

Physician Assistants and Bioterrorism Preparedness

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ABSTRACT

Despite the resources dedicated since 2001 to training health providers in emergency and bioterrorism preparedness and response, the literature on the participation of physician assistants (PAs) is very limited. The purpose of this pilot study was to explore the training level and experiences of PAs in the diagnosis and treatment of chemical, biological, radiological, nuclear, and explosive agents that could be used in a bioterrorism attack. The study population consisted of licensed PAs in 37 northern Texas counties. Data were collected through a mailed survey. Response rate was 36%. More than half of the respondents (58.6%) had not participated in bioterrorism preparedness and response training. Results also indicate that the level of training has not increased since September 11, 2001. However, most respondents were receptive to the idea of participating in both preparedness training and response efforts. It is recommended that state agencies increase training opportunities for PAs in bioterrorism preparedness and response.

EMERGENCY PREPAREDNESS and response training has become a major concern and a public health priority in the U.S. because of recent tragic consequences of natural disasters (most recently, hurricanes Katrina and Rita) and terrorist attacks. These events have challenged federal, state, and local agencies to become sufficiently prepared to respond to emergency events.¹⁻³

The literature suggests that physician assistants (PAs) are likely to be among the first responders in the event of a major disaster⁴ and that they have traditionally been involved in emergency response.⁵ During an emergency, PAs are responsible for a variety of tasks, including diagnosing and treatment, recognizing clusters of unusual disease, and reporting unusual signs and symptoms to public health authorities.⁶ This is not surprising, given that approximately 10% of the 50,000 PAs in practice in 2003 listed emergency medicine as their primary specialty.⁷

Studies suggest that PAs have sustained a higher level of excellence in treating emergency cases and at a much reduced cost compared with their physician counterparts.^{8,9} For example, PAs played an important role in the 1994 earthquake in Northridge, California, where they contributed significantly to the efforts of the local emergency system.⁸ Other research indicates that PAs are a cost-effective option in treating emergency room patients.⁹

The literature also indicates that the key to a more effective response to both natural and manmade disasters is an appropriately trained healthcare workforce.^{10,11} After the terrorist attack of September 11, 2001, unprecedented resources and efforts have been dedicated to emergency and bioterrorism preparedness and response training. According to the Centers for Disease Control and Prevention (CDC), approximately \$2 billion was distributed to state and local governments during 2002-03 to improve

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public health capacity for terrorism preparedness and emergency response.¹² The fiscal year 2005 Homeland Security Grant Program allocated \$3 billion to state and local agencies to enhance the nation's homeland security.¹³

However, recent studies of healthcare providers indicate that they lack confidence and skills in diagnosing and treating chemical, biological, radiological, nuclear, and explosive (CBRNE) related cases,^{10,14-16} pointing to the need for additional training.¹⁷ Literature on the participation of PAs in emergency response and bioterrorism training is very limited, and there is little information related to their experience with CBRNE agents.

The objective of this pilot study was to explore the training needs and experiences of PAs in northern Texas with respect to the diagnosis and treatment of CBRNE agents that could be used in a bioterrorist attack. The information obtained will facilitate the planning and implementation of preparedness and response initiatives.

METHODS

Study Design

This study employed a cross-sectional survey design. The universe of study included all PAs ($N = 105$) practicing in 37 selected counties, which represents a PA cluster in Texas Public Health Regions 2 and 3. Selected counties included those without a public health office. A Microsoft Excel database of healthcare providers was obtained from the Texas State Board of Medical Examiners (TSBME), which licenses all practicing PAs in the state. The database includes demographics, professional license numbers, education, and information related to status of practice. Although information on PAs is available from local and state professional organizations, such as the Texas Academy of Physician Assistants, these entities collect data only on their members, which may not provide an accurate count of all licensed providers practicing in particular regions.

To identify the study population, the database was converted to Microsoft Access and queried. The unit of analysis and observation for this study was the individual PA. The main selection criteria for inclusion were: (1) participants must be professionals included in the TSBME database, and (2) participants must practice or live in one of the 37 selected counties.

Survey Instrument

The survey instrument was developed by the research team through a review of the literature and approved by officials at the Texas Department of State Health Services (TDSHS). It had been previously administered by

this research team¹⁰ and consisted of 12 items divided into two main sections: language use and experience. Language questions referred to the language(s) other than English spoken at home and at place of professional practice.

The second section included questions about previous experience with CBRNE agents, including anthrax, smallpox, botulism, plague, and chemical and radiological exposure. The remaining questions in the experience section explored topics such as participation in bioterrorism preparedness and response training, and willingness and availability to collaborate with TDSHS in the event of an emergency. Demographic information was compiled from the TSBME database, so demographic questions were not included in the survey. The surveys included both Likert-type and categorical scales.

Data Collection Procedures and Methods

After obtaining institutional review board approval, a package containing a cover letter, the survey, and a stamped self-addressed envelope was mailed to all identified PAs. The cover letter requesting participation in the survey included a description of the study and its relevance and information on the measures taken for the protection of human subjects and anonymity. Participants were invited to respond by one of several methods: completing the hard copy of the survey and returning it by fax or mail, or visiting a web page and completing it online.

The web-based survey supported a unique identification code, which was required to log in to the system. The server (ColdFusion Server) verified the respondents' information before permitting access to the electronic survey. A unique identifier was assigned to each potential participant in order to compute participation and response and for follow-up purposes. Approximately 3 weeks after the initial mailing of the survey package, a second survey package identical to the first was sent to those from whom a completed survey had not yet been received.

TABLE 1. CHARACTERISTICS OF STUDY POPULATION AND RESPONDENTS

	<i>Population, Number (%)</i>	<i>Respondents, Number (%)</i>
Gender		
Female	49 (46.7)	15 (51.7)
Male	56 (53.3)	14 (48.3)
Race/Ethnicity		
White	97 (92.4)	25 (86.2)
Black	3 (2.9)	1 (3.4)
Hispanic	1 (1)	0 (0)
Other	4 (3.8)	3 (10.3)

TABLE 2. EXPERIENCE WITH CBRNE AGENTS

CBRNE Agent	Seen		Treated	
	Yes Number (%)	No Number (%)	Yes Number (%)	No Number (%)
Anthrax	1 (3.4)	28 (96.6)	3 (10.3)	26 (89.7)
Botulism	1 (3.4)	28 (96.6)	2 (6.9)	27 (93.1)
Small Pox	0 (0)	29 (100)	1 (3.4)	28 (96.6)
Plague	0 (0)	29 (100)	2 (6.9)	27 (93.1)
Chemical exposure	7 (24.1)	22 (75.9)	9 (31.0)	20 (69.0)
Radiological exposure	1 (3.4)	28 (96.6)	1 (3.4)	28 (96.6)

Surveys completed and returned by fax or mail were entered into the database. To improve the quality of the data, data entry was performed in teams of two, with one member of the team entering the data and the other checking the entered data for any inconsistencies. Electronic surveys were automatically imported into the database.

Data Analysis

Data were analyzed using SPSS 11.5.0 (Chicago, Illinois: SPSS, Inc. 1989–2002). The analyses included simple descriptive statistics to determine the distribution of responses to survey questions. Descriptive statistics, as opposed to inferential statistics, were used since the purpose of the study was to conduct a cross-sectional study of PA_s in the selected region. The response variables included gender, age, practice setting, primary specialty, and ethnicity.

RESULTS

A total of 105 PA_s met the inclusion criteria, but nearly one fourth (23.8%, *n* = 25) of the mailed packets were not delivered and were returned due to incorrect addresses. The response rate for packets successfully delivered was 36.25% (29/80). Of the 29 surveys that were received, 31.0% (*n* = 9) were received after the second mailing. The characteristics of the study population and respondents are described in Table 1. Female (*n* = 15) and male (*n* = 14) respondents were almost equally represented, and the majority (*n* = 25, 86.2%) were white. Respondents represented 14 of the 37 counties included in the study.

Responses to each survey question are summarized below. The following notation conventions were adopted to describe the responses: (*n* = number of respondents who chose the option; % = percent of respondents who chose the option). Note that the denominator of the percentage is based on the number of subjects who actually responded to the survey (*N* = 29).

Language

The results indicate that Spanish is the most frequently spoken language, other than English, both at home (*n* = 4, 13.8%) and in practice (*n* = 7, 24.1%).

Experience

About a quarter of respondents reported having seen (*n* = 7, 24.1%) or treated (*n* = 9, 31.0%) chemical exposures (see Table 2). More than half (*n* = 17, 58.6%) of the respondents had not participated in bioterrorism preparedness and response training (see Table 3). Of those who reported receiving training, almost as many had done so before September 11, 2001 (*n* = 6, 54.5%) as after that date (*n* = 5, 45.4%).

When questioned about the type of training obtained in handling a bioterrorism event, of the respondents who said they had received training, many had participated in more than one type (see Table 4). Training was principally in managing or treating a chemical exposure, followed by smallpox.

Willingness and Level of Confidence

Almost two-thirds of respondents (*n* = 19, 65.5%) reported being willing and available to collaborate with the state health service in diagnosing and treating bioterrorism cases and to participate in a state response plan (*n* = 20, 69%) (see Tables 5 and 6). On the other hand, almost two-thirds of respondents (*n* = 19, 65.5%) were not confident in their ability to diagnose or treat a bioterrorism

TABLE 3. PARTICIPATION IN BIOTERRORISM PREPAREDNESS AND RESPONSE TRAINING

Responses	Number (%)
Yes	11 (37.9)
No	17 (58.6)
Not sure	1 (3.4)

TABLE 4. PARTICIPATION IN BIOTERRORISM-RELATED TRAINING BY TYPE

<i>Bioterrorism Events</i>	<i>Diagnosis, Number (%)</i>	<i>Treatment, Number (%)</i>	<i>Emergency Preparedness, Number (%)</i>	<i>Risk Communication Number (%)</i>
Anthrax	4 (36.3)	4 (36.3)	3 (27.7)	2 (18.2)
Botulism	3 (27.7)	3 (27.7)	3 (27.7)	2 (18.2)
Small Pox	5 (45.4)	5 (45.4)	4 (36.3)	2 (18.2)
Plague	4 (36.3)	4 (36.3)	3 (27.7)	2 (18.2)
Chemical exposure	7 (63.6)	8 (72.7)	5 (45.4)	4 (36.3)
Radiological exposure	4 (36.3)	4 (36.3)	5 (45.4)	3 (27.7)

case (“not very confident” [$n = 11$, 37.9%] and “not confident at all” [$n = 8$, 27.6%]).

Training

The majority ($n = 24$, 82.8%) of respondents wanted to receive additional information or materials on bioterrorism, and 89.7% ($n = 26$) wanted to be informed of future training opportunities. Among those wanting to receive information on training opportunities, half expressed a preference for instructor-led training and small-group workshops ($n = 13$, 50%), and only a few preferred large group presentations ($n = 5$, 19.2%). In addition, a few ($n = 3$, 11.5%) expressed the need for both types of training. Half ($n = 13$, 50%) of the respondents who wanted to receive information on training opportunities preferred self-paced training materials on CD-ROM, followed by curriculum-based reading materials ($n = 10$, 38.5%), and audiovisual and professional/scientific journals and publications ($n = 8$, 30.8%).

DISCUSSION

In FY2005, Texas received approximately \$226 million in funding for terrorism preparedness and homeland security.^{13,18} The results presented here indicate that PAs in northern Texas have had limited participation in emergency and bioterrorism preparedness and response training. Results also suggest that the level of training has not increased since September 11. Consequently, respondents lack confidence in handling bioterrorism-related events. These results are consistent with a previous study on physicians in the same geographic area.¹⁰

However, more than two-thirds of participating PAs reported their willingness to collaborate with local authorities in diagnosing and treating bioterrorism cases and to participate in state-led preparedness and response efforts. This is an encouraging finding and suggests that state and local agencies may have neglected this important professional collective when planning and implementing training efforts. Regarding training preferences,

respondents expressed interest in instructor-led training, small-group workshops, and self-paced training in the form of CD-ROM.

Despite the local nature of the study and the limited number of respondents, there are several findings that warrant further discussion. First, the study revealed a potential data reliability issue associated with the database obtained from Texas State Board of Medical Examiners. More than 23% of the mailed packets were returned. This is a relevant issue that deserves further investigation, because inaccurate provider data could compromise emergency preparedness and response. State health authorities and/or emergency preparedness planners should work with health professional organizations to maintain accurate and reliable databases.

Second, the survey response rates were low (36.25%). Potential explanations may include a lack of motivation to respond to the survey and a lack of interest in the subject matter.

Third, the TSBME database used in this study included only two race/ethnicity categories: white and black. The Office Management and Budgeting (OMB) Statistical Directive 15 mandates that agencies collecting and reporting health data include 6 race categories (American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian, Pacific Islander, and White) and 2 ethnicities (Hispanic or Latino and non-Hispanic or Latino).¹⁹ State health data should be consistent with Directive 15, and it is recommended that the TSBME disaggregate the “other” category to include those population subgroups recommended by the OMB.

TABLE 5. WILLINGNESS AND AVAILABILITY TO COLLABORATE WITH THE STATE IN THE DIAGNOSIS AND TREATMENT OF BIOTERRORISM-RELATED CASES

<i>Responses</i>	<i>Number (%)</i>
Yes	19 (65.5)
No	0 (0)
Not sure	3 (10.3)
No answer	7 (24.1)

TABLE 6. WILLINGNESS AND AVAILABILITY TO PARTICIPATE IN THE STATE RESPONSE PLAN

Responses	Number (%)
Yes	20 (69.0)
No	0 (0)
Not sure	2 (6.9)
No answer	7 (24.1)

The findings of this study point to the challenges and opportunities inherent in developing a coordinated strategy to strengthen the preparedness education, planning, and response of state health departments and healthcare providers. Based on the results of the study, it is recommended that state agencies strengthen contact with practicing PAs, maintain an up-to-date database of PAs interested in training opportunities and participation in emergency response, and provide additional opportunities for training. Additional research is needed to explore how contact data of health providers is obtained and managed.

Given the exploratory nature of the present study, more research is recommended to address the findings of this and similar published studies. Future research must focus on obtaining a higher response rate. This can be achieved through the active involvement of professional organizations, personalized regular communication with providers, and the provision of incentives for participation. Research also should be expanded to other Texas regions and include practicing PAs in urban and non-urban communities.

Finally, additional research must be conducted to determine whether current state efforts are effective in engaging PAs and other healthcare providers in bioterrorism preparedness and response. It is also essential to develop and maintain an accurate database of providers who are trained and interested in collaborating with planning initiatives. In this regard, the TDSHS Regional Office in Arlington and the University of North Texas (UNT) continue their collaborative partnership to further strengthen bioterrorism preparedness and response at the regional level. A multiyear project is being conducted to expand the current bioterrorism health professional database to include not only physicians and PAs, but also veterinarians, nurses, and emergency medical personnel. Additionally, the project is exploring ways to improve the accuracy of the data on health providers' contact information.

LIMITATIONS

The study population included all PAs practicing in North Texas Regions 2/3 (i.e., this was a non-probabilis-

tic survey), and descriptive statistics were used to describe the results. The low response rate, the high number of returned surveys due to wrong address, and the regional approach taken by the study have the potential of introducing bias into the results and, therefore, of limiting the extent to which the results can be extrapolated to other jurisdictions in the U.S. The results, therefore, present a snapshot of the preparedness and training needs of participants in North Texas Regions 2/3 and may not be applicable to those practicing in other regions.

The low absolute number of respondents (29) disallows statistical comparison between respondents and nonrespondents, although the response rate was higher than previous published studies surveying physicians on similar subject matters.^{10,17} Another issue to be considered is the limited representation of counties; respondents represented 14 counties of the 37 included in the selected geographic area. Finally, this study focused on PAs in non-urban settings. However, it is likely that the conclusions drawn apply to providers in urban areas as well.

Despite the exploratory nature of this study and the abovementioned limitations, to the knowledge of the investigators, this is the first study that involved an assessment of the experiences and training of PAs. The study contributes to the literature, provides the framework for further research, and offers recommendations for improving emergency response plans.

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REFERENCES

1. U.S. General Accounting Office. *Bioterrorism: Preparedness Varied across State and Local Jurisdictions* (DHHS Publication No. GOA 03-373). Washington, DC: U.S. General Accounting Office; 2003.
2. Chaffee M. Reality check. How prepared are we for disasters? *Am J Nurs* 2006 Mar;106(3):13.
3. U.S. Centers for Disease Control and Prevention. Public health response to Hurricanes Katrina and Rita—United States, 2005. *MMWR Morb Mortal Wkly Rep* 2006 Mar 10;55(9):229–231.
4. DiMaggio C, Markenson D, Redlener I. Preparing for disasters: what should you know, and when should you know it? *JAAPA* 2005;18(3):40–53.
5. Cartwright R. Ground zero. *JAAPA* 2001;14(10):55–56.

6. Leger M, McNellis R, Davis R, et al. *Biological and Chemical Terrorism: Are We Providers Ready?* Alexandria, Va: American Academy of Physician Assistants; 2001. Available at: <http://www.aapa.org/clinissues/BTtext.htm#role> Accessed August 23, 2005.
7. American Academy of Physician Assistants. *2003 AAPA Physician Assistant Census Report*. Alexandria, Va: American Academy of Physician Assistants; October 6, 2003. Available at: <http://www.aapa.org/gandp/issuebrief/emergency.pdf>. Accessed October 5, 2005.
8. Teeter DS. Illnesses and injuries reported at Disaster Application Centers following the 1994 Northridge Earthquake. *Mil Med* 1996 Sep;161(9):526–530.
9. Arnopolin SL, Smithline HA. Patient care by physician assistants and by physicians in an emergency department. *JAAPA* 2000 Dec;13(12):39–40.
10. Hsu CE, Soto Mas F, Jacobson H, Papenfuss RL, Nkhoma E, Zoretic J. Assessing the readiness and training needs of non-urban physicians in public health emergency and response. *Disaster Manag Response* 2005;3(4):106–111.
11. Parrish AR, Oliver S, Jenkins D, Ruscio B, Green JB, Colenda C. A short medical school course on responding to bioterrorism and other disasters. *Acad Med* 2005 Sep;80(9):820–823.
12. Improvement in local public health preparedness and response capacity—Kansas, 2002–2003. *MMWR Morb Mortal Wkly Rep* 2005 May 13;54(18):461–462.
13. U.S. Department of Homeland Security. *Fiscal Year 2005 Homeland Security Grant Program*. Washington, DC: U.S. Department of Homeland Security, Office of State and Local Government Coordination and Preparedness, Office for Domestic Preparedness; 2005. Available at: <http://www.dhs.alabama.gov/PDFs/FY05hsgp.pdf> Accessed January 18, 2006.
14. Chen F, Hickner J, Fink K, Galliher J, Burstin H. On the front lines: family physicians' preparedness for bioterrorism. *J Fam Pract* 2002;51(9):745–750.
15. Alder S, Clark J, White GL Jr, Talboys S, Mottice S. Physician preparedness for bioterrorism recognition and response: a Utah-based needs assessment. *Disaster Manag Response* 2004 Jul-Sep;2(3):69–74.
16. Woods R, McCarthy T, Barry M, Mahon B. Diagnosing smallpox: would you know it if you saw it? *Biosecure Bioterror* 2004;2(3):157–163.
17. Alexander G, Wynia M. Ready and willing? Physicians' sense of preparedness for bioterrorism. *Health Aff* 2003 Sep-Oct;22(5):189–197.
18. HHS announces \$1.3 billion in funding to state for bioterrorism preparedness [news release]. Washington, DC: U.S. Department of Health and Human Services; May 13, 2005. Available at: <http://www.hhs.gov/news/press/2005pres/20050513.html>. Accessed January 18, 2006.
19. OMB Statistical Directive 15. Standards for maintaining, collecting, and presenting federal data on race and ethnicity. *Federal Register* Oct 30, 1997. Available at: <http://www.doi.gov/diversity/doc/racedata.htm>. Accessed July 10, 2005.

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