On the front lines: Family physicians' preparedness for bioterrorism

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KEY POINTS FOR CLINICIANS

- Only one quarter of family physicians believe they are prepared to respond to a bioterrorist event.
- Family physicians who have received training in bioterrorism preparedness are more confident than their untrained peers that they would respond effectively to a bioterrorist attack.
- Primary care physicians, who would be on the front line in a bioterrorism attack, should seek training in detection, surveillance, and response activities.

■ OBJECTIVE The events of September 11, 2001, and the nation's recent experience with anthrax assaults made bioterrorism preparedness a national priority. Because primary care physicians are among the sentinel responders to bioterrorist attacks, we sought to determine family physicians' beliefs about their preparedness for such an attack.

■ STUDY DESIGN In October 2001 we conducted a national survey of 976 family physicians randomly selected from the American Academy of Family Physicians' active membership directory.

■ POPULATION 614 (63%) family physicians responded to the survey.

■ OUTCOMES MEASURED Physicians' self-reported ability to "know what to do as a doctor in the event of a suspected bioterrorist attack, recognize signs and symptoms of an illness due to bioterrorism, and know where to call to report a suspected bioterrorist attack."

■ RESULTS Ninety-five percent of physicians agreed that a bioterrorist attack is a real threat within the United States. However, only 27% of family physicians believed that the US health care system could respond effectively to a bioterrorist attack; fewer (17%) thought that their local medical communities could respond effectively. Twenty-six percent of physicians reported that they would know what to do as a doctor in the event of a bioterrorist attack. Only 18% had previous training in bioterrorism preparedness. In a multivariate analysis, physicians' reported that preparedness for a bioterrorist attack was significantly associated with previous bioterrorism preparedness training (OR 3.9 [95% CI 2.4–6.3]) and knowing how to obtain information in the event of a bioterrorist attack (OR 6.4 [95% CI 3.9–10.6]).

■ CONCLUSIONS Only one quarter of family physicians felt prepared to respond to a bioterrorist event. However, training in bioterrorism preparedness was significantly associated with physicians' perceived ability to respond effectively to an attack. Primary care physicians need more training in bioterrorism preparedness and easy access to public health and medical information in the event of a bioterrorist attack.

■ KEY WORDS Bioterrorism, primary care, public health, disease outbreaks. *(J Fam Pract 2002; 51:745–750)*

With the events of September 11, 2001, and the anthrax attacks that followed, the once seemingly remote threat of a bioterrorist attack in the United States is now a reality.[1-3] As with infectious disease outbreaks and other public health emergencies, early detection and reporting are critical to a timely and effective response to a bioterrorist event.[4-7] For most Americans, their first point of contact with the health care system is the primary care physician, who is therefore on the front line in this new era of bioterrorism.[8,9] Because victims of a bioterrorist attack may not know they have been affected, and because the symptoms caused by many bioterror-

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ism-related agents mimic those of common conditions, primary care physicians will likely be in the position of diagnosing and managing the initial cases of a bioterrorist-related illness.[10] Physicians' ability to identify cases and activate the public health system are crucial steps in effectively responding to a bioterrorist attack.[6,11,12]

Recent studies have concluded that the preparedness and infrastructure of the public health system are inadequate to deal with a bioterrorist attack and need improvement.[7,13-16] One survey found that fewer than 20% of emergency departments in the Pacific Northwest had plans for responding to a bioterrorist event.[17] While the emphasis on the public health system is appropriate, these studies failed to discuss the critical role of primary care providers in responding to bioterrorism.[18-20]

While physician experience with the public health system in managing natural disasters and infectious disease outbreaks may be helpful, the unique features of a bioterrorist attack require that primary care physicians be able to obtain and use information from public health and intelligence sources.[4,21] To date, no studies have assessed primary care physicians' ability to respond to a bioterrorist event. In this national survey we assessed family physicians' personal sense of preparedness for responding to a bioterrorist attack.

METHODS

In March 2001, the National Network for Family Practice and Primary Care Research of the American Academy of Family Physicians (AAFP) conducted 2 focus groups of family physicians to explore the issue of bioterrorism preparedness. Using the results of these focus groups, we designed a 37-item questionnaire to be completed by practicing family physicians. The survey was pilot-tested for clarity by 10 academic family physicians and revised accordingly. The questionnaire used 5-category Likert scales, ranging from "strongly agree" to "strongly disagree" or from "excellent" to "poor," to measure physicians' assessment of bioterrorist risk and preparedness, specific clinical competencies, and their prior level of interaction with the public health system. Physicians were also asked to list 4 biologic agents that might be used in a terrorist attack. Physicians' demographic information, including age, gender, training level, and board certification, was obtained from the membership database of the AAFP. Physician age was divided into 3 categories because of its asymmetric distribution. Physicians were asked to describe their location as rural, urban, or suburban, and to describe the size of the population in their area. Using the physicians' zip codes, we geocoded the respondents to 1 of 4 regions of the country. The study was approved by the Social Science Institutional Review Board at the University of Missouri – Kansas City.

The confidential survey was mailed to a national sample of 976 physicians randomly selected from the computerized database of approximately 53,900 active members of the AAFP. Approximately 85% of active members spend at least 70% of their professional time in direct patient care. Two subsequent mailings were sent to non-respondents. The initial survey was mailed in October 2001, before the first case of anthrax was reported to the Centers for Disease Control and Prevention.[1]

Three survey items were the main outcomes of the study because they represented the key features of family physician preparedness: (1) "knowing what to do as a doctor in the event of a suspected bioterrorist attack in my community," (2) "recognizing signs

TABLE 1

Comparison of survey respondents and non-respondents

		% Respondents (n=614)	% Non-respondents (n=362)	*P* value
Mean age (SD)		45 (9.6)	44 (9.6)	.70
Age categories	<40	32	33	.57
	40–50	43	45	
	>50	26	23	
Gender	Male	70	76	.07
Medical training	MD degree	90	91	.53
	International			
	Medical Graduate	17	14	.30
Board status	Board certified	86	82	.09
	Mean years since certification (SD)	12 (7.9)	11 (7.6)	.56
Geographic setting	Northeast	14		
	Midwest	27		
	South	38		
	West	21		
	Rural	35		
	Suburban	37		
	Urban	29		
Population	<25,000	36		
	25,000–350,000	41		
	350,000	24		

TABLE 2

Physicians' responses to selected survey items

		Strongly agree or agree (%)	Neutral (%)	Strongly disagree or disagree (%)
Risk assessment				
"A bioterrorist attack is a real threat..."	in the United States	95	3	2
	in my local community	39	34	27
Preparedness				
"Could respond effectively to a bioterrorist attack"	United States			
	health care system	27	32	42
	My local medical community	19	34	47
	My local hospital	21	33	46
"Know what to do as a doctor in the event of a suspected bioterrorist attack."		26	25	49
"Could respond effectively to a natural disaster"	My local medical community	62	21	17
	My local hospital	66	19	14
	Self	65	20	15
"Could respond effectively to an infectious disease outbreak "	My local medical community	60	27	14
	My local hospital	60	25	15
	Self	66	22	12
Capabilities in bioterrorism response				
"Know where to call to report suspected attack"		57	13	30
"Would recognize signs and symptoms"		24	36	40
"Know how to get information about attack"		56	17	27
"Know how to get clinical information about bioterrorism"		54	18	28
Received prior training in bioterrorism preparedness		"Yes" 18		"No" 82
Current knowledge of management of bioterrorist-related illness		"Excellent or Very good" 5		"Poor" 38

and symptoms of an illness due to bioterrorism in my own patients," and (3) "knowing where to call to report a suspected bioterrorist attack." For analysis, Likert scale responses of "strongly agree" and "agree" were collapsed into a single category because of the small number of "strongly agree" responses. Similarly, "strongly disagree" and "disagree" responses were combined. Student's *t*-test and Pearson's chi-square test were used to assess statistical significance in bivariate analyses. Multivariate logistic regression was performed to assess the effects of age, sex, geographic location, risk assessment, ability to gather information, and previous training in bioterrorism preparedness on the main outcomes of interest. These variables were selected a priori from the conceptual model of the survey. Analyses were conducted using STATA, v. 7.0 (Stata Corp., College Station, TX).

RESULTS

Of the 976 family physicians sent the bioterrorism survey, 614 (63%) responded. The average age of the respondents was 45 years (range 28–76 years) and 70% were male. Respondents were distributed among rural, suburban, and urban geographic locations (Table 1). Respondents did not differ significantly from non-respondents with respect to age, gender, medical training, or board certification (Table 1).

Although 95% of physicians agreed that a bioterrorist attack is a real threat within the United States, only 27% believed the United States health care system could respond effectively to such an attack (Table 2). Thirty-nine percent believed that an attack is a real threat in their local communities; however, only 19% thought their local medical community could respond effectively. Sixty percent thought it likely that current public health surveillance systems

could quickly identify a bioterrorist attack. Physicians' thoughts about the biochemical agents most likely to be used in an attack are listed in Table 3.

Almost three quarters of physicians did not feel prepared to respond to a bioterrorist attack. Only 24% of those surveyed believed they could recognize signs and symptoms of an illness in their patients due to bioterrorism, and 38% rated their current knowledge of the diagnosis and management of bioterrorism-related illness as poor. Moreover, only 18% of physicians had received previous training in bioterrorism preparedness (Table 2).

When asked about their ability to deal with natural disasters or infectious disease outbreaks, a significantly higher percentage of physicians reported they would know how to respond to these major public health events (Table 2). Twenty-six percent of physicians reported they would know what to do in the event of a bioterrorist attack, compared with 65% (P <0.001) of physicians who reported they would know what to do in the event of a natural disaster and 66% (P <0.001) who reported knowing what to do in an infectious disease outbreak. After combining responses for local hospitals and community preparedness, only 17% believed that both their hospitals and their medical communities could respond effectively to a bioterrorism attack, compared with 60% (P <0.001) for a natural disaster and 56% (P <0.001) for an infectious disease outbreak. Physicians who felt prepared for natural disasters were 4 times more likely than other doctors to know how to respond to a bioterrorist attack (36% vs. 9%, P <0.001). Physicians who felt prepared for infectious disease outbreaks were 6 times more likely than other doctors to know how to respond to a bioterrorist attack (37% vs. 6%, P <0.001).

Importantly, physicians felt better prepared for a bioterrorist attack if they had training in bioterrorism preparedness. Physicians who had received such training were 3 times more likely than other doctors to know how to respond to a bioterrorist attack (55% vs. 20%, P <0.001). Ninety-eight percent thought it was important for them to be trained to identify a bioterrorist attack, and 93% of physicians said they would like such training.

TABLE 3

Biologic agents physicians consider most likely to be used in a bioterrorist attack

Agent	Survey respondents (%)
Anthrax	96
Smallpox	82
Plague	28
Botulism	22
Ebola	16
Nerve gas	14
Tularemia	11
Escherichia coli	7
Salmonella	5
Influenza virus	4

TABLE 4

Predictors of preparedness in 3 areas of responsibility

	Knowing what to do as a doctor		Recognizing signs and symptoms		Knowing whom to contact	
Factor	OR*	95% CI	OR*	95% CI	OR*	95% CI
Age <40	1.0	referent	1.0	referent	1.0	referent
Age 40–50	1.1	0.6–1.7	1.0	0.6–1.7	.9	0.6–1.4
Age >50	1.9	1.1–3.3	1.8	1.0–3.2	1.3	0.8–2.1
Female	1.0	referent	1.0	referent	1.0	referent
Male	1.9	1.0–2.6	1.6	0.9–2.6	.8	0.5–1.2
Believe bioterrorist attack is real threat in community	1.3	0.9–2.0	1.9	1.2–2.9	1.4	1.0–2.1
Know how to get info in suspected bio attack	6.4	3.9–10.6	6.2	3.7–10.5	6.3	4.3–9.1
Had prior bioterrorism preparedness training	3.9	2.4–6.3	2.9	1.8–4.7	3.3	1.9–5.9
Live in urban area	1.0	referent	1.0	referent	1.0	referent
Live in rural area	1.2	0.7–1.9	1.1	0.7–1.9	1.2	0.7–1.9
Live in suburban area	1.1	0.7–1.9	1.0	0.6–1.6	1.0	0.6–1.6

* Adjusted for other factors in table. OR=odds ratio. CI=confidence interval.

Familiarity with the public health system was not necessarily associated with physicians' preparedness for bioterrorism. While 93% of physicians report notifiable infectious disease cases to the health department, only 57% (P <0.001) reported knowing whom to call to report a suspected bioterrorist attack. Fifty-six percent of physicians reported knowing how to get information if they suspected an attack in their community.

In the multivariate model, having received training in bioterrorism preparedness (OR 3.9 [95%CI 2.4–6.3]) and knowing how to obtain information in the event of a bioterrorist attack (OR 6.4 [95%CI 3.9–10.6]) were significantly associated with physicians' knowing what to do in the event of an attack (Table 4). These factors were also significantly associated with physicians' ability to recognize signs and symptoms of a bioterrorism-related illness and knowledge of how to report a bioterrorist attack. Believing that bioterrorism was a real threat to their communities was also significantly associated with a physician's ability to recognize signs and symptoms of a bioterrorism-related illness (OR 1.9 [95%CI 1.2–2.9]). Physicians' preparedness was not associated with age, gender, geographic location, or residence in a rural, urban, or suburban area.

DISCUSSION

Only one quarter of family physicians in this national survey felt prepared to respond to a bioterrorist event. The majority of respondents did not feel confident in diagnosing or managing a bioterrorism-related illness, and fewer than 60% reported knowing how to report a bioterrorist event or obtain information about such an event. In addition, only one quarter of physicians were confident that local or national health care systems could respond effectively to a bioterrorist attack.

Those physicians who had received bioterrorism preparedness training were more likely to report having the skills and knowledge to respond to a bioterrorist attack. Knowing how to get information in the event of a suspected attack was the greatest predictor of being able to diagnose and report cases. Although we did not assess the nature of the training or test physicians' actual preparedness, these data suggest that training may improve physicians' abilities to diagnose and treat victims of bioterrorism. Finally, there are no published validated measures of bioterrorism preparedness, and there are few data to demonstrate the effectiveness of particular training interventions.[21]

Physicians felt more comfortable responding to other types of public health emergencies, such as natural disasters or infectious disease outbreaks. This may be due in part to their personal experiences in dealing with these events, or may reflect the formalized training in public health response that is part of medical school curricula. The reporting and response skills physicians would use in dealing with the public health system during a bioterrorist event are similar to the ones they use during natural disasters and infectious disease outbreaks. However, further emphasis should be placed on the importance of information-gathering and pre-incident intelligence for physicians.[4]

Because the survey instrument did not define bioterrorism, we relied on the respondents' personal definitions of bioterrorism. While the timing of the survey coincided with national media attention on the recent anthrax cases, we did not detect a high level of knowledge or confidence in dealing with bioterrorism. In fact, despite the timing, we believe the results are valid and may reflect all physicians' heightened awareness of the threat of bioterrorism and especially their limitations in dealing with it. Physicians clearly acknowledge the need for more training in bioterrorism response.

Primary care physicians have an important role in the public health response to bioterrorism. The results of this study indicate physicians should be trained in how to identify and manage illnesses caused by biologic weapons, how to obtain information about bioterrorism quickly, and how to activate the public health system in the event of a suspected attack. As the public health infrastructure is improved through increased funding, it should integrate training for front-line primary care physicians in detection, surveillance, and response activities.[22] The AAFP has already begun to promote web-based training resources for practicing physicians (www.aafp.org/btresponse). Further study is warranted to test educational interventions designed to improve physicians' preparedness for bioterrorism and their interactions with the public health sector.

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REFERENCES

1. CDC. Update: Investigation of bioterrorism-related anthrax and interim guidelines for clinical evaluation of persons with possible anthrax. Morb Mortal Wkly Rep MMWR 2001;50(43):941–8.
2. Borio L, Frank D, Mani V, et al. Death due to bioterrorism-related inhalational anthrax. JAMA 2001;286(20):2554–9.
3. Mayer TA, Bersoff-Matcha S, Murphy C, et al. Clinical presentation of inhalational anthrax following bioterrorism exposure. JAMA 2001;286(20):2549–53.
4. Committee on R&D needs for improving civilian medical response to chemical and biological terrorism incidents hpp, Institute of Medicine, and Board on Environmental Studies and Toxicology, Commission on Life Sciences, National Research Council. Chemical

and biological terrorism: research and development to improve civilian medical response. Washington DC: National Academy Press; 1999.
5. Khan AS, Morse S, Lillibridge S. Public-health preparedness for biological terrorism in the USA. Lancet 2000;356(9236):1179–82.
6. Franz DR, Jahrling PB, Friedlander AM, McClain DJ, Hoover DL, Bryne WR, et al. Clinical recognition and management of patients exposed to biological warfare agents. JAMA 1997;278(5):399–411.
7. CDC. Biological and chemical terrorism: Strategic plan for preparedness and response. MMWR Morb Mortal Wkly Rep 2000;49(RR04):1–14.
8. Green LA, Fryer GE, Jr., Yawn BP, Lanier D, Dovey SM. The ecology of medical care revisited [see comments]. N Engl J Med 2001;344(26):2021–5.
9. Lane HC, Fauci AS. Bioterrorism on the home front. A new challenge for American medicine. JAMA 2001;286(20):2595–7.
10. Gourlay M, Siwek J. Resources in the war against bioterrorism. Am Fam Physician 2001;64(10):1676–8.
11. Gordon SM. The threat of bioterrorism: a reason to learn more about anthrax and smallpox. Cleve Clin J Med 1999;66(10):592–5.
12. Haines JD, Pitts K, Crutcher JM. Medical response to bioterrorism: are we prepared? J Okla State Med Assoc 2000;93(5):187–96.
13. Inglesby T, Grossman R, O'Toole T. A plague on your city: observations from topoff. Clin Infect Dis 2001;32(3):436–45.
14. Khan AS, Ashford DA. Ready or not—preparedness for bioterrorism. N Engl J Med 2001;345(4):287–9.
15. Garrett LC, Magruder C, Molgard CA. Taking the terror out of bioterrorism: planning for a bioterrorist event from a local perspective. J Public Health Manag Pract 2000;6(4):1–7.
16. Rosen P. Coping with bioterrorism is difficult, but may help us respond to new epidemics [see comments]. BMJ 2000;320(7227):71–2.
17. Wetter DC, Daniell WE, Treser CD. Hospital preparedness for victims of chemical or biological terrorism. Am J Public Health 2001;91(5):710–6.
18. Geiger HJ. Terrorism, biological weapons, and bonanzas: assessing the real threat to public health. [letter; comment]. Am J Public Health 2001;91(5):708–9.
19. Henretig F. Biological and chemical terrorism defense: a view from the "front lines" of public health. [letter; comment]. Am J Public Health 2001;91(5):718–20.
20. Sidel VW, Cohen HW, Gould RM. Good intentions and the road to bioterrorism preparedness. Am J Public Health 2001;91(5):716–8.
21. Training of Clinicians for Public Health Events Relevant to Bioterrorism Preparedness. Rockville, MD: Agency for Healthcare Research and Quality; 2001. AHRQ Publication No. 02-E007.
22. Isaacs B. A boost for public health agencies. Philadelphia Inquirer 2001 November 26, 2001;Sect. A9.

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