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# Preparing for disasters

## What should you know, and when should you know it?

As first responders, PAs need to be familiar with the local disaster plan, understand their role in emergencies involving all types of hazards, and know how to communicate with patients, staff, and government agencies.

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**T**hree waves of terrorism have ushered in a new era in public health, safety, and health care in the United States: The February 26, 1993 explosions at New York's World Trade Center; the April 19, 1995 bombing at the Murrah Federal Building in Oklahoma City, and the September 11, 2001 attacks, along with the anthrax cases that followed. Those events have awakened federal, state, and local governments to the urgency of improving their disaster-response capabilities. The health professions have also stepped forward to delineate the roles of their members in disasters,<sup>1,2</sup> establish minimum competencies,<sup>3,4</sup> and develop new training programs.<sup>5</sup>

Physician assistants have a strong tradition of responding to crisis.<sup>6</sup>

- Fully 10% of the 42,700 PAs in practice today list emergency medicine as their primary specialty.<sup>7</sup>
- 15% of all ambulatory care provided by PAs in 1997 occurred in emergency department settings, compared with 9.9% of visits for non-PA clinicians.<sup>8</sup>
- PAs or nurse practitioners cared for 3.5 million emergency department patients in 1992.<sup>9</sup>

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In all likelihood, PAs will be among the first responders to any disaster in the United States. It is incumbent on the profession and on individual PAs to understand what their roles would be in a disaster and to prepare accordingly.

### Take an all-hazards approach

While there is an urgent need to prepare for chemical, biological, radiologic, nuclear, or explosive emergencies, the next disaster a PA may encounter will more likely be due to natural phenomena (hurricanes, tornadoes, floods) or human failures such as a blackout. An all-hazards approach addresses any natural or man-made disaster.<sup>10</sup> It does not preclude threat-specific preparations, but requires the use of initial, sound gen-

### KEY POINTS in this article

- Physician assistants are likely to be first responders in the event of any major disaster.
- An "all-hazards" approach to preparedness relies on general principles of emergency management that can be applied to any natural or man-made disaster.
- PAs should be familiar with the chemical, biological, radiologic, nuclear, and explosive (CBRNE) agents that have the potential to cause greatest harm.
- PAs should know the mechanisms for reporting any suspicious cases, unusual syndromes, or atypical patterns of patient presentations to local health authorities.
- Office-based practices need disaster plans, just as hospitals and other large institutions do. PAs should be familiar with these disaster plans and the roles they themselves will be expected to play in an emergency.



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eral principles of emergency management (see “The all-hazards approach to disaster preparedness”).

### Be prepared for terrorism: Know CBRNE

Being ready for possible terrorist events brings responsibilities beyond knowing the basics of disaster preparedness. At a minimum, PAs should be familiar with CBRNE—the **chemical, biological, radiologic, nuclear, and explosive** agents with the potential to cause the greatest harm and thus most likely to be used in a terrorist incident. Familiarity means under-

standing the early recognition and treatment of the harm caused by those agents; it also means knowing how to protect yourself and your patients with isolation techniques, decontamination procedures, and personal protective equipment.

**Biologicals** have been called “the poor man’s bomb.” They include a number termed Category A agents because of the increased threat they pose.<sup>1</sup> Among them are the causes of smallpox, tularemia, anthrax, and plague (see Table 1, page 42). They are easily disseminated, cause high mortality and social disruption, and require special emergency preparation on the part of the health care and public health systems. Some, such as smallpox, are highly contagious, while others, such as anthrax, are unlikely to be spread person to person.<sup>11,12</sup>

**Chemicals** of concern include nerve agents, anticholinergics, and vesicants. Treatments, such as atropine and pralidoxime (2-PAM), are available in commercial packages known as Mark-1 kits but should not be used indiscriminately. Simple removal of clothing is more than 90% effective as a decontamination measure.<sup>1</sup> Cleansing with soap and water achieves further decontamination. Table 2 (page 48) summarizes the classes of potential chemical agents and their antidotes.

Terrorist detonation of a **nuclear** device, which involves a fission reaction, is considered unlikely because of the sophistication required. Much more likely is exposure to **radiologic** material through the dispersal of powder or pellets using conventional explosives like dynamite (a so-called “dirty bomb”). The first step is decontamination by removing clothing and cleansing with soap and water. Surgery, if indicated, should be

### The all-hazards approach to disaster preparedness

The key to an all-hazards approach is to avoid creating multiple, narrowly defined disaster plans. For example, rather than preparing only a hospital smallpox plan, there should be a general hospital emergency operations plan. Smallpox would be a specific aspect of the overall plan. The benefits of an all-hazards approach are

- The ability to handle *any* emergency regardless of the specific event
- The ability to address basic *emergency infrastructure*, such as communication and incident command
- The ability to address a number of possible situations, allowing the plan to be put into practice and *tested on a regular basis*, and enabling staff to become accustomed to their roles
- The ability to *link and communicate* easily with agencies, facilities, and other responders that use an all-hazards approach.

TABLE 1

**Category A agents of bioterrorism<sup>1-2</sup>**

Clinical features	Differential
<b><i>Bacillus anthracis</i> (gram-positive, spore-forming, nonmotile rod): Cutaneous anthrax</b>	
Pruritus, papule, vesicle, depressed black eschar after 2-6 d; usually painless	Spider bite, staphylococcal or streptococcal cellulitis, plague, ulceroglandular tularemia
<b><i>Bacillus anthracis</i>: Inhalation anthrax</b>	
Fever, malaise, cough, chest pain progressing to respiratory distress, shock, and death  Mediastinal widening, pleural effusions, bilateral infiltrates, neutrophilia, immature forms on differential blood count	<i>Mycoplasma pneumoniae</i> , Legionnaire's disease, viral pneumonia, tularemia
<b><i>Variola virus</i> (orthopoxvirus): smallpox</b>	
Systemic febrile viral disease followed by characteristic deep-seated, centrifugally distributed rash with all lesions in same stage of maturation (macule, papule, vesicle, pustule)	Chicken pox (herpesvirus)
<b><i>Yersinia pestis</i> (Bipolar staining gram-negative bacillus): Bubonic plague</b>	
Fever, chills, malaise, nausea, sore throat, headache, prostration, lymphadenitis draining site of flea bite  Septicemia from blood-borne dissemination rapidly fatal	Tularemia
<b><i>Yersinia pestis</i>: Pneumonic plague</b>	
Pneumonia, mediastinitis, pleural effusions	
<b><i>Clostridium botulinum</i> (spore-forming anaerobic bacillus): Botulism</b>	
Symmetric flaccid paralysis in paradoxically alert person; acute bilateral 2nd cranial nerve impairment; diplopia and dysphagia; death from respiratory failure  Intestinal (infant) form most common in United States	Stroke
<b><i>Francisella tularensis</i> (gram-negative, nonmotile coccobacillus): Tularemia</b>	
Indolent ulcer with local lymphangitis via arthropod vectors; septicemic, pneumonic possible	Plague

**Key:** HEPA, high-energy particulate air; PCR, polymerase chain reaction.

1. Chin J, ed. *Control of Communicable Diseases Manual*, ed 17. Washington, DC: American Public Health Association; 2000.  
 2. Center for Public Health Preparedness of the Columbia University Mailman School of Public Health. Resources. Available at: <http://www.mailman.hs.columbia.edu/CPHP/resources.html>. Accessed January 5, 2005.  
 3. University of Georgia. College of Veterinary Medicine. Exploring Global Issues in Veterinary Health. Available at: <http://www.vet.uga.edu/vpp/NSEP/Brazil2002/clostridium/Eng/BTdiagnosis.htm>. Accessed January 5, 2005.

Diagnostic tools	Transmission and control	Treatment
Gram's stain, culture and sensitivity, PCR, serology, biopsy	No person-to-person transmission Standard precautions; disinfect clothing and possible fomites	Ciprofloxacin, doxycycline
Blood culture, CSF culture and sensitivity, PCR, immunohistochemistry	No person-to-person transmission Standard precautions; disinfect clothing and possible fomites	Ciprofloxacin, doxycycline, clindamycin, penicillin G; consider combination treatments
Serology, culture	Very contagious, person-to-person transmission via respiratory aerosolization, fomites Respiratory isolation, HEPA filtration, negative airflow	Antiviral drugs may be effective if given within 1-2 d of exposure.
Visualize organisms in bubo aspirate; serology; culture (blood, sputum, CSF)	Contagious Contact precautions	Streptomycin, gentamycin
Serology; culture (blood, sputum, CSF)	Contagious, person-to-person transmission via respiratory route Respiratory isolation, HEPA filtration, negative airflow	
Toxin detection in clinical samples; isolation of toxigenic cultures and identification of the involved type C or D toxin with the aid of serum neutralization in mice or guinea pigs <sup>3</sup>	No isolation required	Antitoxin available; (contraindicated in children); gastric lavage; respiratory support
Serology, biopsy	Standard precautions	Streptomycin, gentamycin

## The best form of disaster preparation begins at home

A disaster is an event that exceeds local capabilities.<sup>1</sup> The most local preparation is that which begins at home and in the community.

Medical professionals must balance duty to the community with loyalty to the family. The personal needs and concerns of medical professionals are legitimate and should be considered an integral part of disaster preparedness; some have suggested that the best and most immediate way to begin a relief effort is to take care of your next of kin.

During a disaster, there is the very real possibility of separation. You may not be able to rely on cell phones or land lines. Take time to discuss how you will respond, where each of you will go, and how you will communicate. In addition, every home should have at least a basic disaster kit that consists of a portable battery-powered radio or television with extra batteries, a flashlight with extra batteries, and a first aid kit. A full discussion of disaster



kits and supplies can be found at the American Red Cross Disaster Services Web site, <http://www.redcross.org/services/disaster/>.

In addition, PAs can contribute to their communities by participating in such organizations as the Medical Reserve Corps, which are locally planned, developed, and organized,<sup>2</sup> and Disaster Medical Assistance Teams, which cover larger areas and are federally deployed.

1. Goyet CV, Lechat MF. Health aspects in natural disasters. *Trop Doct.* 1976;6:152-157.
2. Medical Reserve Corps Resource Site. Available at: <http://www.medicalreservecorps.gov/>. Accessed January 5, 2005.

### How to develop a home disaster plan<sup>1</sup>

1. Investigate and discuss which types of disasters are most likely to occur in your area.
2. Pick two places to meet:
  - Right outside the home in case of a sudden emergency
  - Outside of your neighborhood in case you can't return home: everyone should know the address and phone number.
3. Ask an out-of-town relative to be your family contact for emergency communications. After a disaster, it may be easier to make a long-distance call. Each family member should have the number and call the contact to tell them where they are.
4. Make arrangements for an out-of-town place to stay in case of evacuation.
5. Be familiar with multiple local evacuation and escape routes.
6. Have a plan for taking care of your pets. Local health regulations may not allow pets in shelters.
7. Further details on how to assemble and what to include in a family disaster supply kit can be found at <http://www.redcross.org/disaster/safety/kit.pdf>.

1. American Red Cross Disaster Services. *Talking About Disaster: Guide for Standard Messages*. Available at: [http://www.redcross.org/disaster/safety/family\\_disaster\\_plan.pdf](http://www.redcross.org/disaster/safety/family_disaster_plan.pdf). Accessed January 5, 2005.

performed before the tissue effects of ionizing radiation introduce further complications. Potassium iodide is recommended to prevent thyroid cancer only after exposure to radioactive iodine (<sup>131</sup>I). Marrow stimulants, such as epoetin alfa and granulocyte colony-stimulating factor, may be indicated.<sup>1</sup>

The majority of terrorist incidents involve bombs and **explosions**. They result in standard penetrating and blunt trauma but may also produce "unique patterns of injury seldom seen outside of combat."<sup>13</sup> Gas-filled anatomic structures such as the lung, GI tract, and middle ear are most susceptible. Potential injuries include pulmonary barotrauma ("blast lung"), abdominal hemorrhage and rupture, ocular rupture, traumatic brain injury, tympanic membrane rupture, and middle ear damage.

### Be prepared for public health emergencies

The success of any health response to a large-scale disaster will hinge on the ability to integrate medical and public health practice.<sup>14</sup> PAs should be familiar with the principles of health surveillance and the mechanisms for reporting suspicious cases, atypical syndromes, or unusual patterns of patient presentations to local health authorities. Familiarize yourself with the clinical and public health responses to emerging infectious diseases such as severe acute respiratory syndrome (SARS), avian flu, and West Nile virus. The principles of surveillance and disease control are similar to those that would be instituted in response to biological agents of terrorism. Table 3 (see page 48) lists online resources for clinical and public health disaster preparedness.

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The concepts of incident command and incident management, while new to health care personnel, are an integral part of disaster planning and have been adopted by many public health authorities. Training in incident management may be available at your institution or via online programs. One of the most comprehensive programs is run by the Federal Emergency Management Agency.

Helpful online resources include those retrievable by entering the search term “terrorism” on the American Academy of Physician Assistants’ home page ([www.aapa.org](http://www.aapa.org)).<sup>15</sup> In addition, you can take advantage of numerous clinical training opportunities relevant to disaster preparedness, such as basic, advanced, and pediatric life support courses and Advanced Trauma Life Support. Also consider specific disaster-related continuing educational programs on incident command and incident management, terrorism, decontamination and personal protective equipment, and public health emergencies.

**Have a disaster plan, and know it**

The disaster plan has been called “the most important preparedness tool.”<sup>16</sup> While most commonly associated with hospitals and large institutions, office-based practices also need a plan. The time to read and familiarize yourself with your plan is now, not while you are waiting for the ambulances to arrive.

It is of paramount importance to understand your role in an emergency. This will be primarily defined in your institutional disaster or emergency plan and may be listed as your emergency functional job description. Your emergency role may differ from your day-to-day job, but it will be within the scope of your knowledge and skills. You may also be expected to report to a different location and to a different supervisor.

Disaster response activities can be grouped according to 4 Rs: recognize, respond, report, responsibility.

- **Recognize** that a potential bioterrorism or disaster-related event may be occurring. Be familiar with possible CBRNE agents. Know the routes of exposure, their epidemiology, and the signs and symptoms with which they are associated.
- **Respond** appropriately to the acute-care needs of your patients during acts of terrorism, public health emergencies, or disaster-related events. Be familiar with current treatments and their contraindications, as well as the principles of decontamination and isolation.
- **Report** potential or actual bioterrorist events to the appropriate local, state, and federal authorities. The link between medical care and public health is crucial. Knowing how to contact your local health department is a first step. Public health surveillance

TABLE 2

**Chemical agents<sup>1</sup>**

Class	Examples	Treatment
Nerve agents	Tabun, sarin, soman, VX	Atropine, pralidoxime, diazepam
Vesicants	Mustard gas, nitrogen mustard	Symptomatic care
Irritants/corrosives	Chlorine, bromine, ammonia	Nebulized albuterol
Choking agents	Riot control agents	Supportive care
Cyanogens	Phosgene, hydrogen cyanide	Amyl nitrate, sodium nitrate, sodium thiosulfate
Anticholinergics	3-Quinuclidinyl benzilate (BZ)	Physostigmine

1. Redlener I, Markenson D. Disaster and terrorism preparedness: what pediatricians need to know. *Adv Pediatr.* 2003;50:1-37.

TABLE 3

**Selected online disaster preparedness resources**

<p><b>CDC Emergency Preparedness and Response home page</b>  <a href="http://www.bt.cdc.gov">www.bt.cdc.gov</a></p>
<p><b>National Center for Disaster Preparedness, Center for Public Health Preparedness of the Columbia University Mailman School of Public Health</b>  <a href="http://www.mailman.hs.columbia.edu/CPHP/resources.html">www.mailman.hs.columbia.edu/CPHP/resources.html</a></p>
<p><b>The National Association of County and City Health Officials, Bioterrorism and Emergency Response Program</b>  <a href="http://www.naccho.org/project90.cfm">www.naccho.org/project90.cfm</a></p>
<p><b>American Red Cross Community Disaster Education Materials</b>  <a href="http://www.redcross.org/pubs/dspubs/cde.html">www.redcross.org/pubs/dspubs/cde.html</a></p>
<p><b>The Bioterrorism Learning Center</b>  <a href="http://bioterrorism.digiscript.com">http://bioterrorism.digiscript.com</a></p>
<p><b>Federal Emergency Management Agency Introduction to the Incident Command System</b>  <a href="http://training.fema.gov/EMIWeb/downloads/IS195unt1.pdf">http://training.fema.gov/EMIWeb/downloads/IS195unt1.pdf</a></p>

TABLE 4

**Draft competencies for health care students**

<b>Competency</b>	<b>Proficiency level</b>
<b>I. Emergency preparedness and management</b>	
1. Disaster phases	<i>Define</i> disasters (natural vs. man-made) and their phases with examples
2. All-hazards risk assessment and planning	<i>Define</i> and <i>explain</i> the concept; <i>list</i> data categories, sources, and analytic methods; <i>describe</i> uses and relevance of findings for public facilities such as hospitals, office-based practices, and at the personal level.
3. Response functional roles	<i>Define</i> the concept; <i>describe</i> the role of citizens, volunteers, and health professions; <i>describe</i> the responsibility to maintain expertise and participate in drills; <i>explain</i> the need to practice without exceeding authority or capabilities; <i>describe</i> the importance of family and personal preparedness.
4. Incident command structure	<i>Define</i> the concept and application at federal, state, local, and institutional levels. <i>Define</i> the concept and function of an emergency operations center.
5. Risk communication	<i>Explain</i> the principles and application during a disaster; <i>describe</i> sources to obtain accurate information.
6. Government resources and authority	<i>List</i> and <i>describe</i> basic legal and regulatory issues; <i>list</i> federal, state, and local agencies/offices contributing to disaster response.
7. Evaluation activities	<i>Describe</i> the contribution of one's profession to regular drills and evaluations.
<b>II. Terrorism and public health emergency preparedness</b>	
1. Chemical agents	<i>List</i> and <i>describe</i> general classes of potential chemical weapons, including mechanisms of exposure; <i>describe</i> decontamination and treatment principles and concepts of personal protection.
2. Biological agents	<i>List</i> and <i>describe</i> Category A biological agents; <i>describe</i> epidemiology, routes of exposure, treatments, and infection control principles.
3. Radiologic agents	<i>List</i> types of radiation associated with potential terrorist devices; <i>describe</i> potential mechanisms of distribution, effects of exposure, treatments, and personal protection.
4. Personal protective equipment and decontamination	<i>Describe</i> and <i>demonstrate</i> the basic principles of selection and use of personal protective equipment appropriate to a range of situations typical of one's profession; <i>describe</i> the principles and application of decontamination.
<b>III. Public health surveillance and response</b>	
1. Principles and practice of surveillance	<i>Define</i> and <i>explain</i> the basic principles of surveillance and individual reporting of potential or actual emergencies that could affect the health of a community; <i>list</i> procedures used to collect patient data for surveillance or tracking; <i>describe</i> unusual clinical scenarios that may represent sentinel cases of victims of an unannounced use of CBRNE.
2. Interventions	<i>List</i> and <i>describe</i> public health interventions that are part of the response to public health emergencies such as the use of CBRNE.
<b>IV. Patient care</b>	
1. History and physical examination	<i>Demonstrate</i> the ability to identify symptoms and signs indicative of exposure to chemical, biological, radiologic, or nuclear agents and/or psychological reactions to such incidents
2. Diagnosis	<i>Demonstrate</i> the ability to incorporate clinical, laboratory, and radiologic evidence to arrive at a diagnosis of exposure to CBRNE and/or psychological reactions to such incidents
3. Treatment	<i>Demonstrate</i> the ability to initiate physical and/or psychological interventions for patients who are victims of CBRNE agents
4. Forensics	<i>Demonstrate</i> the ability to collect and preserve evidence from patients who may be victims of a CBRNE event
<b>Key:</b> CBRNE, chemical, biological, radiologic, nuclear, explosive.	

varies by municipality; familiarize yourself with the system in your community and what your role is. Understand that you may be expected to collect forensic evidence and to know the lead law enforcement agency for possible bioterrorist incidents in your community.

- **Responsibility** refers to your duty to address your own needs and those of your family by developing personal disaster plans (see “The best form of disaster preparation begins at home” and “How to develop a home disaster plan,” page 45). This principle recognizes that you work within the limits of your ability and authority, and that you consider other ethical concerns such as patients’ refusal of isolation and treatment, the allocation of limited resources,<sup>4</sup> and the prospect of pressure by patients, friends, or family to provide the antibiotics or other agents they could not obtain from emergency departments or physicians.

### Fortify student competencies

A number of clinical professions are developing bioterrorism and emergency preparedness competencies for practitioners and students.<sup>3-5</sup> Competencies are the skills, knowledge, and abilities necessary for effective and efficient functioning of an organization or profession.<sup>3</sup>

For PA programs, the challenge is to add material to an already full curriculum. Much of the relevant material may already be in the training program; incorporating discussion of bioterrorism and emergency preparedness may simply be a matter of providing the appropriate emphasis and context. Some entirely new

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material may have to be added, however. For programs that share campuses with other health professions, these activities might be interdisciplinary. Resources can be standardized, and aspects of the curriculum may be incorporated into distance-based learning modules that can be shared across departments and even institutions. Faculty development will be necessary, supported by continuing education activities, training opportunities, and fellowships. Some of these tools may



come from a number of projects currently under way to enhance existing health sciences curricula.<sup>17</sup> PA schools should consider interdisciplinary hands-on senior-year activities such as tabletop exercises or case studies.

An interdisciplinary group from Columbia University's health sciences campus in New York, NY—representing the College of Physicians and Surgeons, the School of Nursing, the School of Oral and Dental Surgery, and the Mailman School of Public Health—is defining a set of core competencies for all health care professionals. A draft set of competencies applicable to PAs is presented in Table 4 (page 51).

### Expanding the scope of PA practice in an emergency

If the medical system is overwhelmed, it may “fall to non-physicians to provide many services ordinarily supplied by physicians (such as performing triage, dispensing medications, and providing general medical support).”<sup>22</sup> By virtue of their training and experience, PAs are positioned to respond to this need for crisis surge capacity. An increase in minor injuries may necessitate a demand for clinicians “skilled in managing minor surgical emergencies.”<sup>18</sup> PAs may also contribute to “the prompt reestablishment of normal curative and preventative health activities,” which is a priority after a disaster.<sup>19</sup> In addition, PAs may be called on to assist public health authorities with mass vaccination, public health surveillance, and outbreak investigation.

There should be a framework for expanded scope of practice and the assumption of non-traditional roles during times of emergency. Since PAs practice medicine within unique state legislative niches, the profession should contribute to the policy making process. Of particular concern are the implications for liability and indemnification, given the need for supervision. The AAPA has advocated for exemptions to state supervision laws “to allow PAs to respond to exceptional circumstances created by disasters or emergencies in the field.”<sup>20</sup> AAPA model language was used in recently passed Arizona legislation “to facilitate PA practice in disasters and emergencies.”<sup>21</sup> It remains your responsibility to be familiar with applicable state laws regarding your participation in disaster settings.

### Conclusions

The goals of disaster preparedness are to anticipate, mitigate, and rehabilitate. All health professionals can and should contribute to this process. Among the most essential competencies are the ability to locate your institutional or office disaster plan, to understand your role in an emergency; and to know how to communicate with patients, ancillary staff, and governmental agen-

cies during an emergency.<sup>3</sup> As clinicians, you have the added responsibility of becoming familiar with the chemical, biological, radiologic, nuclear, and explosive agents of concern.

The PA's role may change or expand during times of crisis. Many resources are available to train and prepare clinicians on an individual basis. This includes gathering information on personal and family preparation. The PA profession, through its organizations, should address issues of professional education and legislation. □

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