion

The higher confidence level among infectious diseases and emergency medicine physicians in recognizing potential bioterrorism threats is encouraging, as they may be some of the first responders seeing potential incidents. Further, 71% of respondents indicated that they would refer to an infectious diseases physician if they identified unusual symptoms of a possible infectious agent. Although this is reassuring, many people who are exposed to an infectious agent first may call on their primary physician who often is likely to be a specialist in internal or family medicine. All physicians indicated a higher level of confidence in recognizing signs of smallpox in a patient. This confidence likely was a result of widespread media coverage on a possible smallpox bioterrorism attack in the fall of 2003, just preceding the survey. In addition, during the survey period, a number of physicians and nurses in Connecticut were asked to be vaccinated for smallpox as a precaution, since they would be first responders in a potential outbreak.

The low level of physician familiarity with the DPH reporting requirements further highlights the need for basic education and training in infectious disease recognition and basic reporting requirements. Waeckerle (2000) and Macintyre (2000) emphasized the need for strengthening the education and training of first responders, including the communication infrastructure.[2,6] This supports the vision that Gerberding had presented as head of the [US] Centers for Disease Control and Prevention.[4]

The respondents largely preferred to obtain their CME credits through conferences and lectures. Research suggests that conferences and lectures are less likely to incorporate interactive, problem-solving, teaching components than

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other CME delivery mechanisms, which lead to more efficacious learning outcomes.[12,15,16,25] The preference for conferences likely reflects lifestyle choices regarding learning and self-study.[15,17] The range of other preferred learning modalities ranged from 30.8 to 57.4% suggesting that many clinicians are open to these more interactive sessions. With the ubiquity of the Internet and computers, there will be a tendency to create Web- or CD Rom-based training in this area, and if they incorporate problem-based and interactive learning styles, they are more likely to be successful in teaching skills.[24] However, the importance of including CME sessions on bioterrorism preparedness at medical conferences should not be overlooked as an opportunity.

There are a number of limitations to this study. The survey only had a 38% response rate despite repeated mailings. Most mail-in surveys tend to have a 25–50% response rate, so this response is not unusual. Still, a response from 820 physicians is encouraging and the fact that they did not vary significantly by profession with the non-respondents suggests that a fairly representative sample of the physician population in the three hospitals was obtained. However, given the small sample size in the specialty groups (e.g., infectious disease, emergency medicine) within the larger sample, broad claims cannot be made. Furthermore, the physicians' self-reported capability to recognize an unusual infection may have been incorrect self-perceptions. A more accurate means to measure knowledge might be through case scenarios, chest x-rays, photographs of rashes, and other relevant data.

Conclusions

The results of this study demonstrate that there is a long way to go in adequately preparing physicians to respond to possible bioterrorism incidents.

1. There is a need for more CME training for physicians of all specialty areas in the recognition of Category-A infectious agents.
2. Continuing medical education and training in bioterrorism preparedness must include clear steps for how to communicate a suspect case within the hospital, as well as to local health departments, and state and federal systems.
3. Despite research that indicates that training in smaller groups or with problem-based learning methods produces greater skill and knowledge retention on-the-job, clinicians generally prefer more passive learning methods for CME credits such as lectures.
4. Although the physicians in this survey still showed some reluctance to Internet-based learning, studies should be developed to test specifically for the receptivity of CME bioterrorism preparedness courses through interactive Internet sites or CDs that incorporate problem-based scenarios as a way to bridge the gap between learner styles, convenience, and retention.

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Appendix—Survey tool for physicians in the Yale New Haven Health System

continued on page 53

Training Needs & Preferences for Bioterrorism Preparedness

For the questions below, please mark the appropriate circle.

1. In what setting do you conduct most of your clinical work?
   - ☐ Hospital
   - ☐ Hospital-based clinic
   - ☐ Public Health clinic
   - ☐ Research or academia
   - ☐ Private Practice
   - ☐ Other: Specify _____

In this section, we would like to ask you how you obtain your Continuing Medical Education (CME) credits or Continuing Education Units (CEU).

2. Please check the two (2) methods for obtaining CME or CEU credits you use MOST.
   - _____ Seminars, conferences or other live-formats?
   - _____ Teleconferences?
   - _____ Written professional journals with mail-in quizzes?
   - _____ On-line journals with on-line quizzes?

3. On a scale of 1 to 5, with 1 being low and 5 being high, please indicate your preferences for obtaining CME credits:

	Low				High
A. Seminars or other classroom methods, including satellite conferences.	1	2	3	4	5
B. Attending conferences with lectures.	1	2	3	4	5
C. Self-study through journals or distance learning.	1	2	3	4	5
D. Interactive workshops with problem-based learning and small numbers of participants.	1	2	3	4	5
E. Computer-based training with disks or CD.	1	2	3	4	5
F. Internet-based training that can be accessed through various websites.	1	2	3	4	5

Below are a number of questions regarding internet access:

4. Is there Internet capability at your primary work site?
   - ☐ Yes
   - ☐ No (If 'No', please skip to question # 7)

5. How accessible is the Internet at your work site?
   - ☐ Difficult to access due to location or other physical constraints.
   - ☐ Difficult to access due to time constraints.
   - ☐ Fairly accessible.
   - ☐ Easy access.

6. How often do you access the Internet while at work?
   - ☐ Less than once per week.
   - ☐ 1 to 2 times per week
   - ☐ 3–4 times per week.
   - ☐ Daily

7. How often do you access the Internet from home?
   - ☐ Less than once per week.
   - ☐ 1 to 2 times per week.
   - ☐ 3–4 times per week
   - ☐ Daily
   - ☐ No access at home.

8. On a scale of 1 to 5, with 1 being low and 5 being high, how familiar are you with the Department of Public Health protocols on the reporting requirements for a possible incident case of Bioterrorism?

Low familiarity				High familiarity
1	2	3	4	5

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Appendix *(continued from page 52)*—Survey tool for physicians in the Yale New Haven Health System

The following questions relate to your level of knowledge around a number of possible disease outbreaks.

9. How confident are you that you could recognize a patient with:
(please respond to each...)

	Not confident	Somewhat confident	Moderatley confident	Confident	Very confident
A. Anthrax	1	2	3	4	5
B. Botulism	1	2	3	4	5
C. Plague	1	2	3	4	5
D. Smallpox	1	2	3	4	5
E. Tulermia	1	2	3	4	5
F. Viral hemorrhagic fever	1	2	3	4	5

10. If you were presented with a patient with an unusual infectious disease, where would you turn first for information?
☐ Consult with a colleague.
☐ Consult with an infectious disease specialist.
☐ Use texts to look up the information.
☐ Use an on-line web-site, provided by your worksite such as MD Consult.
☐ Use an on-line web-site specializing in infectious diseases.
☐ Use an on-line web-site such as the CDC.
☐ Other: _____

11. If additional training in bioterrorism preparedness were offered about 3 months from now, how likely would you be to access the training if it were: (please respond to each...)

	Not confident	Somewhat confident	Moderatley confident	Confident	Very confident
A. Provided at your facility?	1	2	3	4	5
B. Provided within 30 minutes of your facility?	1	2	3	4	5
C. Provided in a central CT area?	1	2	3	4	5
D. Provided via the Web?	1	2	3	4	5
E. Provided in printed format?	1	2	3	4	5
F. Provided via a teleconference?	1	2	3	4	5

12. What are the key factors that encourage or discourage your participation in obtaining CME or CEU education?

Encourage	Discourage
_____	_____
_____	_____

13. What other topics regarding disaster or terrorism preparedness or response would you like to obtain?

_____	_____
_____	_____
_____	_____

14. Please check this box if you would be willing to participate in evaluating future bioterrorism, training and education courses. ☐

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