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## Hospital Preparedness for Emergency Response: United States, 2008

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### Abstract

*Objective*—This report is a summary of hospital preparedness for responding to public health emergencies, including mass casualties and epidemics of naturally occurring diseases such as influenza.

*Methods*—Data are from an emergency response preparedness supplement to the 2008 National Hospital Ambulatory Medical Care Survey, which uses a national probability sample of nonfederal general and short-stay hospitals in the United States. Sample data were weighted to produce national estimates.

### Key results

- Nearly all hospitals had response plans for chemical releases, natural disasters, epidemics, and biological incidents. Preparedness for explosive or incendiary incidents was less frequent than preparedness for other types of incidents.
- While most hospitals had plans for cancellation of elective procedures and admissions, two-thirds had plans for alternate care areas with beds, staffing, and equipment.
- One-half of hospitals planned for alternate care areas in inpatient hallways or decommissioned ward space, or for conversion of inpatient units to augment intensive care.
- One-half of hospitals had adjusted standards of care for allocation of mechanical ventilators for mass casualties.
- Although over one-half of hospitals had staged epidemic drills, only one-third included mass vaccination or medication distribution.
- One-half of hospitals planned for advance registration of health care professionals.
- While most hospitals had memoranda of understanding (MOUs) with other hospitals to transfer adults during an epidemic, fewer hospitals had MOUs for pediatrics and burns. Less than one-half of hospitals accommodated the needs of children and persons with disabilities during a public health emergency.

**Keywords:** Emergency preparedness ● hospital preparedness ● mass casualty ● pandemic

### Introduction

Following the World Trade Center attack of September 2001 and the anthrax terrorism incident of October 2001, there has been a heightened interest in using surveys to assess our readiness for various disasters. Therefore, the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (ASPE), provided funding to the National Center for Health Statistics (NCHS) to survey hospitals about preparedness for treating patients from bioterrorism attacks or mass casualty incidents. Bioterrorism and Mass Casualty Preparedness Supplements were added to the 2003 and 2004 National Hospital Ambulatory Medical Care Surveys (NHAMCS). A preliminary report on hospital preparedness for bioterrorism or other mass casualties showed that hospitals were prepared in 2003 in most of the areas studied (1). Other more comprehensive publications covering both years followed (2–4).

In subsequent years, the national focus shifted from bioterrorism to preparation for natural disasters such as Hurricane Katrina and major influenza outbreaks. In 2004, an outbreak of H5N1 avian influenza was reported in



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poultry in nine eastern Asian countries, which was genetically related to 52 fatal human cases reported by early 2005 (5). By the end of 2008, H5N1 avian influenza had been responsible for 248 human deaths in 15 countries in Asia and Africa, and had been reported in both domestic and wild birds in Europe as well (6,7). Although no avian or human H5N1 cases have been reported in the Americas, there is public concern that this virus or others could result in outbreaks or even pandemics in the future. In response to this concern, ASPE provided funds for NCHS to survey hospitals on their preparedness for mass casualty events including pandemics.

This report serves as a descriptive summary of hospital preparedness for dealing with naturally occurring diseases, epidemics and pandemics such as influenza, and other public health emergencies. Information about emergency preparedness in U.S. hospitals is crucial for those who are charged with planning how to prevent and treat large outbreaks of infectious disease and other mass casualty events.

## Methods

NHAMCS is a national annual survey of ambulatory medical care visits to noninstitutional, nonfederal, acute care, and short-stay hospitals. Short-stay hospitals are those with an average length of stay of less than 30 days, whereas acute care hospitals are those whose specialty is general (medical or surgical) or children's general. NHAMCS uses a multistage probability sampling design involving samples of geographic primary sampling units and hospitals with emergency departments (ED) or outpatient departments within those units. The data are weighted using the inverse probabilities of hospital selection with an adjustment for nonresponse. Therefore, estimates are considered representative of hospitals throughout the United States.

In 2008, emergency preparedness items were added to NHAMCS in a special supplement. Many of the items on the 2003–2004 surveys were retained, but the 2008 instrument was

greatly expanded to include new questions arising from research findings as well as those suggested by outside professional organizations. This report focuses on new content added to the 2008 survey. A future report will discuss trends between 2003–2004 and 2008 for items that were retained from the earlier surveys.

NHAMCS is administered on-site at each participating hospital by field representatives employed by the U.S. Census Bureau under an interagency agreement with NCHS. The pandemic supplement was an eight-page self-administered questionnaire consisting of 112 total data items. It was completed for each sample hospital by the person responsible for the hospital's emergency response plan. The supplement was returned to the U.S. Census Bureau's National Processing Center (NPC) with the NHAMCS core materials. NPC performed the quality control edits and data entry, and provided NCHS with monthly updates and a final cumulative SAS file.

A descriptive analysis was conducted by NCHS using a first-order Taylor series approximation method as applied in SUDAAN-9.0.1 to account for the complex survey design (8). Because all continuous variables had positively skewed distributions, the central tendency was reported as the median.

The determination of statistical significance was based on the two-tailed *t*-test. The Bonferroni inequality was used to establish the critical value for statistically significant differences (0.05 level of significance) based on the number of possible comparisons within a particular variable (or combination of variables) of interest. Terms relating to differences such as "more" or "fewer" indicate that the difference is statistically significant. Terms such as "not different" or "similar" indicate that the difference is not statistically significant. A lack of comment on a particular difference does not imply anything about statistical significance.

## Results

Of the sample of 395 in-scope hospitals from the 2008 NHAMCS, 294

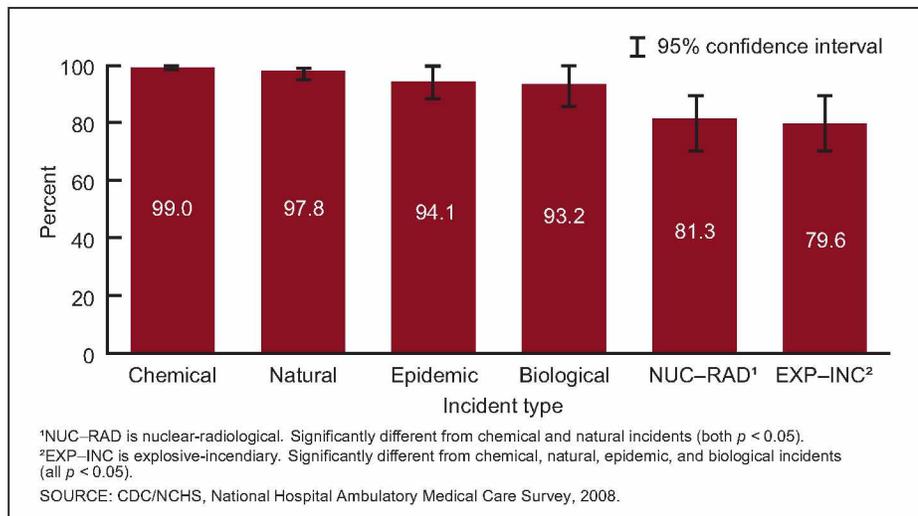
hospitals responded to the supplement (response rate of 74.4 percent unweighted and 78.1 percent weighted), representing the national weighted universe of 5,212 hospitals.

## Emergency response plans

- All hospitals had an emergency response plan for at least one of the six hazards studied (epidemic-pandemic, biological, chemical, nuclear-radiological, explosive-incendiary, and natural incidents) (Table 1, Figure 1).
- Nearly all hospitals (99.0 percent) had emergency response plans that specifically addressed chemical accidents or attacks, which were not significantly different from the prevalence of plans for natural disasters (97.8 percent), epidemics or pandemics (94.1 percent), and biological accidents or attacks (93.2 percent).
- Significantly fewer hospitals (81.3 percent) had plans for nuclear or radiological accidents or attacks than for chemical accidents or attacks and natural disasters.
- Significantly fewer hospitals (79.6 percent) had plans for explosive or incendiary accidents or attacks than for chemical accidents or attacks, natural disasters, epidemics or pandemics, and biological accidents or attacks.
- About 67.9 percent of hospitals had plans for all six hazards.

## Cooperative planning

- About 99.6 percent of hospitals engaged in cooperative planning with at least one of the eight entities studied (Table 2).
- About 93.7 percent of hospitals engaged in cooperative planning in developing or updating an emergency response plan for public health emergencies with the state or local office of emergency management; this was not significantly different from the prevalences for planning with other hospitals (92.7 percent), emergency medical services (EMS) (89.0 percent), state or local public



**Figure 1. Percentage of hospitals with emergency response plans for selected types of incidents: United States, 2008**

health departments (88.7 percent), or fire departments (86.0 percent).

- Significantly fewer hospitals included hazardous materials teams (64.3 percent) or the Federal Bureau of Investigation (19.0 percent) in their emergency response planning than the other six entities listed above.
- About 18.7 percent of hospitals included all eight entities in their emergency response planning.

### Plans for components of hospital preparedness

Table 3 summarizes responses to a series of questions about written emergency response plans for 48 components of preparedness for hospital overcrowding incidents or public health emergencies, and whether the plans were implemented in an actual incident during 2007. Broad categories of hospital preparedness included memoranda of understanding (MOUs) with other hospitals, regional communication systems, mutual aid agreements, expansion of on-site surge capacity, priority setting for limited resources, expansion of on-site health care work force, mass casualty management, management of pediatric and other special populations, and communication strategies.

### MOUs with other hospitals

- About 87.8 percent of hospitals had MOUs with one or more hospitals to accept adult patients, but only 56.2 percent had MOUs with one or more children's hospitals to accept pediatric patients in transfer from their own ED when no beds were available at the hospital.
- Only 8.6 percent of hospitals had implemented adult transfer MOUs, and 8.0 percent had implemented pediatric transfer MOUs during actual incidents in 2007.
- Only about one-half of hospitals had MOUs with burn centers to accept explosive-incendiary mass casualties (56.9 percent), or with other outpatient facilities to augment outpatient services (42.8 percent).

### Regional communication systems

- About 85.3 percent of hospitals had regional communication systems to track ED closures or diversions. About 29.2 percent implemented these systems during an actual incident in 2007.
- About 80.6 percent of hospitals had regional communication systems to track available adult intensive care unit (ICU) beds, 70.1 percent tracked pediatric ICU beds, and 64.8 percent tracked neonatal ICU beds. About 22.6 percent implemented adult ICU

tracking systems, 16.9 percent implemented pediatric ICU tracking systems, and 14.1 percent implemented neonatal ICU tracking systems during an actual incident in 2007.

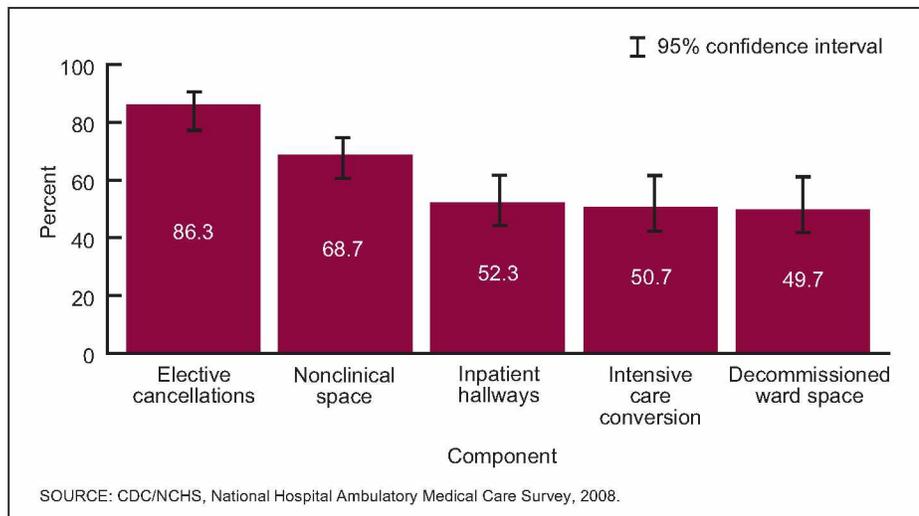
- Most hospitals had regional communication systems to track available adult (89.7 percent), pediatric (82.0 percent), and neonatal (67.8 percent) hospital beds. About one-quarter implemented adult (30.4 percent), pediatric (23.7 percent), or neonatal (18.9 percent) bed tracking systems during an actual incident in 2007.
- Only 51.9 percent of hospitals had regional communication systems to track specialty coverage. About 15.1 percent implemented this system in 2007.

### Mutual aid agreements

- About 84.1 percent of hospitals had mutual aid agreements with other agencies to share supplies and equipment. About 16.3 percent implemented these agreements in 2007.

### Expansion of on-site surge capacity

- About 90.5 percent of hospitals had plans for isolation of airborne disease patients in negative pressure rooms. About 14.2 percent implemented these plans in 2007 (Table 3, Figure 2).
- About 86.3 percent of hospitals had plans for cancellation of elective procedures and admissions. About 12.9 percent implemented these plans in 2007.
- About 73.7 percent of hospitals had plans for setting up temporary facilities when the hospital is unusable (e.g., without power or flooded).
- Many hospitals had plans for establishment of alternate care areas with beds, staffing, and equipment in nonclinical space (68.7 percent), inpatient unit hallways (52.3 percent), or decommissioned ward space (49.7 percent).



**Figure 2. Percentage of hospitals with plans for selected components of onsite surge capacity expansion: United States, 2008**

- Only 50.7 percent of hospitals had plans for conversion of inpatient units to augment intensive care capacity.

### Priority setting for limited resources

- About 72.4 percent of hospitals had written triage processes for limited intensive care resources (Table 3).
- About 64.0 percent of hospitals had plans for regional coordination of adjusted standards of care during a pandemic or other mass casualty incident.
- About 43.2 percent of hospitals had plans for implementing adjusted standards of care for initiation and withdrawal of mechanical ventilation.
- About 32.9 percent of hospitals had plans for delivery of potassium iodide in response to radioactive release.

### Expanding on-site health care work force

- About 88.8 percent of hospitals had a plan for continuity of operations in the event of an emergency. About 14.9 percent implemented this plan during an actual incident in 2007.
- About 6 of 10 hospitals had mutual aid agreements with other agencies to share health care providers (69.5 percent), or plans for advance registration of volunteer health professionals (55.9 percent).

- About 6 of 10 hospitals had plans for staff absenteeism due to personal or family impact from the emergency (66.9 percent), or on-site child care to maintain staff at the hospital (63.1 percent).

### Mass casualty management

- About 94.6 percent of hospitals had plans for hospital evacuations.
- Most hospitals had plans for transporting large numbers of patients within the hospital (83.9 percent) or between hospitals (77.0 percent).
- Only 62.6 percent of hospitals had plans for an on-site large capacity morgue.

### Pediatrics

- About 42.6 percent of hospitals had a tracking system for accompanied and unaccompanied children.
- About 34.0 percent of hospitals had plans for reunification of children with families, and 31.1 percent for protocols to identify and protect displaced children.
- About 32.4 percent of hospitals had guidelines for increasing pediatric surge capacity.
- About 29.4 percent of hospitals had plans for acquiring supplies to shelter healthy displaced children.

### Special populations

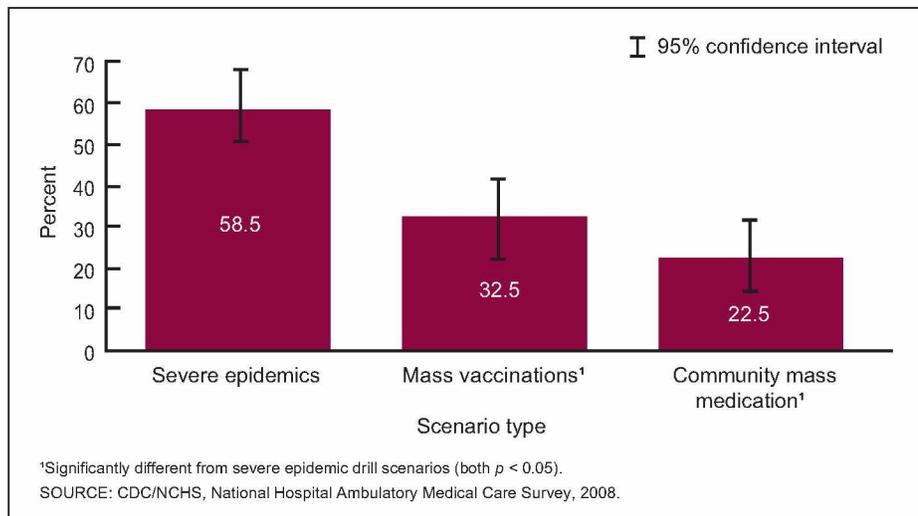
- About 73.3 percent of hospitals had plans for communicating with non-English-speaking patients. About 15.4 percent implemented those plans during an actual incident in 2007.
- Only about one-half of hospitals had plans for communicating with deaf (58.3 percent) or blind (47.5 percent) patients.
- About 47.6 percent of hospitals had plans for sheltering mobility-impaired patients.
- About 46.7 percent of hospitals had plans for sheltering patients with special health care needs. About 42.0 percent implemented these plans during an actual incident in 2007.
- Only about one-third of hospitals had plans for sheltering pregnant women (39.2 percent), mentally challenged (39.0 percent), or technology-dependent (33.7 percent) patients.

### Communications

- About 93.4 percent of hospitals had plans for receiving notification of alerts from the state or local health department. About 34.5 percent implemented these plans during an actual incident in 2007.
- About 79.4 percent of hospitals had plans for participating with local public health departments in public education about the importance of influenza vaccination. About 29.5 percent implemented these plans during an actual incident in 2007.

### Internal mass casualty drills, simulations, or exercises

- In the last year, one-half (50.6 percent) of hospitals conducted more than one internal drill; 31.9 percent conducted only one internal drill; 11.1 percent conducted no internal drills; and the number of internal drills was unknown for 6.4 percent (Tables 4 and 5).
- For those hospitals in which the number of drills was known, the median number of internal full-scale simulations conducted was one.
- The median number of adult victims utilized in each hospital's largest internal drill was 15.



**Figure 3. Percentage of hospitals participating in selected mass casualty drill scenario types: United States, 2008**

- The median length of each hospital's longest internal drill was 4.0 hours.
- The median number of table-top exercises conducted in the last year by a hospital was one.

### External mass casualty drills, simulations, or exercises

- In the last year, 28.4 percent of hospitals conducted more than one external drill (i.e., in collaboration with other organizations); 53.6 percent conducted only one external drill; 11.5 percent conducted no external drills; and the number of external drills was unknown for 6.5 percent of hospitals (Tables 4 and 5).
- For those hospitals in which the number of drills was known, the median number of full-scale simulations conducted in collaboration with other organizations (law enforcement, health department, emergency management, fire department, EMS, hazardous materials teams, or decontamination teams) was one.
- The median number of adult victims utilized in each hospital's largest external drill was 16.
- The median length of each hospital's longest external drill was 4.0 hours.
- The median number of table-top exercises hospitals conducted in

collaboration with other organizations was 0.5.

### Types of scenarios in mass casualty drills

- About 88.2 percent of hospitals addressed general disaster and emergency response in their drills, significantly more than any other type of scenario studied (Table 6).
- About the same percentages of hospitals addressed decontamination procedures (69.6 percent), severe epidemics or pandemics (58.5 percent), and chemical accidents or attacks (55.6 percent) in their drills.
- Compared with hospitals staging decontamination scenarios, significantly fewer hospitals (42.5 percent) focused on acute decontamination of aerosol exposures from biological accidents or attacks.
- Compared with hospitals staging severe epidemic scenarios, about the same percentage (39.1 percent) focused on delayed disease outbreak management for biological accidents or attacks. However, significantly fewer hospitals addressed mass vaccinations (32.5 percent), mass medication distribution to hospital personnel (30.6 percent), or mass medication distribution to the community (22.5 percent) (Figure 3).

- For mass medication distribution, statistically similar percentages of hospitals focused on hospital personnel and the community.
- In their drills on biological accidents or attacks, statistically similar percentages of hospitals focused on acute decontamination of aerosol exposures and delayed disease outbreak management.
- About 32.4 percent of hospitals addressed explosive or incendiary accidents or attacks in their drills, significantly fewer than scenarios for general disasters, decontamination, epidemics, or chemical attacks, but statistically similar to scenarios for acute decontamination of biological aerosol exposures and delayed disease outbreak management for biological attacks.
- About 18.7 percent of hospitals addressed nuclear or radiological accidents or attacks in their drills, significantly fewer than scenarios for general disasters, decontamination, epidemics, chemical attacks, or acute decontamination of biological aerosol exposures, but statistically similar to scenarios for delayed disease outbreak management for biological attacks and explosions.
- Statistically similar percentages of hospitals addressed children (44.6 percent) and the frail elderly (36.2 percent) in their drills. But only 17.1 percent addressed mentally challenged individuals in their drills, significantly less than children or the frail elderly.

### Collaboration with outside organizations on mass casualty drills

- Statistically similar percentages of hospitals performed drills, simulations, or exercises with state or local offices of emergency management (85.8 percent), state or local law enforcement (81.5 percent), state or local public health departments (81.3 percent), fire departments (79.7 percent), and fire department-based EMS (72.1 percent) (Table 7).

- About 69.7 percent of hospitals performed drills with EMS not based in a fire department, significantly fewer than with offices of emergency management, but statistically similar to fire department-based EMS, law enforcement, public health departments, and fire departments.
- Statistically similar percentages of hospitals performed drills with decontamination teams (58.4 percent) and hazardous materials teams (50.9 percent).
- Statistically similar percentages of hospitals performed drills with school systems (30.6 percent), industrial or commercial organizations (25.8 percent), or long-term care facilities (20.4 percent).

### Mass casualty resources

- For personal protection, the median number of N95 masks per hospital was 432, and the median number of personal protective suits with powered air-purifying respirators per hospital was 10 (Table 8).
- The median numbers of patients that could be handled by hospital decontamination showers per hour was seven for ambulatory patients, three for small children or infants, and three for stretcher patients.
- The median numbers of beds per hospital was 70 for regular inpatient staffed beds, 8 for critical care beds, 11 for ED treatment spaces, and 4 for negative pressure isolation rooms.
- The median number of mechanical ventilators per hospital was six.

### Ambulance diversion

When EDs are at capacity, ambulance diversion is implemented. Thus, the number of annual hours that an ED is on ambulance diversion, or that a hospital is on diversion for trauma or critical care cases, reflects the hospital's capacity to accept new patients, not only during routine operations, but also during a mass casualty incident (Table 9).

- In 2007, the majority of hospitals (58.7 percent) did not report being on ED ambulance diversion. About

16.3 percent of hospitals were on ambulance diversion for 220 hours or less (equivalent to about 9.2 days), which represented the mean for the 91.2 percent of hospitals for which data were available. About 16.2 percent of hospitals were on ambulance diversion for more than 220 hours. Ambulance diversion information was unknown for 8.7 percent of hospitals.

- In 2007, the majority of hospitals (72.5 percent) did not report being on trauma diversion. About 7.1 percent of hospitals were on trauma diversion for 32 hours or less (equivalent to about 1.3 days), which represented the mean for the 85.2 percent of hospitals for which data were available. The estimate was unreliable for hospitals on trauma diversion for more than 32 hours. Trauma diversion information was unknown for 14.8 percent of hospitals.
- In 2007, the majority of hospitals (66.4 percent) did not report being on critical care diversion. About 10.6 percent of hospitals were on critical care diversion for 72 hours or less (equivalent to three days), which represented the mean for the 84.5 percent of hospitals for which data were available. About 7.5 percent of hospitals were on critical care diversion for more than 72 hours. Critical care diversion information was unknown for 15.5 percent of hospitals.

### Hospital preparedness funding

Between 2002 and 2007, about one-quarter of hospitals (24.3 percent) received more than \$150,000 in federal preparedness funding, 19.2 percent received more than \$75,000 but less than \$150,000, and 24.2 percent received more than zero but less than \$75,000. About 5.2 percent received no funding. The amount of funding was unknown for 27.2 percent of hospitals (Table 10).

### Discussion

This emergency response preparedness supplement contains

valuable information for federal, state, and local planners who are responsible for hospitals' response to infectious disease epidemics and other mass casualty incidents. In this report, baselines have been established for new data elements. Future research will track trends between 2003–2004 and 2008 for data elements that are unchanged, and identify hospital characteristics that are associated with emergency preparedness. There are several key issues that are highlighted by this survey.

While nearly all hospitals have emergency response plans for chemical releases, natural disasters, epidemics or pandemics, and biological accidents or attacks, preparedness for explosive or incendiary incidents is significantly less frequent than preparedness for other types of mass casualty incidents. A similar trend was found with respect to including explosion scenarios in mass casualty drills. Explosive terrorism is infrequent in the United States, with no incidents having occurred since the 2001 airline attacks at the World Trade Center, Pentagon, and over Pennsylvania (9). However, incendiary incidents (fires) are more common. The U.S. Fire Administration reported that there were about 15,500 fires in high-rise structures between 1996 and 1998. While hospital preparedness for fires most often involves receiving casualties from incidents occurring elsewhere, it is noteworthy that about 6 percent of these high-rise structure fires occurred in hospitals (10).

ED crowding continues to be a major policy issue. The Institute of Medicine (IOM) has expressed concern that many hospitals now operating at or near full capacity lack the ability to handle sudden increases in volume associated with mass casualties (11). The American College of Emergency Physicians (ACEP) recommends that hospitals develop influenza preparedness plans to assure adequate inpatient surge capacity by such means as opening unused areas, doubling up inpatient rooms, canceling elective admissions and procedures, and using alternate areas for extra critical care space (12). We found that while most hospitals had plans for cancellation of elective

procedures and admissions, only about two-thirds had plans for establishment of alternate care areas with beds, staffing, and equipment in nonclinical space. Only about one-half had plans for establishing alternate care areas in inpatient unit hallways or decommissioned ward space, or for conversion of inpatient units to augment intensive care capacity. One practice that may be useful in decompressing EDs is establishing alternate care areas in inpatient hallways until regular beds become available. Because of concerns about the safety to patients of this approach, one academic ED studied adverse events resulting from their institutional protocol for admitting ED-boarded patients to inpatient hallway beds during overcrowding situations. In-hospital mortality and ICU transfers were both significantly lower for patients admitted to hallway beds than for those admitted to standard inpatient beds. The authors concluded that hallway boarding was not harmful to patients (13).

When resources for patient care become scarce in disaster situations, IOM recommends the development of consistent state crisis standards of care (14). One example of such a resource is mechanical ventilators for patients in respiratory failure due to infectious agents that have compromised lung function. We found that only about one-half of hospitals had advance plans for adjusted standards of care for allocation of mechanical ventilators during mass casualty incidents when normal capacities might be overwhelmed. But models do exist for developing such standards. In one tertiary medical center, a triage system was developed and tested for instituting or continuing mechanical ventilation based on objective clinical factors related to survival potential and available resources. The system, which involves a change in the standard of care, would be implemented through the health department and supported by a declaration from the state governor with professional liability protections in place (15).

ACEP recommends that hospitals create and execute a training program

based upon their emergency operations plans, develop pandemic influenza exercise programs, and execute an exercise to test the validity of the training and plans (12). As evidenced by the 2009 H1N1 influenza epidemic, mass vaccination and medication distribution are frequently key components of epidemic response. We found that although more than one-half of hospitals had staged epidemic drills, only about one-third had included mass vaccination or community medication distribution specifically. In a survey of health care epidemiologists following the experience of the 2009 H1N1 influenza epidemic, only 60 percent felt that their hospitals were well prepared for a pandemic, and 31 percent reported shortages of antiviral medications. The authors identified pandemic influenza plan revisions and consideration of mandatory influenza vaccinations for health care workers as important priorities (16).

The Emergency System for Advance Registration of Volunteer Health Professionals Grant Program of the U.S. Office of the Assistant Secretary for Preparedness and Response helps health professionals volunteer in public health emergencies by providing verifiable information about their identity, license, credentials, and clinical privileges to participating medical facilities (17). Despite the existence of this federal initiative, we found that about one-half of hospitals had plans for advance registration of outside health care professionals.

Planning for special populations, including children, appears to be less common than planning for adult patients. For example, ACEP recommends that written transfer protocols and interfacility agreements should be in place when patient transfer is part of a regional plan to provide optimal specialized care (18). While most hospitals have MOUs with other hospitals to accept adult patients in transfer during an epidemic, fewer hospitals have MOUs for pediatric and burn patients. Similarly, less than one-half of hospitals had various programs in place to accommodate the needs of children and persons with

disabilities during a public health emergency.

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**Table 1. Hospitals with emergency response plans for selected types of incidents: United States, 2008**

Type of incident	Number of hospitals	Percent	SE	95% confidence interval	
Chemical accidents or attacks . . . . .	5,162	99.0	0.3	98.1	99.5
Natural disasters . . . . .	5,095	97.8	0.8	95.4	98.9
Epidemics or pandemics . . . . .	4,904	94.1	1.9	88.9	96.9
Biological accidents or attacks . . . . .	4,859	93.2	2.2	87.4	96.5
Nuclear or radiological accidents or attacks . . . . .	4,235	81.3	4.5	70.7	88.6
Explosive or incendiary accidents or attacks . . . . .	4,147	79.6	4.1	70.3	86.5
All types of incidents . . . . .	3,540	67.9	4.7	58.0	76.4

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent.

**Table 2. Hospitals engaged in cooperative planning in developing or updating a response plan for public health emergencies, by type of entity engaged: United States, 2008**

Type of outside entity engaged	Number of hospitals	Percent	SE	95% confidence interval	
State or local office of emergency management . . . . .	4,884	93.7	1.9	88.7	96.6
Other hospitals . . . . .	4,832	92.7	2.7	85.2	96.6
Emergency medical services . . . . .	4,640	89.0	3.3	80.7	94.0
State or local public health department . . . . .	4,622	88.7	3.1	80.9	93.6
State or local law enforcement . . . . .	4,492	86.2	2.9	79.4	91.0
Fire department . . . . .	4,483	86.0	3.4	77.9	91.5
Hazardous materials teams . . . . .	3,351	64.3	5.6	52.6	74.5
Federal Bureau of Investigation . . . . .	992	19.0	3.2	13.6	26.0
All eight entities . . . . .	973	18.7	3.2	13.2	25.7

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent.

**Table 3. Hospitals having components in a written plan for use during an overcrowding incident or public health emergency, by type of plan component: United States, 2008**

Type of plan component	In emergency response plan					Used in 2007 incident				
	Number	Percent	SE	95% confidence interval		Number	Percent	SE	95% confidence interval	
Collaboration with outside entities										
MOU to accept adult patients in transfer from ED . . . . .	4,578	87.8	3.2	80.0	92.9	446	8.6	1.8	5.6	12.8
MOU to accept pediatric patients in transfer from ED . . . . .	2,927	56.2	5.6	45.1	66.7	416	8.0	1.9	5.0	12.6
MOU with burn center to accept patients in transfer . . . . .	2,965	56.9	5.7	45.4	67.7	*	*	*	*	*
MOU with other outpatient facilities . . . . .	2,228	42.8	4.2	34.8	51.1	*	*	*	*	*
Regional communication systems to track:										
Emergency department closures or diversions . . . . .	4,445	85.3	3.4	77.1	90.9	1523	29.2	4.3	21.4	38.4
Available intensive care unit beds . . . . .										
Adult . . . . .	4,203	80.6	4.5	70.3	88.0	1180	22.6	3.4	16.6	30.1
Pediatric . . . . .	3,651	70.1	4.7	60.1	78.4	880	16.9	3.0	11.7	23.7
Neonatal . . . . .	3,376	64.8	4.8	54.9	73.6	736	14.1	3.0	9.2	21.2
Available hospital beds . . . . .										
Adult . . . . .	4,673	89.7	2.6	83.3	93.8	1584	30.4	3.9	23.2	38.7
Pediatric . . . . .	4,273	82.0	3.0	75.2	87.2	1237	23.7	3.5	17.5	31.4
Neonatal . . . . .	3,531	67.8	3.3	60.9	73.9	987	18.9	3.4	13.2	26.5
Specialty coverage . . . . .	2,706	51.9	4.6	42.8	60.9	788	15.1	3.2	9.9	22.5
Mutual aid agreements to share supplies and equipment . . . . .	4,381	84.1	3.8	75.2	90.2	850	16.3	3.5	10.5	24.4
Expansion of on-site surge capacity										
Cancellation of elective procedures and admissions . . . . .	4,500	86.3	3.4	78.2	91.8	671	12.9	1.8	9.8	16.8
Isolation in negative pressure rooms . . . . .	4,719	90.5	2.5	84.5	94.4	738	14.2	2.4	10.0	19.7
Conversion of inpatient units for intensive care . . . . .	2,642	50.7	4.6	41.7	59.6	*	*	*	*	*
Establishment of alternate care areas										
Inpatient unit hallways . . . . .	2,728	52.3	4.3	43.9	60.7	*	*	*	*	*
Decommissioned ward space . . . . .	2,589	49.7	4.4	41.1	58.3	*	*	*	*	*
Nonclinical space . . . . .	3,579	68.7	3.8	60.7	75.7	*	*	*	*	*
Setting up temporary facilities . . . . .	3,842	73.7	3.8	65.6	80.5	*	*	*	*	*
Priority setting for limited resources										
Delivery of potassium iodide . . . . .	1,712	32.9	5.2	23.6	43.7	*	*	*	*	*
Adjusted standards of care for mechanical ventilation . . . . .	2,253	43.2	4.2	35.2	51.6	*	*	*	*	*
Triage processes for limited intensive care resources . . . . .	3,771	72.4	3.9	64.2	79.3	*	*	*	*	*
Regional coordination of adjusted standards of care . . . . .	3,335	64.0	4.8	54.0	72.9	*	*	*	*	*
Expanding on-site health care work force										
Continuity of operations . . . . .	4,629	88.8	2.8	82.0	93.3	775	14.9	2.4	10.8	20.2
Mutual aid agreements to share health care providers . . . . .	3,621	69.5	4.7	59.5	77.9	*	*	*	*	*
Advance registration of volunteer health professionals . . . . .	2,914	55.9	5.0	46.0	65.4	*	*	*	*	*
Staff absenteeism due to personal or family impact . . . . .	3,489	66.9	4.9	56.8	75.8	*	*	*	*	*
On-site child care to maintain staff at the hospital . . . . .	3,291	63.1	4.4	54.1	71.4	*	*	*	*	*
Mass casualty management										
Within-hospital transfer of large numbers of patients . . . . .	4,371	83.9	3.0	76.9	89.0	*	*	*	*	*
Inter-hospital transfer of large numbers of patients . . . . .	4,012	77.0	3.9	68.4	83.8	*	*	*	*	*
Hospital evacuations . . . . .	4,930	94.6	1.8	89.8	97.2	*	*	*	*	*
Establishing an on-site large-capacity morgue . . . . .	3,264	62.6	3.9	54.7	69.9	*	*	*	*	*

See footnotes at end of table.

**Table 3. Hospitals having components in a written plan for use during an overcrowding incident or public health emergency, by type of plan component: United States, 2008—Con.**

Type of plan component	In emergency response plan					Used in 2007 incident				
	Number	Percent	SE	95% confidence interval		Number	Percent	SE	95% confidence interval	
Pediatric										
Guidelines on increasing pediatric surge capacity . . . . .	1,687	32.4	3.9	25.2	40.5	*	*	*	*	*
Protocol to identify and protect displaced children rapidly. . . . .	1,621	31.1	3.7	24.4	38.8	*	*	*	*	*
Tracking system for children . . . . .	2,222	42.6	4.1	34.8	50.9	*	*	*	*	*
Reunification of children with families . . . . .	1,774	34.0	3.8	27.1	41.8	*	*	*	*	*
Supplies for sheltering healthy displaced children . . . . .	1,531	29.4	4.1	22.0	38.0	*	*	*	*	*
Special populations										
Communication with deaf patients . . . . .	3,036	58.3	5.0	48.2	67.6	*	*	*	*	*
Communication with blind patients. . . . .	2,476	47.5	4.9	38.1	57.1	*	*	*	*	*
Communication with non-English-speaking patients . . . . .	3,820	73.3	4.2	64.3	80.7	804	15.4	4.1	8.9	25.3
Sheltering mobility-impaired patients . . . . .	2,481	47.6	4.4	39.2	56.2	*	*	*	*	*
Sheltering technology-dependent patients . . . . .	1,757	33.7	3.9	26.5	41.8	*	*	*	*	*
Sheltering pregnant women . . . . .	2,042	39.2	3.9	31.7	47.2	*	*	*	*	*
Sheltering patients with special health care needs . . . . .	2,433	46.7	4.0	39.0	54.5	2187	42.0	3.9	34.6	49.8
Sheltering mentally challenged patients. . . . .	2,034	39.0	3.9	31.6	47.0	*	*	*	*	*
Communications										
Notification of alerts from your health department . . . . .	4,866	93.4	2.3	87.1	96.7	1800	34.5	4.2	26.9	43.1
Participation in public education about influenza vaccination . . . . .	4,140	79.4	3.0	73.0	84.7	1536	29.5	4.0	22.2	38.0

\* Figure does not meet standards of reliability (fewer than 30 unweighted cases).

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent. MOU is memoranda of understanding. ED is emergency department.

**Table 4. Internal and external mass casualty drills (number and percent distribution): United States, 2008**

Internal drills	Number of internal drills				
	Number of hospitals	Percent	SE	95% confidence interval	
Total . . . . .	5,212	100.0	...	...	...
No drills . . . . .	578	11.1	2.4	7.2	16.8
One drill . . . . .	1,661	31.9	4.3	24.0	40.9
More than one drill . . . . .	2,638	50.6	5.5	39.9	61.3
Unknown . . . . .	335	*6.4	2.8	2.6	14.8
				Drills in collaboration with other organizations	
Number of external drills	Number of hospitals	Percent	SE	95% confidence interval	
Total . . . . .	5,212	100.0	...	...	...
No drills . . . . .	599	11.5	2.5	7.4	17.5
One drill . . . . .	2,794	53.6	3.9	45.9	61.2
More than one drill . . . . .	1,482	28.4	3.9	21.4	36.7
Unknown . . . . .	337	*6.5	2.1	3.3	12.2

... Category not applicable.

\* Figure does not meet standards of precision (relative standard error greater than 30%).

NOTES: Total unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent.

**Table 5. Internal and external mass casualty drills (median number of drills, number of victims, and length of longest drill): United States, 2008**

	Internal drills				
	Number of hospitals	Median	SE	Interquartile range	
Full-scale simulations . . . . .	4,877	1.1	0.1528	0.4	1.9
Number of victims in largest drill					
Adult . . . . .	4,058	14.9	2.5	4.8	26.1
Pediatric . . . . .	3,752	*1.4	0.6	**	4.2
Length of longest drill (hours) . . . . .	4,271	4.0	0.5	3.4	20.3
Table-top exercises . . . . .	4,373	0.7	0.1	0.1	1.5
				External drills (in collaboration with other organizations)	
	Number of hospitals	Median	SE	Interquartile range	
Full-scale simulations . . . . .	4,875	0.7	0.1	0.2	1.3
Number of victims in largest drill					
Adult . . . . .	4,006	15.6	2.2	6.0	24.9
Pediatric . . . . .	3,681	1.2	**	**	4.6
Length of longest drill (hours) . . . . .	4,189	4.0	0.5	3.9	19.5
Table-top exercises . . . . .	4,436	0.5	0.1	**	1.3

\* Figure does not meet standards of precision (relative standard error greater than 30%).

\*\* Not possible to extrapolate data to compute value.

NOTES: Total unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. Number of hospitals excludes those for which the number of drills is unknown. SE is standard error of median.

**Table 6. Type of drill scenario among hospitals participating in mass casualty drills: United States, 2008**

Type of scenario	Number of hospitals	Percent	SE	95% confidence interval	
General disaster and emergency response . . . . .	4,599	88.2	3.2	80.2	93.3
Decontamination procedures . . . . .	3,627	69.6	4.2	60.8	77.1
Severe epidemic or pandemic . . . . .	3,051	58.5	4.3	49.9	66.7
Chemical accidents or attacks . . . . .	2,898	55.6	4.3	47.0	63.9
Biologic accidents or attacks . . . . .					
Decontamination of aerosol exposure . . . . .	2,213	42.5	4.0	34.9	50.4
Delayed disease outbreak management . . . . .	2,038	39.1	5.4	29.0	50.2
Mass vaccinations . . . . .	1,692	32.5	4.6	24.1	42.1
Explosive or incendiary accidents or attacks . . . . .	1,689	32.4	3.6	25.8	39.8
Mass medication distribution to hospital personnel . . . . .	1,597	30.6	4.9	22.0	41.0
Mass medication distribution to community . . . . .	1,174	22.5	4.3	15.2	32.0
Nuclear or radiological accidents or attacks . . . . .	972	18.7	2.8	13.8	24.8
Special populations					
Children . . . . .	2,324	44.6	3.9	37.0	52.4
Frail elderly . . . . .	1,886	36.2	4.0	28.6	44.5
Mentally challenged . . . . .	892	17.1	3.6	11.2	25.3

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent.

**Table 7. Type of organization with which hospitals collaborate in external mass casualty drills: United States, 2008**

Type of collaborating organization	Hospital collaborating with organization				
	Number of hospitals	Percent	SE	95% confidence interval	
State or local office of emergency management . . . . .	4,471	85.8	2.5	80.0	90.1
State or local law enforcement . . . . .	4,248	81.5	2.7	75.5	86.3
State or local public health department . . . . .	4,235	81.3	3.3	73.8	87.0
Fire department . . . . .	4,155	79.7	3.0	73.1	85.0
EMS: fire department based . . . . .	3,760	72.1	3.7	64.3	78.8
EMS: not based in fire department . . . . .	3,633	69.7	4.0	61.2	77.0
Decontamination teams . . . . .	3,042	58.4	4.0	50.3	66.1
Hazardous materials teams . . . . .	2,652	50.9	4.8	41.6	60.1
School systems . . . . .	1,595	30.6	4.2	23.0	39.5
Industrial or commercial organizations . . . . .	1,347	25.8	4.1	18.7	34.6
Long-term care facilities . . . . .	1,061	20.4	3.4	14.5	27.8

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent. EMS is emergency medical services.

**Table 8. Selected emergency response resources and capabilities in hospitals: United States, 2008**

Type of equipment	Number of hospitals	Median	SE	Interquartile range	
Mechanical ventilators . . . . .	4,814	5.7	0.9	2.0	19.4
N95 masks . . . . .	3,912	432.1	78.0	128.2	1,494.7
Personal protective suits with PAPR . . . . .	4,705	9.7	1.0	5.4	19.2
Emergency department treatment spaces . . . . .	4,953	10.5	1.1	5.1	21.6
Critical care beds . . . . .	4,807	8.5	1.0	3.7	26.3
Negative pressure isolation rooms . . . . .	5,020	4.1	0.4	1.0	10.0
Regular inpatient staffed beds . . . . .	4,817	70.4	15.5	24.6	158.6
Decontamination showers					
Ambulatory patients per hour . . . . .	4,863	7.0	1.1	1.4	19.8
Stretcher patients per hour . . . . .	4,776	3.0	0.4	0.8	7.9
Small children or infants per hour . . . . .	4,429	3.4	0.9	0.6	13.4

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. Number of hospitals excludes those for which the number of selected resources or capabilities is unknown. SE is standard error of median. PAPR is powered air purifying respirator.

**Table 9. Annual hours spent on diversion status, by type of diversion: United States, 2008**

Diversion type	Number of hospitals	Percent	SE	95% confidence interval	
Total . . . . .	5,212	100.0	...	...	...
Ambulances to emergency department					
None . . . . .	3,061	58.7	3.8	51.0	66.0
1 to 220 hours <sup>1</sup> . . . . .	850	16.3	2.8	11.5	22.6
More than 220 hours . . . . .	846	16.2	2.8	11.4	22.5
Unknown . . . . .	455	8.7	1.8	5.8	13.0
Trauma					
None . . . . .	3,777	72.5	3.1	65.9	78.2
1 to 32 hours <sup>2</sup> . . . . .	370	7.1	1.9	4.2	11.7
More than 32 hours . . . . .	295	*5.7	1.8	3.0	10.6
Unknown . . . . .	770	14.8	2.0	11.2	19.3
Critical care cases					
None . . . . .	3,461	66.4	3.2	59.9	72.3
1 to 72 hours <sup>3</sup> . . . . .	551	10.6	2.3	6.9	16.0
More than 72 hours . . . . .	393	7.5	1.7	4.8	11.6
Unknown . . . . .	807	15.5	2.3	11.5	20.6

... Category not applicable.

\* Figure does not meet standards of precision (relative standard error greater than 30%).

<sup>1</sup>The mean was 220.4 hours. The median and mode were zero.

<sup>2</sup>The mean was 31.6 hours. The median and mode were zero.

<sup>3</sup>The mean was 72.1 hours. The median and mode were zero.

NOTES: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error.

**Table 10. Total funding received per hospital from federal hospital preparedness programs: United States, 2002–2007**

Funding	Number of hospitals	Percent	SE	95% confidence interval	
Total . . . . .	5,212	100.0	...	...	...
None . . . . .	270	*5.2	1.7	2.7	9.9
\$1-\$75,000 . . . . .	1,259	24.2	5.4	15.1	36.3
\$75,001-\$150,000 . . . . .	1,002	19.2	4.8	11.5	30.5
More than \$150,000 . . . . .	1,265	24.3	2.7	19.4	29.9
Unknown . . . . .	1,416	27.2	4.4	19.4	36.6

... Category not applicable.

\* Figure does not meet standards of precision (relative standard error greater than 30%).

NOTE: Unweighted sample size is 294, representing a weighted national estimate of 5,212 hospitals. SE is standard error of percent.

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