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Training for Terrorism-Related Conditions in Hospitals: United States, 2003–04

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Abstract

Objective—This study estimates baseline data to determine which hospital characteristics are associated with providing terrorism preparedness training to clinical staff.

Methods—Information from a Bioterrorism and Mass Casualty Supplement to the 2003 and 2004 National Hospital Ambulatory Medical Care Surveys was used to provide national estimates of variations in terrorism preparedness training by eight hospital characteristics. Of 874 hospitals in scope, 739 (84.6 percent) responded. Estimates are presented with 95 percent confidence intervals.

Results—Hospitals with Joint Commission accreditation were more likely to provide terrorism preparedness training to all types of clinical staff (staff physicians, residents, nurse practitioners, physician assistants, and laboratory staff). Teaching hospitals, medical school affiliation, bed capacity, and urban location were also associated with training staff physicians, residents, nurse practitioners, and physician assistants. Hospitals with residency programs were associated with training only staff physicians and residents. There was more parity across hospital characteristics in training nurses and laboratory staff than for physicians, residents, nurse practitioners, and physician assistants. Joint Commission accreditation was the most consistent factor associated with providing training for all nine exposures studied (smallpox, anthrax, chemical and radiological exposures, botulism, plague, tularemia, viral encephalitis, and hemorrhagic fever).

Keywords: bioterrorism • terrorism • medical education • health professional education

Introduction

In response to the September 11, 2001, airborne terrorist attacks and the anthrax outbreak on the East Coast in October 2001, Congress passed the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. Emergency funds were appropriated to establish the Bioterrorism Hospital Preparedness Program of the Health Resources and Services Administration (HRSA). In 2002, funding was awarded to all state and territorial health departments and those of the District of Columbia, New York City, Chicago, and Los Angeles. It has continued annually. Its purpose is to increase the ability of hospitals to prepare and respond to weaponizable infectious diseases that might be utilized by terrorists operating within the United States. One of the priority areas in this program was training clinicians in how to manage these diseases (1). In 2003, the Bioterrorism Training and Curriculum Development program of HRSA was begun to provide continuing education for practicing clinicians and to enhance curricula in health professional schools in terrorism preparedness. Academic health centers, health professional schools, and other health educational entities were eligible to receive funds (2). The Centers for Disease Control and Prevention has provided funding for bioterrorism education and training since 2000. Among the other target groups, emergency department personnel, medical schools, and academic health centers were specifically mentioned as being appropriate for program funding in the cooperative agreement guidance (3).

This survey represents a baseline assessment of hospital terrorism preparedness during the time when funding for this purpose was first becoming available. Although initial funding was awarded to state, territorial, and selected municipal health departments in February 2002, many hospitals had not yet received funding from their health departments during 2003 (4). One group made site visits to 12 metropolitan communities between September 2002 and May 2003, and reported that hospitals in most of those

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communities had not received any of the HRSA hospital preparedness funding that had been allocated to the states (5). The 2002 program funded only biological terrorism preparedness and did not cover chemical, radiological, and explosive terrorism until the 2003 continuation year (6).

The objective of this study was to provide an assessment of terrorism preparedness training among clinicians in U.S. hospitals and to identify hospital characteristics associated with providing training. A previous report provided estimates of training provided in 2003, but it did not include details on training differences by hospital characteristics (7). Information about strengths and limitations of terrorism preparedness in U.S. hospitals is crucial in planning how future funding could be used to improve the domestic defensive posture.

Methods

The National Hospital Ambulatory Medical Care Survey is conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS) with yearly review and approval by its Ethics Review Board. The Bioterrorism and Mass Casualty Supplement was funded by the Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. A complex survey design was used, with the frame constructed from 112 geographic primary sampling units consisting of U.S. counties and townships. Within those primary sampling units, 1,110 total hospitals were sampled. Survey responses were weighted according to the inverse probability of hospital selection and adjusted to account for nonresponse. Therefore, estimates were considered representative of similar health care facilities over the entire Nation. The scope of the surveys included only those hospitals that had a 24-hour emergency department or an outpatient department with clinics supervised by physicians. Supplement data from 2003 and 2004 were combined to provide more reliable estimates of terrorism preparedness. Of 1,110 eligible hospitals sampled, 874 were in scope. Of these, data were received from 739 hospitals, for an unweighted response rate of 84.6 percent. More information on this survey is available from: http://www.cdc.gov/nchs/nhamcs.htm.

The National Hospital Ambulatory Medical Care Survey studies nonfederal general and short-stay hospitals. The sample frame was taken from the Verispan (formerly SMG) Hospital Database, whose universe includes hospitals from the states and the District of Columbia.

The terrorism preparedness supplement was a self-reported written questionnaire, which was given to the hospital administrator during an induction interview by a U.S. Census Bureau interviewer. Completion of the survey instrument was by the staff person responsible for the hospital's emergency response plan for bioterrorism or mass casualties. The completed instrument was then collected by the interviewer. A copy of the bioterrorism supplement is available from: http://www.cdc.gov/nhamcs/data/NHAMCS-905.pdf.

The supplement asked whether hospital staff (staff physicians, residents, physician assistants and nurse practitioners, registered and licensed practical nurses, laboratory staff, and others) had received special training since September 11, 2001, in the identification, diagnosis, and treatment of smallpox, anthrax, plague, botulism, tularemia, viral hemorrhagic fever, viral encephalitis, chemical exposures, and nuclear-radiological exposures.

Dichotomous summary variables were created using SAS arrays for each type of clinician receiving training in any of the exposures and for each exposure for which training was received by any type of clinician. Hospitals were also asked if their key personnel had been trained in how to implement a formal hospital emergency incident command system or comparable platform during emergencies.

Various hospital characteristics were studied to determine whether they were associated with providing training. These characteristics included teaching hospital status (defined by membership in the Council of Teaching Hospitals and Health Systems), whether the hospital had a residency program, affiliation with a medical school, bed capacity (less than 100, 100–199, 200–299, or 300 or more), ownership (nonprofit, state or local government, proprietary), metropolitan statistical area status (urban or rural), geographic region (Northeast, Midwest, South, or West), and accreditation by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

Categorical independent and dependent variables were cross-tabulated. Missing or unknown values were recoded into negative responses and ranged from 0.8 to 3.0 percent on the variables for teaching hospitals, medical school affiliation, residency school programs, Joint Commission accreditation, and training on hospital incident command. The tables provide the unweighted number of sample cases upon which the weighted nationally representative percentages are based. Cross-tabulation was performed using SAS-callable SUDAAN-9.0 to adjust for the complex sample design (8). Results with nonoverlapping 95 percent confidence intervals were considered significant.

Results

The all-hospital estimates below include data collected during 2003 and 2004 for both training of specific clinician categories and training in individual exposure types.

Clinician training

Of the 96.3 percent of hospitals with registered or licensed practical nurses, 88.4 percent reported training them in terrorism response. Joint Commission-accredited hospitals trained their nurses more frequently than unaccredited hospitals (Table 1, Figure 1).

Of the 94.2 percent of hospitals with attending physicians on staff, 75.1 percent reported that they had received training in any of the diseases or conditions examined in this survey. In contrast, of the 65.5 percent of hospitals that had residents, only 39.3 percent reported that these physicians had received this training, a significant

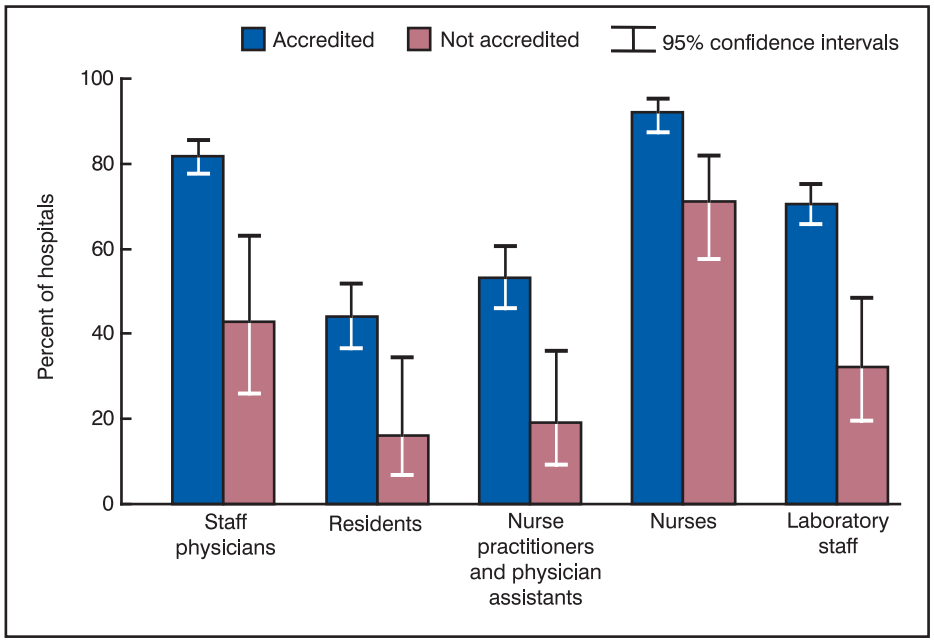

Figure 1. Terrorism response training by Joint Commission on Accreditation of Healthcare Organizations accreditation: United States, 2003–04

difference from staff physicians. For staff physicians, all hospital characteristics were associated with greater frequencies of training. For residents, all characteristics were associated except ownership and region (Table 1). Figure 1 highlights the differences in training for clinical staff by JCAHO accreditation status.

Of the 74.3 percent of hospitals with physician assistants or nurse practitioners, only 46.7 percent reported that they had received training in terrorism-related conditions. Associated factors included teaching hospitals, medical school affiliations, bed capacity, urban location, and Joint Commission accreditation (Table 1).

Of the 90.3 percent of hospitals with laboratory staff, 63.7 percent reported that laboratorians had received terrorism preparedness training. Associated factors included Joint Commission accreditation and region (Table 1).

Training in terrorism-related diseases and conditions

Hospitals were also asked whether any of their staff (physicians, residents, nurse practitioners, physician assistants, nurses, laboratorians, or others) had received training for specific terrorism-related biological, chemical, or radiological exposures. Hospitals reported training for smallpox (86.0 percent), anthrax (82.3 percent), and chemical exposures (76.1 percent) most often and for viral hemorrhagic fever (52.3 percent) least often (Table 2).

Teaching hospitals trained clinicians more frequently for chemical and radiological exposures than nonteaching hospitals. However, there were no significant differences for any exposure based on other hospital characteristics, including residency and medical school affiliation (Table 2).

Hospital bed capacity was associated with training only for radiological exposures. Hospital ownership was associated with training only for smallpox. Urban hospitals trained clinicians more frequently for radiological exposures than rural hospitals. Geographic region was associated with training only for anthrax. Joint Commission accreditation was associated with training for all nine exposures (Table 2). Figure 2 highlights the training for selected exposures by JCAHO accreditation status.

More than three quarters of hospitals had trained their key personnel in implementation of the Hospital Emergency Incident Command System or a similar program. Bed capacity was the only associated hospital characteristic (Table 2).

Discussion

Clinician training

JCAHO accredited hospitals were strikingly ahead of their counterparts in having nurses, staff physicians, laboratorians, nurse practitioners, physician assistants, and residents trained to respond to terrorism, although a relatively small proportion (9.5 percent) of the hospitals were not accredited. Similarly, teaching hospitals and those affiliated with medical schools were ahead of other hospitals in training staff physicians, residents, nurse practitioners, and physician assistants; hospitals with residency programs were ahead of others with respect to staff physicians and residents.

The discrepancy in terrorism preparedness training between practicing physicians and those in residency training was unexpected because the original assumption was that physicians in the midst of their specialty education would be more likely to have received training in the current medical issues. However, in teaching hospitals the gap between staff physicians and residents is much narrower than in nonteaching hospitals. Thus, it is possible that the residents had received their preparedness training at their home teaching hospital sites and not at outlying hospitals through which they were rotating temporarily.

This gap may be due partly to the curriculum that is offered to residents. Pesik et al. (9) surveyed 118 emergency medicine residency directors. Although 84 percent provided formal training in hazardous materials, only 53 percent included formal training in biological weapons in their programs. Thirteen percent felt that biological weapons defense training was unnecessary, despite high levels of self-reported inadequacy in both recognizing and treating bioterrorism casualties.

Curriculum guidelines for residency terrorism response training already exist. The recommendations of the Residency Assistance Program of the American Academy of Family Physicians has a

section devoted to disaster medicine, including a multifaceted response to specific biological and chemical agents (10). In June 2001, the American College of Emergency Physicians made recommendations on the best way to train emergency physicians in responding to weapons of mass destruction (11). The College found that this training was absent from medical school core curricula and present to only a small degree in emergency medicine residency programs. It recommended a number of awareness and performance objectives on recognition of a terrorist attack, the biochemical agents that might be used, decontamination, isolation and containment of exposed individuals, and triage, diagnosis, stabilization, and treatment of casualties. Barriers to implementing standard training included lack of funding, time constraints related to competing subject matter that residents must learn, lack of standard curricula, and reluctance of both hospital administrators and emergency physicians to give high priority to this subject. Given these barriers, the College recommended incorporation of weapons of mass destruction training objectives into existing subjects such as toxicology, infectious and respiratory diseases, hazardous materials, and epidemics such as influenza. In 2003, the recommendations were updated to include radiation emergencies (12). Over the long term, the College recommended developing standard teaching materials for emergency medicine residencies and engaging relevant professional organizations in advocating for inclusion of weapons of mass destruction training into the emergency medicine core content. Given the recency of the emphasis on terrorism response, the extent to which these guidelines have actually been mainstreamed into residencies in a high-quality manner remains to be seen.

In 2003, the Association of American Medical Colleges conducted an expert panel on bioterrorism education for medical students (13). Although it cited instances where such education could be integrated into existing subjects, the report gave a comprehensive list of recommendations for a curriculum that is not yet standard with respect to weapons of mass destruction. Also, it cited six model programs where terrorism preparedness education was integrated into the standard curriculum, but noted that none included hospital-based experiences.

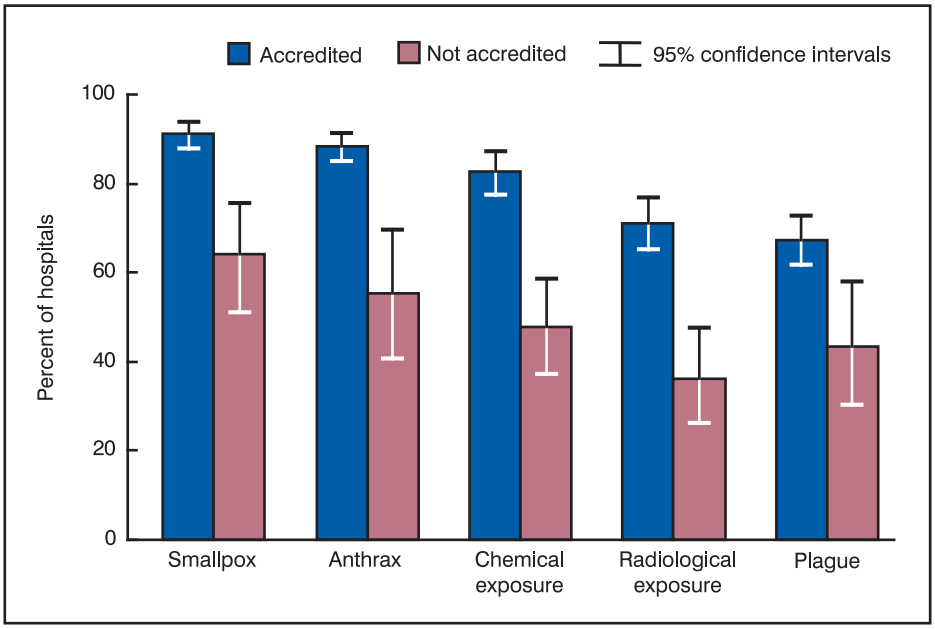

Figure 2. Training in selected exposures by Joint Commission on Accreditation of Healthcare Organizations accreditation: United States, 2003–04

In regard to training of laboratorians, health departments have received funding for this through CDC's bioterrorism program for several years (3). A similar emphasis was added to the newer Bioterrorism Hospital Preparedness Program of the HRSA for hospital-based laboratories in 2003 so it is possible that training levels will improve in the future (6).

Training in terrorism-related conditions and hospital incident command

Training for smallpox was ahead of that for naturally occurring infectious diseases. Because smallpox has not occurred naturally since 1977, this may reflect a national concern about a terrorist-induced epidemic, emphasized by the redirection of federal funding in late 2002 toward smallpox prevention efforts. It is possible that anthrax training levels were similar to smallpox because of the terrorist-induced outbreak of this disease in October 2001.

The other conditions are relatively rare naturally, and there have been no recent outbreaks of these diseases that could be related to terrorism. But all the diseases assessed in this study, and others, are weaponizable. Some biological agents have been used by terrorists previously, such as Salmonella, ricin, mycotoxins, and typhoid. Others such as plague, Q-fever, Ebola, and botulinum have been found to be in questionable hands (14). Because most weaponizable biological and chemical agents are rarely seen in everyday practice, they may be seen as exotic. The emphasis on smallpox preparedness has probably contributed to this perception. However, anthrax, plague, tularemia, botulism, and viral encephalitis occur naturally in the United States. Therefore, emphasis on naturally occurring diseases would increase general awareness of infectious disease prevention and treatment that could be applied to bioterrorism response.

Because chemical exposures are more likely to occur in emergency medical practice than are radiological ones, and because there have been some recent incidents with such toxins as sarin and ricin (14), this may account for the greater effort expended on training for chemical attacks compared with others.

Training in incident command systems is widespread, but almost one-quarter of the Nation's hospitals remain untrained in this method of responding in an organized fashion to a chaotic event. Hospital Emergency Incident Command System training has been offered to health departments having cooperative agreements with HRSA Bioterrorism Hospital Preparedness Program. The Hospital Emergency Incident Command System program, funded by the California Emergency Medical Services Authority but publicly available without charge, is in its third edition, with plans underway for a fourth edition (15).

Although this survey was designed to generate nationally representative estimates, funding constraints limit the sample size. The sample is too small to investigate some characteristics of interest such as hospitals associated with nursing schools. This limited a discussion on nursing education as it relates to terrorism. Also, the findings are not applicable to federal and military hospitals, those without emergency or outpatient departments, or those located in the five U.S. territories because these institutions were excluded from the sample. Because hospitals were surveyed at different times throughout the year and only during one 4-week period, the results represent an average over the year. This could have contributed to underestimation of preparedness at the end of the year or overestimation if a hospital discontinued a program started earlier. Finally, although this survey queries hospitals on the presence of various training programs, there is no measure of the quality or detailed content of these efforts.

This study presents baseline data for terrorism preparedness training, with respect to various hospital characteristics, to help inform emergency physicians and other health care professionals for future planning efforts. In general, Joint Commission accreditation is the most consistent factor associated with preparedness training.

The National Hospital Ambulatory Medical Care Survey terrorism supplement also addressed other hospital preparedness topics such as emergency response plans, surge capacity, equipment, and collaboration with outside organizations with respect to planning. These topics will be the subjects of future reports.

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Table 1. Percentage of hospitals training clinicians in at least one terrorism-related exposure, by hospital characteristics: United States, 2003–04

Characteristic	Staff physicians				Residents				Nurse practitioners and physician assistants				Nurses				Laboratory staff			
	Sample size	Percent	95% confidence interval		Sample size	Percent	95% confidence interval		Sample size	Percent	95% confidence interval		Sample size	Percent	95% confidence interval		Sample size	Percent	95% confidence interval	
All hospitals	696	75.1	68.9	80.4	484	39.3	32.3	46.8	549	46.7	39.7	53.7	712	88.4	83.6	92.0	667	63.7	58.8	68.3
Teaching																				
Yes	149	93.9	87.6	97.1	146	81.1	73.0	87.2	142	73.7	64.2	81.4	149	95.4	89.8	98.0	147	75.5	59.7	86.6
No	547	73.5	67.0	79.2	338	33.3	25.9	41.6	407	43.7	36.4	51.3	563	87.9	82.6	91.7	520	62.6	57.4	67.5
Residency																				
Yes	267	86.2	79.3	91.1	245	56.7	45.1	67.6	237	56.4	44.2	67.9	268	88.0	71.7	95.6	255	67.5	59.2	74.8
No	429	72.0	64.5	78.4	239	31.3	23.2	40.7	312	43.4	35.4	51.8	444	88.6	83.3	92.3	412	62.7	56.9	68.2
Medical school																				
Yes	336	88.5	82.6	92.6	294	60.1	49.1	70.1	287	61.6	49.9	72.0	335	89.9	77.3	95.9	317	71.4	63.0	78.6
No	360	69.3	61.6	76.0	190	26.2	17.7	37.0	262	39.7	31.2	48.7	377	87.9	82.4	91.8	350	60.7	54.2	66.8
Bed capacity																				
Less than 100	217	68.0	58.5	76.2	116	24.6	15.1	37.4	148	34.6	24.9	45.7	226	86.0	78.1	91.4	207	58.8	51.1	66.1
100–199	153	79.4	69.8	86.6	96	39.3	28.3	51.5	113	57.6	46.4	68.0	156	89.1	82.2	93.5	145	67.8	57.6	76.5
200–299	125	91.4	84.2	95.5	98	60.2	46.7	72.3	112	57.1	45.6	67.9	129	95.6	90.8	97.9	123	72.2	61.9	80.6
300 or more	201	88.8	80.7	93.8	174	68.8	59.8	76.7	176	69.2	60.4	76.9	201	92.8	86.3	96.3	192	72.1	62.1	80.3
Ownership																				
Nonprofit	489	80.5	75.0	85.0	341	42.3	33.9	51.2	385	52.9	44.7	61.0	499	90.8	85.0	94.5	470	66.8	60.1	72.9
Government	137	57.9	41.3	72.9	106	30.1	17.3	47.0	115	30.9	18.4	46.9	139	79.2	66.6	87.9	129	51.0	37.8	64.1
Private	70	80.9	66.2	90.2	37	43.7	25.5	63.9	49	40.6	25.8	57.4	74	93.8	81.9	98.0	68	73.1	58.3	84.1
Metropolitan statistical area																				
Urban	572	81.7	76.7	85.8	423	51.0	42.7	59.2	461	54.6	47.1	61.9	586	89.7	84.3	93.4	549	68.1	62.3	73.4
Rural	124	64.1	50.2	75.9	61	12.1	5.3	25.2	88	32.5	20.6	47.0	126	86.1	75.3	92.7	118	56.2	45.6	66.2
Region																				
Northeast	165	83.7	75.5	89.5	130	51.1	41.2	61.0	141	62.1	49.1	73.5	166	91.1	83.8	95.3	157	63.6	52.2	73.7
Midwest	160	67.3	50.5	80.6	118	31.2	20.4	44.5	137	41.1	29.2	54.1	161	88.5	77.9	94.4	154	57.6	49.1	65.8
South	235	69.9	61.8	77.0	146	35.7	25.7	47.2	166	40.4	30.4	51.3	247	88.3	80.0	93.4	227	61.2	52.4	69.4
West	136	89.4	79.7	94.8	90	46.7	25.3	69.4	105	53.7	33.3	73.0	138	86.3	68.3	94.9	129	78.5	67.4	86.6
JCAHO[1]																				
Accredited	638	81.8	77.6	85.4	448	44.1	36.6	51.8	503	53.3	45.9	60.6	652	92.0	87.3	95.1	611	70.6	65.6	75.1
Not accredited	58	42.9	25.9	61.8	36	16.2	6.6	34.3	46	19.2	9.2	35.9	60	71.2	57.5	81.9	56	32.1	19.4	48.2

[1]JCAHO is Joint Commission on Accreditation of Healthcare Organizations.

NOTE: Terrorism-related exposure includes smallpox, anthrax, plague, botulism, tularemia, viral hemorrhagic fever, viral encephalitis, and chemical or radiological exposures.

Table 2. Percentage of hospitals in which at least one staff category has received training in selected terrorism-related biological, chemical, and radiological exposures and in which key hospital staff have received training in incident command systems, by selected hospital characteristics: United States, 2003–04

Characteristic	Sample size	Smallpox			Anthrax			Plague			Botulism			Tularemia		
		Percent	95% confidence interval		Percent	95% confidence interval		Percent	95% confidence interval		Percent	95% confidence interval		Percent	95% confidence interval	
All hospitals	739	86.0	81.2	89.7	82.3	76.5	86.9	62.9	57.2	68.2	65.8	60.2	70.9	56.5	50.8	62.0
Teaching																
Yes	151	93.0	83.7	97.2	87.8	78.2	93.5	76.8	66.8	84.4	74.8	64.6	82.9	70.6	58.7	80.2
No	588	85.4	80.3	89.4	81.9	75.7	86.8	61.8	55.7	67.5	65.0	59.1	70.6	55.4	49.3	61.3
Residency																
Yes	275	87.3	80.8	91.8	83.3	76.7	88.3	69.4	61.6	76.1	70.2	62.3	77.1	64.0	55.0	72.1
No	464	85.6	79.6	90.1	82.0	74.6	87.6	61.1	54.3	67.5	64.5	57.8	70.7	54.4	47.8	60.9
Medical school																
Yes	345	89.6	84.2	93.3	87.3	82.1	91.2	69.8	61.9	76.8	70.6	62.6	77.4	62.2	53.4	70.3
No	394	84.5	78.2	89.2	80.2	72.5	86.2	60.0	52.8	66.7	63.8	56.8	70.2	54.1	47.1	60.9
Bed capacity																
Less than 100	235	84.0	76.3	89.6	79.7	70.2	86.8	59.3	50.4	67.7	63.1	54.4	71.1	51.8	43.1	60.5
100–199	164	85.7	77.4	91.3	84.2	77.0	89.4	63.5	54.2	71.9	65.7	56.6	73.7	60.6	50.9	69.5
200–299	133	94.2	88.0	97.2	90.5	83.5	94.7	71.4	60.6	80.2	74.3	65.0	81.9	70.2	59.5	79.0
300 or more	207	89.2	81.5	93.9	84.6	76.6	90.3	72.0	63.0	79.6	71.6	62.8	79.0	60.6	51.7	68.8
Ownership																
Nonprofit	512	90.0	85.5	93.2	86.2	80.9	90.3	66.1	60.0	71.8	68.4	62.6	73.7	58.1	51.8	64.2
Government	149	74.3	61.1	84.2	71.3	54.7	83.6	57.0	43.1	69.9	58.9	45.1	71.5	54.7	40.9	67.8
Private	78	88.8	77.7	94.7	84.1	71.2	91.9	55.6	40.8	69.5	65.5	53.4	75.9	49.6	34.8	64.4
Metropolitan statistical area																
Urban	608	87.6	83.1	91.0	86.5	82.7	89.5	65.7	59.5	71.5	71.3	66.1	76.0	62.2	55.8	68.2
Rural	131	83.3	71.7	90.7	75.2	61.3	85.2	58.0	46.5	68.7	56.2	44.7	67.1	46.7	35.9	57.7
Region																
Northeast	172	89.1	81.3	93.9	90.5	85.7	93.8	63.3	55.1	70.8	65.8	57.6	73.2	57.5	48.6	66.0
Midwest	168	80.0	68.4	88.2	72.2	56.9	83.7	59.6	47.4	70.8	58.5	46.4	69.6	52.0	40.8	63.0
South	254	86.6	78.6	92.0	83.8	76.1	89.3	60.4	50.9	69.3	64.5	55.8	72.4	54.8	46.4	63.0
West	145	91.2	81.3	96.2	87.8	79.0	93.2	72.4	58.4	83.0	79.4	67.4	87.9	65.8	48.8	79.4
JCAHO[1]																
Accredited	669	91.1	87.6	93.6	88.5	85.0	91.3	67.4	61.6	72.6	69.8	64.5	74.7	61.1	55.2	66.8
Not accredited	70	64.0	50.9	75.4	55.4	40.5	69.4	43.5	30.1	57.8	48.2	35.2	61.4	36.2	24.5	49.9

See footnotes at end of table.

Table 2. Percentage of hospitals in which at least one staff category has received training in selected terrorism-related biological, chemical, and radiological exposures and in which key hospital staff have received training in incident command systems, by selected hospital characteristics: United States, 2003–04—Con.

Characteristic	Hemorrhagic fever			Viral encephalitis			Chemical exposure			Radiological exposure			Incident command		
	Percent	95% confidence interval		Percent	95% confidence interval		Percent	95% confidence interval		Percent	95% confidence interval		Percent	95% confidence interval	
All hospitals	52.3	47.1	57.5	54.7	49.1	60.1	76.1	70.7	80.8	64.6	59.1	69.8	77.6	71.7	82.6
Teaching															
Yes	67.8	56.2	77.6	67.3	55.7	77.1	92.0	85.7	95.7	86.4	78.9	91.5	91.5	81.2	96.4
No	51.1	45.6	56.6	53.7	47.7	59.6	74.9	69.1	79.9	62.9	57.0	68.5	76.6	70.2	81.9
Residency															
Yes	54.7	44.5	64.5	53.4	43.4	63.2	76.2	64.2	85.1	68.7	57.9	77.9	79.4	65.2	88.8
No	51.7	45.7	57.7	55.0	48.4	61.5	76.1	69.7	81.5	63.5	56.9	69.7	77.2	70.2	82.9
Medical school															
Yes	56.1	46.9	64.9	57.1	47.8	66.0	80.7	70.8	87.8	71.7	62.0	79.7	82.5	72.3	89.5
No	50.8	44.6	56.9	53.7	46.8	60.4	74.3	67.6	80.0	61.7	54.8	68.2	75.6	67.9	82.0
Bed capacity															
Less than 100	46.8	39.2	54.5	49.5	41.1	57.9	72.6	64.4	79.6	58.8	50.5	66.6	70.6	61.5	78.3
100–199	57.2	47.6	66.3	62.0	52.3	70.8	79.5	71.1	86.0	69.5	60.5	77.2	82.2	73.3	88.7
200–299	64.6	54.2	73.8	63.1	52.5	72.6	85.1	77.3	90.6	76.8	67.6	84.0	91.8	84.5	95.8
300 or more	61.1	52.6	69.0	61.1	53.0	68.7	80.0	71.9	86.3	75.0	67.1	81.6	92.9	85.0	96.8
Ownership															
Nonprofit	53.8	47.4	60.1	56.1	49.7	62.3	77.8	71.2	83.3	66.6	59.7	72.8	76.4	68.7	82.7
Government	49.8	37.6	62.0	49.5	37.1	61.9	71.0	58.9	80.7	58.4	45.0	70.6	78.5	68.4	86.1
Private	48.7	33.7	63.9	58.3	43.2	72.1	78.1	65.3	87.1	67.6	54.1	78.7	84.1	69.5	92.5
Metropolitan Statistical area															
Urban	56.5	50.1	62.6	59.4	52.7	65.8	79.5	74.2	83.9	71.1	65.8	75.9	79.2	72.6	84.6
Rural	45.2	35.9	54.9	46.5	36.6	56.8	70.4	58.7	79.8	53.5	42.3	64.5	75.0	62.9	84.1
Region															
Northeast	52.9	45.1	60.5	52.9	43.6	62.1	78.5	67.5	86.6	69.0	60.2	76.6	83.2	76.0	88.6
Midwest	46.3	36.0	56.9	53.0	42.4	63.4	71.4	60.5	80.2	59.1	46.8	70.4	78.0	65.5	86.9
South	52.4	45.0	59.8	56.4	47.8	64.7	77.7	68.1	85.1	63.1	54.2	71.2	74.8	64.3	83.0
West	60.9	44.2	75.5	55.3	39.2	70.3	78.2	64.1	87.8	72.4	59.3	82.5	77.9	60.5	89.1
JCAHO[1]															
Accredited	57.5	51.5	63.2	59.8	53.6	65.6	82.7	77.4	87.0	71.2	65.2	76.6	80.7	74.3	85.8
Not accredited	30.0	21.0	41.0	32.7	23.3	43.7	47.7	37.1	58.5	36.1	26.1	47.5	64.5	48.8	77.5

[1]JCAHO is Joint Commission on Accreditation of Healthcare Organizations.

NOTE: For exposures, staff includes staff physicians, interns or residents, physician assistants or nurse practitioners, nurses, laboratory staff, and others. For incident command, staff includes key personnel.

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