Center for Biosecurity of UPMC

The Next Challenge in Healthcare Preparedness: Catastrophic Health Events

Preparedness Report | January 2010

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Executive Summary

The Next Challenge in Healthcare Preparedness: Catastrophic Health Events

In 2007, the Office of the Assistant Secretary for Preparedness and Response (ASPR) in the U.S. Department of Health and Human Services (HHS) contracted with the Center for Biosecurity of UPMC (the Center) to conduct a 2-year, comprehensive assessment of the HHS Hospital Preparedness Program (HPP), from the time of its establishment in 2002 through mid-2007, and to develop recommendations for improving and evaluating future hospital preparedness efforts. This document, *The Next Challenge in Healthcare Preparedness: Catastrophic Health Events (Preparedness Report)*, is the third major deliverable of this project.

Prior to completing this *Preparedness Report*, the Center submitted to HHS its *Evaluation Report* (delivered March 2009). A key finding of the *Evaluation Report* was that, while much progress has been made in healthcare preparedness for common medical disasters, the U.S. healthcare system is ill-prepared for catastrophic health events (CHE), and there is as yet no clear strategy that will enable an effective response to such an event. For this report, the definition of "catastrophic health event" is that put forth in Homeland Security Presidential Directive 21 (HSPD-21): an event that could result in tens or hundreds of thousands of sick or injured individuals who would require access to healthcare resources.

This *Preparedness Report* proposes the following key elements of a national strategy for healthcare preparedness and response:

- Definition and vision of a U.S. healthcare system prepared to handle the response to a spectrum of mass casualty events that vary in size and severity from common medical disasters (eg, a bus crash or tornado), to catastrophic health events (eg, a nuclear detonation) that would seriously injure or sicken tens of thousands of people or more.
- Recommendations and actions that will lead to a healthcare system capable of responding to the full spectrum of mass casualty events, including CHEs.

Methodology

The methodology used for this *Preparedness Report* included a thorough review of the published U.S. and international literature on healthcare disaster preparedness, healthcare response to disasters, and complex systems theory literature; a review of HPP program guidance from 2008 and 2009; and other federal guidance, plans, and documents with particular emphasis on CHEs. Three CHE scenarios based on federal planning assumptions also were considered in the development of this report.

A preliminary presentation of the analysis and recommendations of this report was made at the second Issue Analysis Meeting on February 24, 2009. Input and peer review from that meeting's participants — state and local disaster coordinators and key disaster healthcare leaders in government and academia — have also been incorporated into this document. See *Appendix D: Second Issue Analysis Group Meeting Participants* (page 54).

Major Challenges to Catastrophic Health Event Response

The Center's analysis of the current system for a national response to CHEs revealed several major challenges:

- Many hospitals and other healthcare organizations do not yet participate in fully functional healthcare coalitions, which are necessary to CHE response.
- Most existing coalitions do not yet have the ability to share information, resources, and decision making with neighboring coalitions during a CHE.
- There are inadequate systems to perform the necessary triage, immediate treatment, and transport of patients outside of the immediate area stricken by a CHE.
- Existing plans and resources for patient transport are grossly inadequate for moving the expected numbers of patients.
- There is not enough guidance on the crisis standards of care that will be necessary throughout all stages of a CHE.
- There is no plan that sufficiently outlines healthcare roles, responsibilities, and actions during the response to a CHE.

Definition and Vision of a Healthcare System Prepared for Events of All Sizes

Definition: A well-prepared healthcare system is able to effectively manage the healthcare consequences of common medical disasters and is able to respond quickly and with agility to harness all useful public and private national resources to cope with a CHE.

Vision: During a disaster, a well-prepared healthcare system will be able to function under a variety of adverse circumstances that may include: an immediate surge of patients in need of acute care, a prolonged surge of patients, a contaminated or contagious environment, loss of infrastructure that necessitates triage and treatment outside of healthcare institutions, poor situational awareness, and disruption of incident management chains of command.

Recommendations

Described below are recommendations and specific actions that the federal government can take to achieve progress toward preparing the U.S. healthcare system for responding effectively to mass casualty events of all sizes (see Table 1). These recommendations are derived from the results of research and evaluation conducted by the Center in developing the *Descriptive Framework*, the *Evaluation Report,* the *HFPP and ECP Partnership Evaluation;* from conducting Issue Analysis Meetings; and from the Center's independent analysis.

Table 1: Overview of Recommendations for Improving U.S. Healthcare Response to Mass Casualty Events of All Sizes

RECOMMENDATIONS	ACTIONS
Every U.S. hospital should participate in a healthcare coalition that prepares and responds collaboratively to common medical disasters and CHEs.	• A Presidential Decision Directive on healthcare preparedness for CHEs should be issued (as a follow-up to Homeland Security Presidential Directive-21*) to outline a vision of preparedness that builds on progress to date and is consistent with the National Health Security Strategy (NHSS).** • HPP, U.S. Centers for Disease Control and Prevention (CDC), and U.S. Department of Homeland Security (DHS) federal grant programs should require organization of grantee preparedness and response activities through healthcare coalitions linked to emergency management and public health authorities. Program guidance should outline the critical functions that coalitions must be able to perform.† • The HPP should promulgate more detailed guidance on the organization and response roles of healthcare coalitions, including surge capacity goals. • HPP guidance should specify surge goals to be achieved by healthcare coalitions. • Centers for Medicare and Medicaid Services (CMS) should provide all healthcare entities with financial incentives to participate in healthcare coalitions. • HPP should establish goals and metrics to assess the progress of the development of healthcare coalitions in every community.
Links should be established between neighboring healthcare coalitions to enable regional exchange of healthcare information and assets during a CHE.	• HPP, CDC, and DHS program guidance should specifically require collaboration with neighboring jurisdictions and coalitions across state lines, including sharing of plans and joint exercises. • HHS should develop guidelines and requirements for communications, situational awareness, and health information technology (HIT).
Out-of-hospital triage sites should be established and healthcare responders should be trained in CHE triage.	• Future HPP guidance should include requirements for out-of-hospital triage site designation, and ensure provision of specialized training in CHE triage for National Disaster Medical System (NDMS) teams and identified first responders.

RECOMMENDATIONS	ACTIONS
A patient transportation system that harnesses alternative, private sector resources should be created.	• Federal initiatives already in place to provide a national network of emergency medical transport capacity should address the enhancement of local emergency medical transportation following CHEs. • NDMS, DHS, and United States Transportation Command (USTRANSCOM) should jointly review and revise aeromedical evacuation strategies. • Federal and state governments should develop and disseminate guidance and best practices for transportation planning efforts. • HHS and DHS should jointly commission a detailed study of crisis standards of care related to patient transportation.
Development of crisis standards of care should be expanded, and their consistent implementation within and across states should be promoted.	• HHS should continue to provide leadership on the issue of crisis standards of care, to include providing a clearinghouse of information to facilitate state and local planning efforts. • Future HPP guidance should specify crisis standards of care planning, as well as intrastate and interstate consistency in crisis standards, as priorities for grantees.
A national framework for healthcare response to CHEs should be developed to guide states, jurisdictions, and local entities in developing ConOps for medical and public health activities.	• DHS and its federal partners should expedite the development of federal Concept of Operations (ConOps) for CHEs. • HHS should create a work group of federal planners and stakeholders to sketch a national ConOps for medical and public health activities (Emergency Support Function [ESF-8]) following a CHE, using a Tier 1 Urban Area Security Initiative (UASI) region.

* The White House. *Homeland Security Presidential Directive 21: Public Health and Medical Preparedness*. October 18, 2007. http://www.dhs.gov/xabout/laws/gc_1219263961449.shtm#1. Accessed November 12, 2009.

** U.S. Department of Homeland Security. Federal Emergency Management Agency. *Comprehensive Preparedness Guide 101*. March 2009. 2009. http://www.fema.gov/about/divisions/cpg.shtm. Accessed January 22, 2010.

† Healthcare coalition critical functions are described in the HHS Tier 2 *MSCC Handbook*, the Center for Biosecurity *Evaluation Report*, and the Center for Biosecurity *Provisional Assessment Criteria* (see *Appendix B* of this *Preparedness Report*, page 36).

Conclusions

While the recommendations made in this report are feasible, many of them will take time to accomplish. Concrete progress toward the goal of CHE preparedness can be achieved through the series of actions outlined in this report, but will require sustained effort at the federal, state, and community levels for a number of years, and funding sufficient to make it possible.

The Next Challenge in Healthcare Preparedness: Catastrophic Health Events

Project Overview

In 2007, the Office of the Assistant Secretary for Preparedness and Response (ASPR) in the U.S. Department of Health and Human Services (HHS) contracted with the Center for Biosecurity of UPMC (the Center) to conduct a 2-year, comprehensive assessment of the HHS Hospital Preparedness Program (HPP), from the time of its establishment in 2002 through mid-2007, and to develop recommendations for improving and evaluating future hospital preparedness efforts. This document, *The Next Challenge in Healthcare Preparedness: Catastrophic Health Events (Preparedness Report)*, is the third major deliverable of this project. It builds upon the findings and recommendations of the earlier reports of this project, including the *Descriptive Framework for Healthcare Preparedness for Mass Casualty Events (Descriptive Framework)*[1] and *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward (Evaluation Report*).[2]

Key project activities and deliverables under this contract have included the following:

- Development of the Center for Biosecurity of UPMC *Descriptive Framework for Healthcare Preparedness for Mass Casualty Events (Descriptive Framework),* a conceptual model of local and regional healthcare system preparedness for mass casualty events that outlines the essential elements of hospital disaster preparedness (delivered February 2008.)
- Assessment of both the accomplishments of the HPP[3] from 2002 through 2007 and the impact of the program on hospital and community preparedness. The assessment was based on the

1 Center for Biosecurity of UPMC. *Descriptive Framework for Healthcare Preparedness for Mass Casualty Events.* Prepared for the U.S. Department of Health and Human Services under Contract No. HHSO100200700038C. 2008.

2 Center for Biosecurity of UPMC. *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward.* Prepared for the U.S. Department of Health and Human Services under Contract No. HHSO100200700038C. 2009. http://www.upmc-biosecurity.org/website/resources/publications/2009/pdf/2009-04-16-hppreport.pdf.

3 The program's name has changed over time. Initially, it was referred to as the "National Bioterrorism Hospital Preparedness Program" (NBHPP), but it was renamed "Hospital Preparedness Program" (HPP). Recently, the name changed to the "National Healthcare Preparedness Program" (NHPP). Throughout this report, we refer to the program as "HPP." The HPP was originally administered by HHS's Health Resources and Services Administration (HRSA), but was moved to HHS's Office of the Assistant Secretary for Preparedness and Response (ASPR), where it now resides, pursuant to the December 2006 Pandemic and All-Hazards Preparedness Act (PAHPA).

Descriptive Framework and the contributions of members of a Virtual Working Group (Working Group) of local, state, and regional hospital preparedness experts. Both the assessment and the accompanying June 2008 and February 2009 Issue Analysis Meetings, comprising subgroups of the Working Group, culminated in *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward* (*Evaluation Report*), which was delivered March 2009.

- Development of *Provisional Assessment Criteria* for evaluating progress in preparedness within the HPP program and determining the feasibility of adopting its elements as a tool for routine HPP reporting and assessment; these criteria are based on the *Descriptive Framework* and *Evaluation Report* (delivered August 2009). An excerpt from the *Assessment Criteria* is included in *Appendix B: Assessment Criteria for the Future* (page 36).
- Evaluation of the effectiveness, efficiency, and impact of the 11 demonstration grant projects in the competitive Healthcare Facilities Partnership Program (HFPP), the 5 demonstration projects in the Emergency Care Partnership Program (ECP), and development of policy recommendations for the ECP moving forward, delivered December 2009.

Purpose of the Preparedness Report

A key finding of the March 2009 *Evaluation Report* was that, while much progress has been made in healthcare preparedness for common medical disasters, the U.S. healthcare system is ill-prepared to respond to catastrophic health events (CHE), and there is as yet no clear strategy that will enable an effective response to such an event.

This *Preparedness Report,* therefore, proposes key elements of a national strategy for healthcare preparedness and response to mass casualty events of all sizes. Those elements include the following:

- Major challenges to healthcare preparedness for CHEs
- Vision and definition of a successful response system for the future
- Recommendations for improving U.S. healthcare response to mass casualty events of all sizes
- Assessment criteria for measuring progress toward healthcare preparedness and response capability goals (see *Appendix B: Assessment Criteria for the Future*, page 36)

Defining "Catastrophic Health Event": As defined by Homeland Security Presidential Directive 21 (HSPD-21), a CHE is "any natural or manmade incident, including terrorism, that results in a number of ill or injured persons sufficient to overwhelm the capabilities of immediate local and regional emergency response and health care systems."[4] This magnitude of healthcare need would quickly exceed the capability of any locality or region. HSPD-21 directs the federal government to develop a strategy for addressing these kinds of events:

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4 The White House. *Homeland Security Presidential Directive 21: Public Health and Medical Preparedness.* October 18, 2007. http://www.dhs.gov/xabout/laws/gc_1219263961449.shtm#1. Accessed November 12, 2009.

> *A catastrophic health event, such as a terrorist attack with a weapon of mass destruction (WMD), a naturally-occurring pandemic, or a calamitous meteorological or geological event, could cause tens or hundreds of thousands of casualties or more, weaken our economy, damage public morale and confidence, and threaten our national security. It is therefore critical that we establish a strategic vision that will enable a level of public health and medical preparedness sufficient to address a range of possible disasters.*[5]

Preparing the healthcare system for such events is challenging due to both the country's lack of experience with this scale of disaster and the level of coordination that CHE response would demand. Preparedness for CHEs will require new approaches that are in concord with ongoing successful efforts to prepare for common medical disasters and capable of addressing events of much greater consequence—those that could have national and homeland security significance.

Methodology

The findings and recommendations of this *Preparedness Report* are based upon the Center's *Descriptive Framework*, findings and analysis described in the *Evaluation Report*, an updated review of the healthcare preparedness and disaster response, and input from hospital and public health preparedness experts from the Virtual Working Group.

Descriptive Framework: The *Descriptive Framework* is a conceptual model of local and regional hospital and healthcare system preparedness for mass casualty events that outlines the essential elements of hospital disaster preparedness. It is based on the Center's comprehensive review and analysis of hospital disaster preparedness documents, which included reports, evaluations, handbooks, and studies that were produced before and after the 2002 establishment of the HPP.

Evaluation Report: The *Evaluation Report* included a review of progress in healthcare preparedness in the HPP from 2002 to 2007 and preliminary recommendations for the future of the program. To select preparedness topics from the *Descriptive Framework* that would structure the *Evaluation Report* research, the project team completed: (1) a comprehensive review of the literature on and history of U.S. hospital preparedness, FY2002-2008 HPP guidance, and self-reported data from HPP grantees; (2) in-depth conversations with the Working Group, HHS staff and leadership, and experts in healthcare preparedness from every U.S. state, the District of Columbia, the nation's 3 largest municipalities (Chicago, Los Angeles, and New York), Puerto Rico, and the U.S. Virgin Islands; and (3) in-person discussions with Working Group participants during 2 Issue Analysis Meetings convened by the Center in June 2008 and February 2009.

Literature review: A thorough literature review was conducted using PubMed to identify all studies published in U.S. and international journals from 1995 through 2009 that examined the following topics: disaster preparedness in healthcare systems, healthcare response to disasters, and complex systems theory. The research team also conducted a thorough internet search using the Google search engine to supplement the PubMed search.

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5 The White House. *Homeland Security Presidential Directive 21: Public Health and Medical Preparedness.* October 18, 2007. http://www.dhs.gov/xabout/laws/gc_1219263961449.shtm#1. Accessed November 12, 2009.

The team reviewed HPP program guidance from 2008 and 2009, as well as other federal guidance, plans, and documents relevant to healthcare response to mass casualty events, with particular emphasis on CHEs. See: *Appendix C: Existing Systems for CHE Response* (page 44).

Virtual Working Group: The Working Group phase of the evaluation involved 91 in-depth telephone or in-person conversations with 133 individuals who had firsthand experience with hospital preparedness efforts (including but not limited to HPP experience); participants represented all U.S. states, the District of Columbia, the nation's 3 largest municipalities (Chicago, Los Angeles, and New York), Puerto Rico, and the U.S. Virgin Islands. The project team identified and recruited Working Group participants by contacting grant coordinators and HPP leaders from each of the 62 jurisdictions participating in the HPP (see Figure 1).

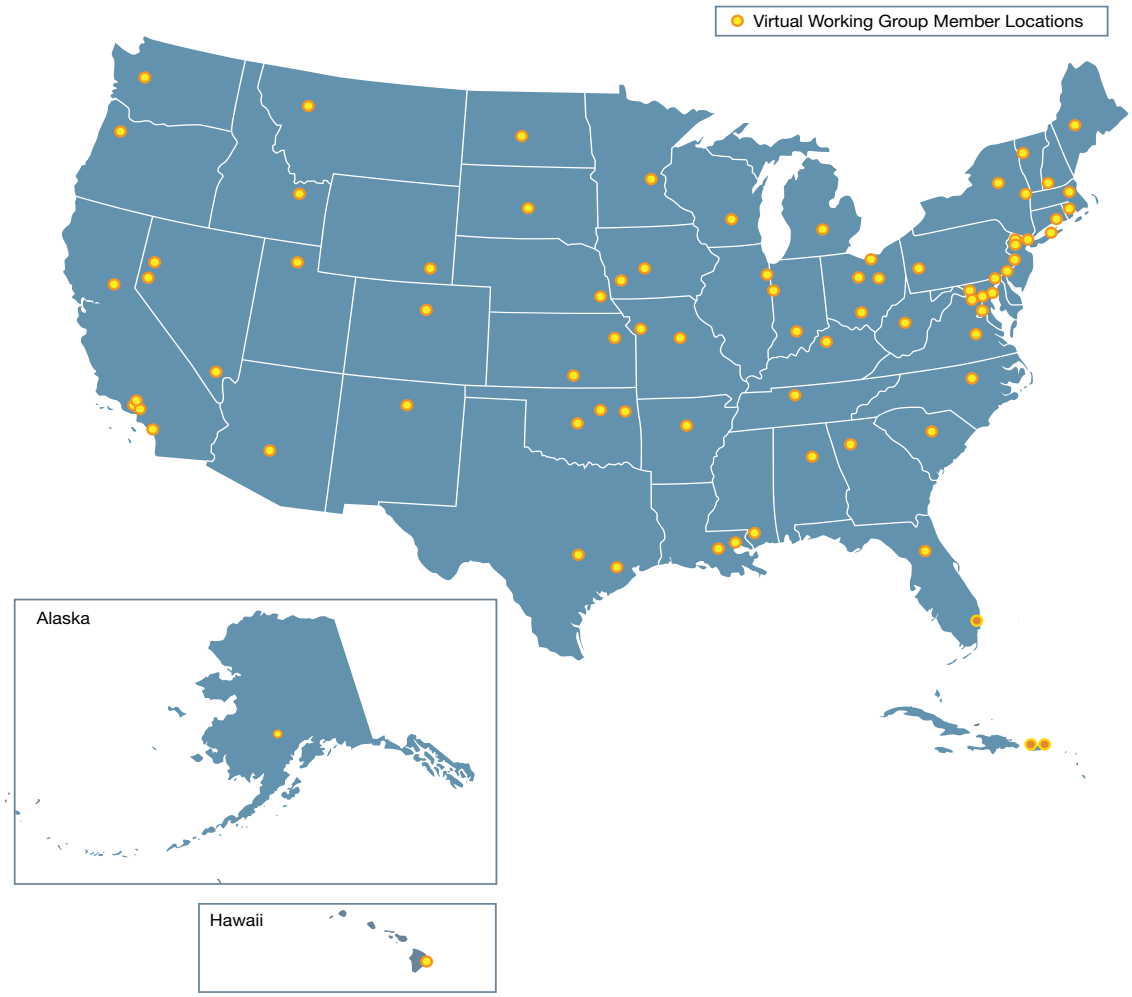
Participants: Virtual working group participants included HPP grant coordinators; state hospital preparedness coordinators; disaster coordinators from academic medical centers, public hospitals, nonprofit community hospitals, for-profit hospitals, small independent hospitals, and hospitals belonging to multi-hospital organizations; emergency medical services (EMS) representatives; healthcare preparedness experts; leaders in healthcare and public health; and leaders of key government preparedness and evaluation efforts. In all, 9 healthcare sectors were represented by 91 participants; numbers of participants from each sector are noted below:

- Department of Health—Municipality: 6
- Department of Health—State: 31
- Department of Health—Territory: 2
- EMS: 3
- Hospital: 28
- Hospital Association: 4
- Hospital Region: 4
- Hospital System: 6
- National Preparedness Leaders: 7

Hospital representatives were selected from various types and sizes of institutions in an attempt to assess progress toward preparedness in the range of hospital systems, from rural to urban.

Issue Analysis Meeting: The Center invited 28 individuals to participate in its second Issue Analysis Meeting *(*Issue Analysis Meeting: National Strategy for Healthcare Preparedness and Response for Catastrophic Health Events), which focused on healthcare preparedness topics in more detail, through a structured, in-person group discussion. Participants included local, state, and federal public health and government officials, representatives from hospitals and health systems, representatives from academia, and other subject matter experts (see *Appendix D: Second Issue Analysis Group Meeting Participants*, page 54, for a list of participants). The meeting was held on February 24, 2009, at the Center for Biosecurity of UPMC in Baltimore, Maryland. Each of the 28 participants was provided with a draft of the *Evaluation Report* and other background materials to review in advance. During the meeting, the group was presented with 2 scenarios, derived from the DHS National Planning Scenarios (NPS), and similar to Scenarios #1 and #2 included in this report (see pages 13 and 14) The meeting was facilitated by Center leaders and senior members of the Center's HPP project team on a not-for-attribution basis and was recorded for reference purposes only.

Figure 1. Map of Working Group Participants for HPP Evaluation



To confirm the validity of the findings and to promote further exploration, the meeting discussions were organized around the following 5 topic areas derived from the Working Group conversations:

- Need for a national (not federal) concept of operations (ConOps) plan for healthcare response to CHEs down to the local level.
- Promotion of fully functioning healthcare coalitions in every community.
- Creation of a patient transport system that harnesses private sector resources.
- Establishment of close operational relationships among neighboring healthcare coalitions for mutual aid to supplement state and federal incident command systems.
- Provision of incentives for all healthcare entities to participate in healthcare coalitions for disaster response.

Discussions addressing each of the meeting topics ranged from approximately 30 to 60 minutes. Feedback from the second Issue Analysis Meeting was received and incorporated into the *Preparedness Report*. While the views in this report were substantially shaped by those expressed by members of the 133 Virtual Working Group members and the 27 individuals who participated in the second Issue Analysis Meeting, the *Preparedness Report* represents the opinions of the Center for Biosecurity of UPMC and does not necessarily represent the opinions or consensus of the meeting participants.

Definitions: The term "mass casualty event" has been used to describe many kinds of disasters that range widely in scale and number of casualties. This report will use the same definition of "mass casualty event" that was used in the earlier *Descriptive Framework*: "any event that requires the coordinated response of at least several hospitals within a community to provide adequate medical care for those affected."

The definition of "catastrophic health event" used in HSPD-21[6] is used in this report: "Any natural or manmade incident, including terrorism, that results in a number of ill or injured persons sufficient to overwhelm the capabilities of immediate local and regional emergency response and health care systems."[7]

Healthcare coalitions were identified in the *Evaluation Report* as essential to effective regional response to commonly occurring mass casualty events and as an important part of the foundation of a national strategy for response to CHEs. Healthcare coalitions have been defined in a variety of ways, reflecting the current great diversity in their composition, organization, governance, and scope of activities. In this report "healthcare coalition" is defined as a formal collaboration among hospitals, public health, and emergency management authorities (EMA) that may include other nonhospital healthcare entities. The geographic size and relationship between a coalition and city, county, or state jurisdictional boundaries vary and reflect local conditions. Fully functional and mature healthcare coalitions have a role in both preparedness and response. This project expands the definition of healthcare coalitions to correspond to the first 3 Medical Surge Capacity and Capability (MSCC) Framework tiers (see Figure 2) to emphasize the concept outlined in the MSCC that the coalition must integrate with the broader jurisdiction emergency management agencies.

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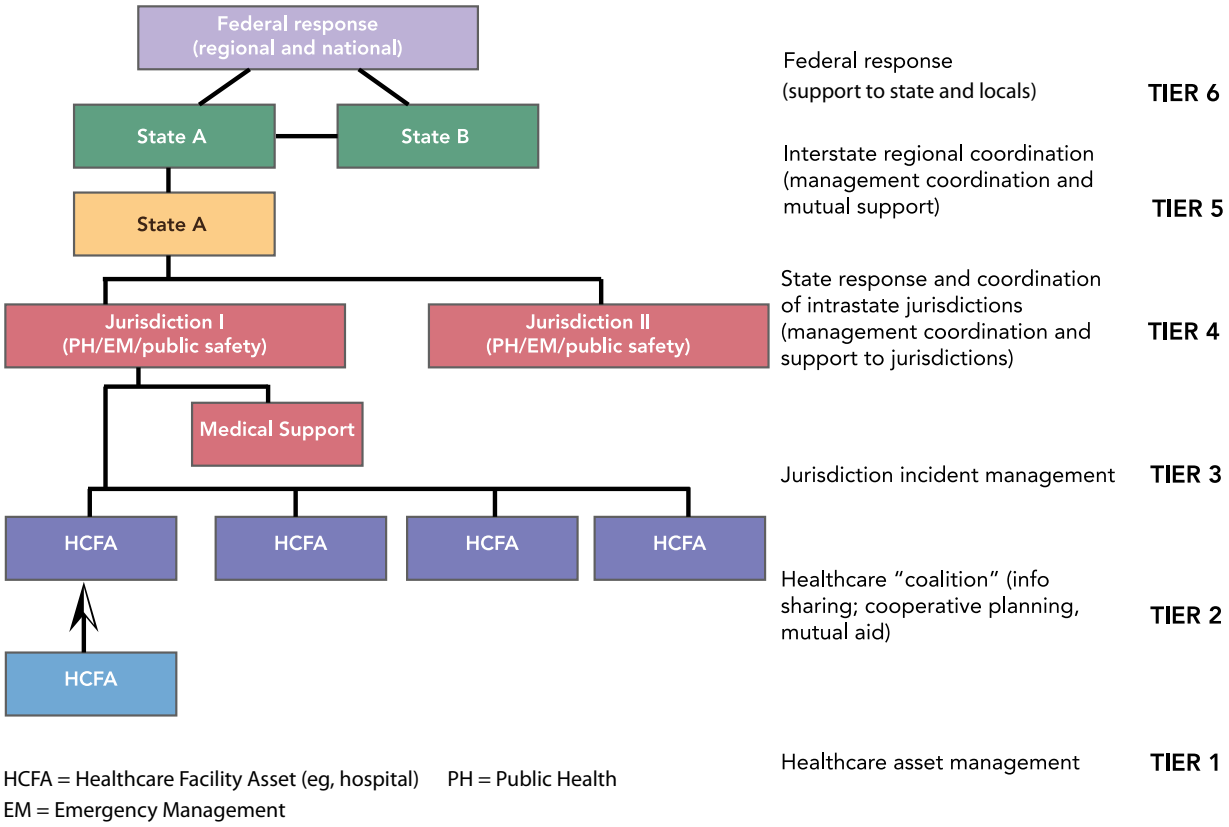
6 *Homeland Security Presidential Directive 21* establishes a National Strategy for Public Health and Medical Preparedness, and was set forth by President Bush in October 2007. For more information see *Appendix C* of this *Preparedness Report* page 44.

7 The White House. *Homeland Security Presidential Directive 21: Public Health and Medical Preparedness.* October 18, 2007. http://www.dhs.gov/xabout/laws/gc_1219263961449.shtm#1. Accessed November 12, 2009.

Figure 2. Adapted from HHS Medical Surge Capacity and Capability (MSCC) Framework[8]



8 U.S. Department of Health and Human Services. *Medical Surge Capacity and Capability: The Healthcare Coalition in Emergency Response and Recovery.* Prepared for HHS Under Contract # HHSP23320064154EB. May 2009.

Why the U.S. Healthcare System Must Prepare for Catastrophic Health Events

Since the inception of modern medicine, the U.S. has been fortunate to have had no experience with CHEs. The 9/11 attacks and Hurricane Katrina (2005), as terribly consequential as they both were, did not result in tens of thousands of patients in need of access to emergency medical care. However, other regions of the globe have not been so fortunate, as was the case in the devastating earthquakes in Haiti (2010) and China (2008) and the tsunami in Southeast Asia (2005), all of which are examples of CHEs.[9]

There are a number of terrorist and natural hazard scenarios articulated in the NPS that have the potential to be catastrophic in nature, and for which the U.S. must plan and prepare.[10] Given the potential consequences, CHE preparedness is a matter of national security.

Building the capability to respond effectively to a CHE will take a great deal of effort and coordination of private and public institutions and resources. From previous discussions with local and state level disaster preparedness coordinators, it is clear that, while the country has made progress toward responding to common medical disasters, less progress has been made in thinking through and preparing for CHE response. Therefore, the next step in national disaster preparedness must be to develop plans to respond effectively to CHEs.

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9 Haiti: On January 12, 2010, an earthquake of a magnitude 7.0 struck Haiti. As this report is being prepared, details about the earthquake are still emerging. However, with casualty estimates ranging from 100,000 to 200,000 and as yet undetermined numbers of injured victims, there is no question about the scale of this disaster or that it fits the definition of a CHE. • China: On May 12, 2008, a large earthquake in the Sichuan Province of China killed more than 69,000 people, injured more than 370,000, and left almost 5 million people homeless. • Southeast Asia: The 2005 Indian Ocean Tsunami left nearly 200,000 people dead across 11 countries, injured more than 100,000, and displaced or left homeless several million.

10 U.S. Department of Homeland Security (DHS). *National Preparedness Guidelines.* September 2007. http://www.dhs.gov/xlibrary/assets/National_Preparedness_Guidelines.pdf. These scenarios include a biological attack, a nuclear detonation, and a large scale earthquake.

Examples of Catastrophic Health Events

The U.S. could confront a range of CHEs that would be attended by distinct challenges, even as they shared key commonalities. CHEs could be geographically widespread, like an influenza pandemic, or could be more localized, like a large hurricane or a nuclear detonation. A CHE may cause obvious and extensive physical destruction, or it may cause destruction that is not immediately obvious. By definition, all CHEs have the potential to produce tens or hundreds of thousands or more live casualties that would overwhelm the healthcare system.

The following 3 scenarios illustrate the size and scale of exemplar CHEs, estimate the healthcare system resources that would be required and available for response, and posit the major challenges to effective healthcare response. The first 2 scenarios[11] are based on the NPS released by the Homeland Security Council and DHS, but include additional information about healthcare capacity. The third scenario uses HHS planning assumptions for a severe influenza pandemic[12] and applies these assumptions to CDC's FluSurge[13] modeling program to derive additional information about healthcare capacity for the event.

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11 The White House Homeland Security Council. *National Planning Scenarios: Executive Summaries—Created for Use in National, Federal, State, and Local Homeland Security Preparedness Activities.* April 2005. Page 2-1. http://cees.tamiu.edu/covertheborder/TOOLS/NationalPlanningSen.pdf. Accessed November 25, 2009.

12 U.S. Department of Health and Human Services. *HHS Pandemic Influenza Plan. November 2005, Planning Assumptions.* http://www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf. Accessed September 26, 2009.

13 *CDC FluSurge 2.0.* Atlanta, GA: U.S. Centers for Disease Control and Prevention. http://www.cdc.gov/flu/tools/flusurge/. Accessed September 26, 2009.

Scenario 1: Nuclear Detonation

Detonation of 10-Kiloton Improvised Nuclear Device (from National Planning Scenario #1)

- **Location:** Washington, DC/National Capital Region (NCR).
- **Physical damage:** Extensive building collapse; 250 major fires within ¾-mile radius; loss of electrical power, most electronics, and communication within ¾ miles. In outer ring, shattered glass and auto crashes that could cause thousands of injuries.
- **Fallout:** Extends into Virginia, Maryland, and possibly beyond.
- **Casualties:** 9,000 instantaneous deaths; 19,000 injured from blast, burns, trauma, and radiation (6,000 die in <24 hours; 13,000 acutely injured victims survive).
- **Injuries and illness:** An additional 120,000 victims exposed to significant fallout, with acute radiation syndrome (ARS) over 1 to 14 days; most will need hospital care; many could survive if care is received.

Hospital Capacity (Center for Biosecurity estimate)

- **Within 20-mile radius:** 4 of 49 hospitals are destroyed or nonfunctional;* the estimated surge capacity of 45 other hospitals in the area is 3,500 beds.**
- **Within 100-mile radius:** Approximately 14,000 surge beds and 2,000 intensive care unit (ICU) beds could be available within 24 hours.†

Challenges

- **Search and rescue operations:** In such a difficult and dangerous environment, many victims will die before they can reach a hospital.
- **Transportation for responders, public, and patients:** Infrastructure will be severely damaged, and there will be debris throughout the city.
- **Identification, screening, and transport of ARS patients:** No method currently exists for rapidly categorizing patients based on dose of radiation and risk.
- **Communications:** Most modes of communication will be disrupted.
- **Hospital surge:** All hospital beds from Philadelphia to Norfolk will be needed for the acutely injured; fallout patients will require surge capacity of the entire U.S. healthcare system.‡

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*Determined by overlaying NPS map with location of hospitals on Google maps.

**Based on Center's estimate of 30% surge capacity available within 24 hours from 13,000 total beds (after subtracting the number of damaged hospitals assuming 20% surge available immediately and additional 10% available within 24 hours).

†Based on Center's estimate of 30% surge capacity available within 24 hours of 46,000 total beds within 100 miles.

‡Sheltering in a building following a nuclear event could provide significant protection from radiation. DHS is currently working on guidelines and recommendations for sheltering in place and other protective actions. IOM. *Assessing Medical Preparedness to Respond to a Terrorist Nuclear Event: Workshop Report*. Washington, DC. The National Academies Press. 2009. Pages 18, 19, 48, 49.

CDC/Laura Rose/Janice Haney Carr

Scenario 2: Biological Attack

Attack with Aerosolized *B. anthracis* (from National Planning Scenario #2)

- **Location:** Large city, such as Washington, DC/National Capital Region (NCR).
- **Potentially exposed:** 330,000 individuals; release not recognized until first patients become sick*.
- **Cases:** 13,000 cases of inhalational anthrax, most requiring critical care.
- **Median incubation period:** 10 days.
- **Hospital beds needed:** 13,000 critical care beds.

Hospital Capacity (Center for Biosecurity estimate**)

- **Within 20-mile radius:** 49 hospitals; 13,000 beds in total.
- **Estimated surge capacity:** 3,300 regular beds available within 24 hours;† 585 ICU beds available within 24 hours.‡

Challenges

- **Hospital triage:** Thousands or tens of thousands of noncritical individuals will seek medical care at hospitals.
- **Surge capacity:** There will be a critical lack of regional hospital and ICU surge capacity—only 5% of critical care surge and 30% of hospital bed needs can be met regionally.
- **Limited time to implement response:** Patient surge will greatly exceed capacity within 1 to 2 days of recognition of outbreak.
- **Diagnostics:** No rapid diagnostic tests for anthrax currently exist.
- **Needs vs. resources:** Need for mass dispensing of limited countermeasures to public and responders.

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*NPS assumes that the release would not be detected by the BioWatch system.

**Personal communication, ASPR.

†Based on the Center's estimate of 30% surge capacity available within 24 hours.

‡Based on the Center's estimate of 15% of hospital beds being ICU beds.

Scenario 3: Severe Influenza Pandemic

1918-like Severe Influenza Pandemic (from HHS Planning Assumptions*)

- **Location:** Entire U.S.
- **Symptomatic cases:** 90 million
- **Outpatient visits:** 45 million
- **Hospitalizations:** 9.9 million

Healthcare Resources Required: Peak Bed Occupancy & Ventilator Utilization by Flu Patients (FluSurge**)

- **Hospital beds:** 1,130,284 (151% of existing hospital beds nationally)
- **ICU beds:** 327,475 ICU beds (364% of existing ICU beds nationally)
- **Ventilator utilization:** 163,737 (205% of existing ventilators nationally)

Challenges

- **Scope:** All hospitals and all communities will be affected more or less concurrently. Sharing of resources and distribution of patient load is not likely to be possible.
- **Scale:** All medical care capacity will be overwhelmed, especially emergency departments and ICUs.
- **Limited resources:** There will not be enough ventilators for all who need them and, mass dispensing of limited countermeasures to the public will be very difficult.
- **Resource allocation:** Optimal allocation of scarce medical resources and coordinated implementation of crisis standards of care will be very important.

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*U.S. Department of Health and Human Services. *Pandemic Influenza Plan. November 2005, Planning Assumptions.* http://www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf. Accessed September 26, 2009.

**CDC, FluSurge 2.0. http://www.cdc.gov/flu/tools/flusurge/. Accessed September 26, 2009. Input HHS planning assumptions for a severe pandemic along with population data and healthcare resource data for entire U.S. using a 15% attack rate during an 8 week outbreak.

Major Challenges to Catastrophic Health Event Response

Catastrophic health events are in many ways fundamentally different from common medical disasters. Casualties will be orders of magnitude higher in a CHE, infrastructure may be destroyed, and incident command may be significantly hampered. The first hours and days following a CHE will be chaotic, with limited healthcare situational awareness or communications capabilities; incident commanders will be overwhelmed; and communication will likely be difficult. In all likelihood, in this kind of event there will be no single entity or individual with the situational awareness, information sources, or communication capacity to effectively direct the use of all available medical resources or the distribution of patients. However, in many scenarios, this period of time will be the most critical for CHE healthcare response. Actions taken during this period are likely to determine how many people ultimately will live or die, whether there will be a functioning healthcare system, and the public's perception of the response.

Many hospitals and other healthcare organizations do not yet participate in fully functional healthcare coalitions, which are necessary to CHE response.

The *Descriptive Framework* identified community-based collaboration among institutions and agencies in the healthcare sector as essential to preparedness for mass casualty events. The *Medical Surge*

Capacity and Capability (MSCC) Handbook,[14] the Joint Commission standards,[15] and HPP guidance[16] all emphasize the importance of such cooperation. Without a mechanism for coordinating the efforts of many response organizations, it will be impossible for healthcare institutions to respond optimally to large mass casualty events. As detailed in the earlier *Evaluation Report*, the healthcare coalitions that have emerged across the country are in various stages of development. Their diverse structures, membership, and missions reflect the needs of different communities, the highly fragmented and competitive U.S. healthcare landscape, and the limited coalition guidance provided thus far by federal partners and healthcare regulators. Coalitions continue to emerge and develop around the country, yet much of the U.S. healthcare system today still is not represented in a healthcare coalition, and many existing coalitions are not yet fully developed and functional in both preparedness and response. There remains a need to fund and guide the development of coalitions around the country, using a common, yet flexible, set of functional criteria (See *Appendix B – Provisional Assessment Criteria,* page 36).

Most existing healthcare coalitions do not yet have the ability to share information, resources, and decision making with neighboring coalitions during a CHE.

A CHE, as defined by HSPD-21, would produce a number of casualties sufficient to overwhelm, fairly quickly, the resources of not just an individual hospital, but an entire healthcare coalition, and even multiple contiguous coalitions. In order to respond to an event of this magnitude, mechanisms must be in place to obtain situational awareness of the healthcare response (eg, number of patients, type of patient care, available beds, available staff, transportation assets, etc.), and to make coordinated decisions about allocation of scarce resources (ie, staff, equipment, and materials), standards of care, and alternate care arrangements.

Currently, there are no mechanisms in place to achieve the situational awareness needed for national coordination of public and private healthcare resources, to track and manage resources, or to facilitate the difficult healthcare decision making that will be necessary in response to a CHE. While many healthcare coalitions now have communications plans, equipment, and procedures that better enable situational awareness among partners within a coalition, the ability to develop an accurate understanding of the larger scope and pace of an emergency throughout a state, region, or the nation, and the ability to execute an appropriate and adequate CHE response remains an enormous challenge. Horizontal communication and collaboration among neighboring healthcare coalitions, including connections across state borders, have not yet been formed in most locations. Such horizontal communication efforts should complement the vertical connections currently being established among healthcare coalitions and state, multistate-regional, and federal officials.[17]

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14 U.S. Department of Health and Human Services. *Medical Surge Capacity and Capability Handbook, 2nd ed.* http://www.hhs.gov/disasters/discussion/planners/mscc/index.html. September 2007.

15 The Joint Commission. *History Tracking Report: 2009 to 2008 Requirements.* Accreditation Program: Hospital. Chapter: Emergency Management. 2008. http://www.jointcommission.org/NR/rdonlyres/D5607767-744C-462D-9527- B9B0E464C524/0/HAP_EM_09_to_08.pdf. Accessed January 7, 2010

16 U.S. Department of Health and Human Services. Hospital Preparedness Program (HPP). Office of the Assistant Secretary for Preparedness and Response. Notice. 73 FR 28471 (May 16, 2008).

17 One exception to this is the FEMA's Region 4 Unified Planning Coalition (UPC), an interstate public health and medical preparedness and response organization devoted to planning and the development of partnerships.

In a CHE, healthcare coalitions will have to take a lead role in coordinating the allocation of scarce resources and implementing crisis standards of care in a fair, uniform, and ethical manner based on situational awareness and resource assessment. Healthcare coalitions have begun to plan individually for these scenarios, yet the situational awareness, communications, and coordination mechanisms needed to implement them have not yet been developed. If they are to succeed in CHE response, coalitions will have to coordinate and share information with neighboring coalitions, in addition to local, state, tribal, regional, and federal officials.

There are inadequate systems to perform the necessary patient triage, treatment, and transport out of the immediate area stricken by a CHE.

The hospitals closest to a CHE or within the stricken area, which likely operate at or near full capacity on a normal day, will be very quickly overwhelmed if they are still operational. By definition, any CHE will produce an overwhelming number of sick or injured patients, along with patients who are suffering from stress-related health problems after the event. The primary concerns of hospitals still in operation must be protecting the health of already hospitalized patients and the triage and rapid temporary stabilization of incoming patients. It will be essential that patients are transferred quickly to other, less-affected hospitals; in most instances, this will require transfer to another city or jurisdiction. To lessen the burden on the hospitals as much as possible, initial triage of all patients and treatment of those with non-life threatening conditions should take place somewhere other than the hospital. HHS has developed a functional response system, Radiation Triage, Treatment and Transport (RTR) that features Assembly Centers (for non-critically injured and general evacuees) and Medical Care sites.[18] The RTR system has been incorporated into practical guidance for local responders rendering life-saving assistance in the wake of a nuclear detonation.[19] The RTR is a reasonable approach and a good beginning; however, even if the RTR system were to be implemented successfully, the number of people in need of care would likely far exceed the capacity of nearby hospitals.

Existing plans and resources for patient transport are grossly inadequate for moving the expected numbers of patients during a CHE.

Patient transport will be very difficult during the response to a CHE. According to each of the NPS, crucial lifesaving medical care will be needed in the initial hours and days following a CHE, long before many federal and state resources will arrive on scene.[20] Furthermore, in many CHE scenarios, the total number of deployable state and federal resources is not sufficient to accommodate the number of anticipated patients.[21] Based on the NPS and the healthcare capacity in most major U.S. cities, hospital surge capacity within a 100- to 200-mile radius of a CHE will be exceeded quickly in most cases;

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18 Hrdina CM, Coleman CN, Bogucki S, Bader JL, Hayhurst RE, Forsha JD, Marcozzi D, Yeskey K, Knebel AR. The "RTR" medical response system for nuclear and radiological mass-casualty incidents: A functional TRiage-TRansport-TReatment medical response model. *Prehospital Disast Med.* 2009;24(3):167–178.

19 Homeland Security Council Interagency Policy Coordination Subcommittee for Preparedness & Response to Radiological and Nuclear Threats. *Planning Guidance for Response to a Nuclear Detonation. First Edition.* January 16, 2009

20 Franco C, et al. The National Disaster Medical System: past, present, and suggestions for the future. *Biosecur Bioterr.* 2007;5 (4).

21 Ibid.

response to some scenarios will necessitate integration of the surge capacity of the entire country. This need for healthcare surge will require rapid and efficient transport of patients to facilities in outlying areas, and will necessitate employment of alternative modes of transportation, such as private vehicles, buses, helicopters, water craft, and other nontraditional means.

There is not enough guidance on the crisis standards of care that will be necessary throughout all stages of a CHE.

The preceding CHE challenges—provision of triage in alternate care sites and rapid transport of patients out of the stricken area—involve changing the ways in which healthcare operations normally are carried out. Consideration of crisis standards of care, therefore, is integral to all parts of CHE response. Often, this planning is the responsibility of state or local health departments, individual hospitals, and/or healthcare coalitions, and is complicated by the range of public and private sector stakeholders involved, challenging medical and legal issues, limited guidance, and the need for consistency in plan development and implementation. HHS and state and local planners have developed some useful guidance documents for moving this issue forward at the state, local, and hospital levels.[22] However, even allowing for differences among communities, there is significant variability in crisis standards of care planning among state and local jurisdictions, as well as among individual hospitals and healthcare coalitions. This variability includes, for example, differences in the stages of plan development, the content of plans, and the approaches to managing scarce resources. Moreover, research has shown that many states are having difficulty in planning for crisis standards of care and have requested additional assistance and guidance from HHS.[23,24] The recent guidance on crisis standards of care from the Institute of Medicine (IOM) does define the challenges and begins to provide national level guidance for crisis standards. The IOM document recognizes regional variability and promotes consistency and transparency while also identifying remaining critical gaps in planning.[25]

There is no plan that sufficiently outlines healthcare roles, responsibilities, and actions during the response to a CHE.

At present, federal concept plans (CONPLANs) and operations plans (OPLANs) for a CHE are still under development, and the National Health Security Strategy has just been released.[26] A number of federal

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22 See, for example: Institute of Medicine, Committee on *Guidance for Establishing Standards of Care for Use in Disaster Situations. Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report.* September 2009 • U.S. Agency for Healthcare Research and Quality. *Altered Standards of Care in Mass Casualty Events.* AHRQ Publication No. 05-0043. 2005 • U.S. Agency for Healthcare Research and Quality. *Mass Medical Care with Scarce Resources: A Community Planning Guide.* AHRQ Publication No. 07-0001. 2007 • Devereaux A, Christian MD, Dichter JR, et al. Summary of suggestions from the Task Force for Mass Critical Care Summit, January 26-27, 2007 *Chest.* 2008;133(5):1S-7S • New York State Department of Health and New York State Task Force on Life and the Law. *Allocation of Ventilators in an Influenza Pandemic: Planning Document.* March 15, 2007.

23 U.S. Government Accountability Office. *Emergency Preparedness: States Are Planning for Medical Surge, but Could Benefit from Shared Guidance for Allocating Scarce Resources* (GAO-08-668). June 2008.

24 Center for Biosecurity of UPMC. *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward.* Prepared for the U.S. Department of Health and Human Services under Contract No. HHSO100200700038C. 2009.

25 Institute of Medicine, Committee on Guidance for Establishing Standards of Care for Use in Disaster Situations*. Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report.* September 2009.

26 U.S. Department of Health and Human Services. Assistant Secretary for Preparedness and Response. *National Health Security Strategy*. December 2009. http://www.hhs.gov/aspr/opsp/nhss/index.html. Accessed January 22, 2010.

documents and initiatives have been created to integrate and synchronize response and recovery plans among federal, regional, state, territorial, and local governments. The *Comprehensive Preparedness Guide 101,* published in March 2009,[27] serves as the foundation for state and local planning. *Appendix C: The Current System for a National Response to CHEs* (page 44), depicts existing CHE preparedness and response structure and assets at multiple levels of government. Federal planners envision that, over time, there will be a truly national all-hazard ConOps plan. Currently, however, the lack of such a plan remains an obstacle to effective planning for CHEs.[28]

27 U.S. Department of Homeland Security. Federal Emergency Management Agency. *Comprehensive Preparedness Guide 101*. March 2009. http://www.fema.gov/about/divisions/cpg.shtm. Accessed January 22, 2010.

28 The federal government is currently reviewing preparedness plans and policies, so this information may change. October 2009. Personal communication, ASPR.

FEMA/Marvin Nauman

Definition and Vision of a Healthcare System Prepared for Mass Casualty Events of All Sizes, Including Catastrophic Health Events

Definition of Healthcare Preparedness

A well prepared healthcare system is one that is able to respond quickly and with agility to mass casualty events of all sizes and sources, including those that cross jurisdictional boundaries, so as to minimize loss of life, suffering, and serious adverse effects on society. Such a system would include every healthcare institution and every community in the country. In the midst of an event as large as a CHE, a prepared system would be able to provide care for the sick and injured, protect the well, and maintain essential healthcare services for the general population. The system would be able to harness all useful national public and private resources to cope with a CHE.

Vision of Success

Healthcare coalitions for preparedness and response: In a well prepared healthcare system, every healthcare institution will be integrated into a community-based healthcare coalition that joins public health agencies, EMAs, Emergency Medical Services (EMS), and private non-healthcare partners. Healthcare coalitions would serve both preparedness and response functions in their communities and would be linked together through interpersonal and electronic connections to create regional coalition networks.

Horizontal and vertical communications: Healthcare coalitions would have the ability to communicate both horizontally, with other coalitions, and vertically, with state, multistate regional, and federal authorities.

Resource sharing: A healthcare coalition would have agreements among its members and with neighboring coalitions to share equipment and staff in an emergency, and agreements and procedures to guide the use of crisis standards of care, alternate care facilities, and patient evacuation and transportation.

Utilization of public and private assets: The communications, coordination, and resource sharing within and among coalitions and with state, regional, and federal authorities would make available the use of substantial public and private healthcare assets during a disaster.

Flexible response to adverse circumstances: The healthcare system would be able to function under a variety of adverse circumstances that may include the following: an immediate and/or prolonged surge of patients in need of acute care; a contaminated or contagious environment; a loss of infrastructure and/or the need to triage and treat outside of a hospital or other healthcare institution; inadequate situational awareness; and a disruption of incident management chains of command.

With healthcare partners and coalitions connected both horizontally and vertically, individual parts of the healthcare system would be able to function autonomously if cut off from outside support and direction.

Resilience: Furthermore, the healthcare system as a whole would be able to adapt if parts became disabled, and after a disaster, the system would be able to recover quickly and resume provision of essential healthcare services to the population.

Recommendations for Improving U.S. Healthcare Response to Mass Casualty Events of All Sizes

Described below are recommendations and specific actions that the federal government can take to achieve progress toward preparing the U.S. healthcare system for responding effectively to mass casualty events of all sizes (see Table 1, below). These recommendations are derived from the results of research and evaluation conducted by the Center in developing the *Descriptive Framework*, the *Evaluation Report,* the *HFPP and ECP Partnership Evaluation;* from conducting Issue Analysis Meetings; and from the Center's independent analysis.

Table 1: Overview of Recommendations for Improving U.S. Healthcare Response to Mass Casualty Events of All Sizes

RECOMMENDATIONS	ACTIONS
Every U.S. hospital should participate in a healthcare coalition that prepares and responds collaboratively to common medical disasters and CHEs.	• A Presidential Decision Directive on healthcare preparedness for CHEs should be issued (as a follow-up to Homeland Security Presidential Directive-21*) to outline a vision of preparedness that builds on progress to date and is consistent with the National Health Security Strategy (NHSS).** • HPP, U.S. Centers for Disease Control and Prevention (CDC), and U.S. Department of Homeland Security (DHS) federal grant programs should require organization of grantee preparedness and response activities through healthcare coalitions linked to emergency management and public health authorities. Program guidance should outline the critical functions that coalitions must be able to perform.† • The HPP should promulgate more detailed guidance on the organization and response roles of healthcare coalitions, including surge capacity goals. • HPP guidance should specify surge goals to be achieved by healthcare coalitions. • Centers for Medicare and Medicaid Services (CMS) should provide all healthcare entities with financial incentives to participate in healthcare coalitions. • HPP should establish goals and metrics to assess the progress of the development of healthcare coalitions in every community.
Links should be established between neighboring healthcare coalitions to enable regional exchange of healthcare information and assets during a CHE.	• HPP, CDC, and DHS program guidance should specifically require collaboration with neighboring jurisdictions and coalitions across state lines, including sharing of plans and joint exercises. • HHS should develop guidelines and requirements for communications, situational awareness, and health information technology (HIT).
Out-of-hospital triage sites should be established and healthcare responders should be trained in CHE triage.	• Future HPP guidance should include requirements for out-of-hospital triage site designation, and ensure provision of specialized training in CHE triage for National Disaster Medical System (NDMS) teams and identified first responders.

RECOMMENDATIONS	ACTIONS
A patient transportation system that harnesses alternative, private sector resources should be created.	• Federal initiatives already in place to provide a national network of emergency medical transport capacity should address the enhancement of local emergency medical transportation following CHEs. • NDMS, DHS, and United States Transportation Command (USTRANSCOM) should jointly review and revise aeromedical evacuation strategies. • Federal and state governments should develop and disseminate guidance and best practices for transportation planning efforts. • HHS and DHS should jointly commission a detailed study of crisis standards of care related to patient transportation.
Development of crisis standards of care should be expanded, and their consistent implementation within and across states should be promoted.	• HHS should continue to provide leadership on the issue of crisis standards of care, to include providing a clearinghouse of information to facilitate state and local planning efforts. • Future HPP guidance should specify crisis standards of care planning, as well as intrastate and interstate consistency in crisis standards, as priorities for grantees.
A national framework for healthcare response to CHEs should be developed to guide states, jurisdictions, and local entities in developing ConOps for medical and public health activities.	• DHS and its federal partners should expedite the development of federal Concept of Operations (ConOps) for CHEs. • HHS should create a work group of federal planners and stakeholders to sketch a national ConOps for medical and public health activities (Emergency Support Function [ESF-8]) following a CHE, using a Tier 1 Urban Area Security Initiative (UASI) region.

* The White House. *Homeland Security Presidential Directive 21: Public Health and Medical Preparedness*. October 18, 2007. http://www.dhs.gov/xabout/laws/gc_1219263961449.shtm#1. Accessed November 12, 2009.

** U.S. Department of Homeland Security. Federal Emergency Management Agency. *Comprehensive Preparedness Guide 101*. March 2009. 2009. http://www.fema.gov/about/divisions/cpg.shtm. Accessed January 22, 2010.

† Healthcare coalition critical functions are described in the HHS Tier 2 *MSCC Handbook*, the Center for Biosecurity *Evaluation Report*, and the Center for Biosecurity *Provisional Assessment Criteria* (see *Appendix B* of this *Preparedness Report*, page 36).

Recommendations

Every U.S. hospital should participate in a healthcare coalition that prepares and responds collaboratively to common medical disasters and CHEs.

Building a national system of fully functional healthcare coalitions that are capable of effectively responding to CHEs will require the action and support of the federal government and its preparedness programs. To enable a more robust national disaster health and medical system that is capable of responding to both common medical disasters and CHEs, healthcare coalitions first must be established in communities throughout the U.S. All healthcare coalitions should have as active participants the hospitals in a given community, along with other healthcare entities (such as specialty hospitals, long-term care facilities, dialysis centers, free standing clinics, and surgical centers), other private non-healthcare partners, and public health, EMS, and EMAs. Coalitions should have a governance structure and formal agreements that define relationships among partners, and all fully functional healthcare coalitions should have a role in coordinating both preparedness and response.

- **The federal government should provide states with guidance on the basic functions of healthcare coalitions:**
  - A Presidential Decision Directive on healthcare preparedness for CHEs should be issued (as a follow-up to HSPD-21) to outline a vision of preparedness that builds on progress to date and is consistent with the National Health Security Strategy.[29]
  - HPP, CDC, and DHS federal grant programs should require organization of grantee preparedness and response activities through healthcare coalitions linked to emergency management and

29 U.S Department of Health and Human Services. *National Health Security Strategy of the United States of America.* December 2009. http://www.hhs.gov/aspr/opsp/nhss/nhss0912.pdf. Accessed January 13, 2010.

public health authorities. Program guidance should outline the critical functions that coalitions must be able to perform.[30]

- The HPP should promulgate more detailed guidance on the organization and response roles of healthcare coalitions, including surge capacity goals. Guidance must accommodate the necessary variety of effective governance structures and approaches.

Healthcare coalitions need specific surge capacity goals. The surge capacity of individual hospitals varies considerably: some operate at more than 100% occupancy much of the time, while others operate well under their capacity. Some hospitals have the ability to increase their numbers of beds, staff, and equipment, while others cannot. And each hospital has its own strengths and weaknesses. Across a community, however, these differences tend to even out. Furthermore, community-wide coalitions can recruit extra capacity from their participants, such as urgent care centers, nursing homes, and surgical centers. For these reasons, surge capacity and capability should be assessed and planned for at the coalition level.

There is no scientific way to determine the right amount of surge capacity for a given community; however, many emergency planners have identified the need for a specific number as a planning target. The best example of this is from Israel, which requires all of its hospitals to have 20% immediate surge capacity for inpatient beds; this number is also used by emergency preparedness scholars to provide a realistic estimate of what hospitals can achieve with short notice.[31] It is likely that capacity above an initial 20% surge could be achieved by most hospitals, given additional time to discharge patients and cancel non-urgent admission and procedures.

Emergency department surge capacity is not the same as inpatient surge capacity. Patient volumes in emergency departments (EDs) typically vary considerably from day to day. For example, it is not unusual for patient volume to increase by as much as 50% to 100% in relationship to weather events or during influenza epidemics. Many ED emergency operation plans include patient overflow areas, and most ED patients could be managed adequately in other outpatient settings, such as physician offices, clinics, or urgent care centers.[32] Because of the considerable variability in hospital surge capacity, future surge goals should be set on a community-wide basis rather than specified for individual hospitals.

- **HPP guidance should specify surge goals to be achieved by healthcare coalitions.** For example, coalitions should have plans to provide (within 4 hours) outpatient assessment and care to twice the number of patients seen on an average day in the EDs of its member hospitals. Furthermore, coalitions should have plans to accommodate (within 4 hours) patients requiring inpatient care equal to 20% above normal capacity of their member hospitals. This number should increase to 30% after 24 hours.

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30 Healthcare coalition critical functions are described in the HHS Tier 2 *MSCC Handbook*, the Center for Biosecurity *Evaluation Report*, and the Center for Biosecurity *Provisional Assessment Criteria* (see *Appendix B* of this *Preparedness Report*, page 36).

31 Peleg K, Kellermann A. Enhancing hospital surge capacity for mass casualty events. *JAMA*. 2009;302(5):565-566.

32 According to the U.S. Centers for Disease Control and Prevention (CDC), in 2006, only 12.8% of hospital emergency department (ED) visits resulted in admissions to the hospital. Most are triaged to urgent or minor rather than emergent care. Reference: Pitts R, Niska R, Xu J, et al. National hospital ambulatory medical care survey: 2006 emergency department summary. *National Health Statistics Reports.* August 6, 2008. http://www.cdc.gov/nchs/data/nhsr/nhsr007.pdf. Accessed November 13, 2009.

Healthcare entities need financial incentives to participate in healthcare coalitions. An optimal healthcare coalition involves the participation of all healthcare entities within a community. Yet many of these non-hospital entities do not recognize the important role they could play in preparedness and response or the benefits they might derive from participation. Many hospitals complain that participation carries a cost and produces no revenue. Hospitals accredited by the Joint Commission are required to have some degree of collaboration with community partners in planning and exercises, but most other healthcare entities have no such requirement. The one incentive that nearly all healthcare entities have in common is Medicare reimbursement. Currently, Medicare has emergency preparedness requirements for participating facilities, but these requirements are less stringent than the Joint Commission's emergency management standards and HPP guidance. If Medicare's requirements were enhanced and aligned with Joint Commission standards and HPP guidance, nearly all facilities would have a strong incentive to abide by them.

- **CMS should provide all healthcare entities with financial incentives to participate in healthcare coalitions.** CMS should update emergency preparedness requirements for participating healthcare facilities and align them with HPP guidelines and the Joint Commission's emergency management standards; requirements should include participation in a healthcare coalition.

Progress toward the development of healthcare coalitions in every community must be assessed using established goals, metrics, and systems for accountability. Assessment of healthcare coalitions should be based on their ability to perform critical coalition functions, such as engaging in effective planning and governance; providing situational awareness during a disaster; maintaining and operating reliable and redundant communications; ensuring the availability of adequate staff, supplies, and equipment across the coalition; and providing sound healthcare decision making for affected populations when resources are scarce. Assessment criteria should reflect the diverse nature of the challenges and priorities of coalitions in urban, rural, dense population, low population, and large land mass areas. As noted in the earlier *Evaluation Report*, Working Group participants reported that the most useful metrics for preparedness were those based on assessment of a coalition's performance in actual events or realistic exercises.

- **HPP should establish goals and metrics to assess progress in the development of healthcare coalitions in every community.** HPP should promulgate functional criteria and metrics for healthcare coalitions and develop a mechanism to hold grantees accountable for achieving the criteria. *See Appendix B: Assessment Criteria for the Future* (page 36).

Links must be established among neighboring healthcare coalitions to enable regional exchange of healthcare information and assets during a CHE.

Collaboration among healthcare coalitions is essential to CHE response that extends beyond local and state geographic boundaries. Few of the currently functioning healthcare coalitions have links to other healthcare coalitions and EMAs beyond their own local and state boundaries. To provide mutual aid, with or without state support, neighboring healthcare coalitions must, through regular meetings and mutual aid agreements, develop redundant, multimodal, high and low tech communications systems, and shared emergency response plans. Neighboring coalitions must also perform joint CHE exercises to

test their ability to expand surge capacity with a web of coalitions by facilitating an outward cascade of patient movement—*from* a stricken area and an inward cascade of resources *to* a stricken area.

- **HPP, CDC, and DHS program guidance should specifically require collaboration with neighboring jurisdictions and coalitions across state lines.**

Healthcare coalition communication and situational awareness capabilities must be enhanced. To meet the challenge of serving as a structure and mechanism for the development of situational awareness for the healthcare response to a CHE, healthcare coalitions need enhanced tools for achieving situational awareness. Digital connections among hospitals, public health, EMS, and EMA are necessary to facilitate bidirectional flow of essential information. Healthcare coalitions must also establish information and communication connections with neighboring coalitions across jurisdictional lines in order to develop situational awareness in a CHE. The current federal effort to promote healthcare information technology should address this requirement for emergency response information technology.

- **HHS should develop guidelines and requirements for communications, situational awareness, and HIT.** HHS should convene work groups of experts and stakeholders who can develop guidelines and/or requirements for healthcare coalition communication, situational awareness, and information technology.

Out-of-hospital triage sites should be established, and healthcare responders should be trained in CHE triage.

In a CHE, a large number of triage sites will have to be established within a few hours to accommodate CHE patients and lessen the impact of overwhelming numbers of patients on hospital operations. Those sites would have to be predesignated, with caches of basic supplies readily available. In most scenarios, some of the predetermined sites may be unusable due to damage, contamination, loss of essential infrastructure, or lack of access. Personnel to staff triage sites would have to be available very quickly, so they would have to be local. And, to be most effective, personnel will need special training in triage decision making in the context of a CHE. For these triage sites to be effective, personnel running the sites would have to assess patients, provide very limited medical aid, provide palliative and comfort care, and transport patients to hospitals, other healthcare facilities, or shelters, as warranted.

- **Future HPP guidance should include requirements for designating out-of-hospital triage sites and ensuring provision of specialized training in CHE triage for NDMS teams and identified first responders.** Personnel reinforcements will be needed very quickly in a CHE; this role could be filled by specially trained state and federal medical teams that could be on scene within a few hours, and could be a role for Disaster Medical Assistance Teams (DMAT).[33]

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33 Disaster Medical Assistance Teams (DMAT) are one type of mobile medical response team as part of the National Disaster Medical System (NDMS). (See *Appendix C* of this *Preparedness Report*, page 44, for further information about NDMS and its current response role).

A patient transport system that harnesses alternative private sector resources should be created.

Taking advantage of national surge capacity will require a new, distributed approach to patient transport. While the hospital surge capacity of most healthcare jurisdictions is quite limited, and the surge capacity of even whole multistate regions may be insufficient for some CHEs, the collective healthcare surge capacity of the nation as a whole is substantial. There are approximately 5,000 acute care hospitals with 800,000 staffed beds in the U.S.[34] Conservatively assuming a surge capacity of 20% in 24 hours, there could be 160,000 beds available following a CHE.[35] This number could be increased further by factoring in beds from military, Department of Veterans Affairs (VA) and specialty hospitals, as well as long-term care facilities and other nontraditional healthcare facilities. Taking advantage of this nationwide surge capacity will require plans for patient transport on a scale not addressed in existing plans. It will require a new, distributed approach that combines the use of traditional medical transport methods (eg, ambulances), private sector nontraditional vehicles (eg, buses, planes, and trains), and state and federal transportation assets (eg, military aircraft). Through effective matching of patient needs to scarce medical resources, a preplanned and well executed emergency patient transport and tracking system could save lives in the critical hours following a CHE.

- **Federal initiatives already in place to provide a national network of emergency medical transport capacity should address the enhancement of local emergency medical transportation following CHEs.** Utilization of private and nontraditional vehicles should be incorporated.

Aeromedical transportation strategies should be revised. The NDMS has long planned to use military aircraft supplied by USTRANSCOM to move patients to other parts of the country for hospital care in a disaster.[36] The limiting factor of military airlift capacity is not the availability of planes—each U.S. Air Force cargo plane can be converted to aeromedical evacuation within a few hours—rather, it is small number of trained and available aeromedical personnel. This limitation presumes that the personnel on the aircraft meet training standards and that the medical care provided enroute will meet normal standards of care.

If the CHE is the result of an attack, it may not be possible to rely on military transport because planes may be needed for military operations. If that is the case, then the Civil Reserve Air Fleet (CRAF) is another viable option. The CRAF is a program under which USTRANSCOM maintains contracts with the airlines to keep some planes available on short notice for back up transportation capacity, including aeromedical evacuation. The potential capacity of the CRAF is extensive: there are nearly 1,400 aircraft in the program, of which approximately 50 are designated for aeromedical evacuation.[37] But the aeromedical portion of the CRAF was not designed to be a rapid response asset. The program was

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34 Fast facts on U.S. hospitals. American Hospital Association website. Updated April 13, 2009. http://www.aha.org/aha/resource-center/Statistics-and- Studies/fast-facts.html. Accessed September 25, 2009.

35 20% of 800,000=160,000.

36 United States Transportation Command website. Department of Defense. April 4, 2009. http://www.transcom.mil/organization.cfm. Accessed September 22, 2009.

37 Ibid.

designed to transport injured service members home from war, and current procedures require that the planes first undergo an interior reconfiguration to carry litters (ie, stretchers) before they are deployed. This would slow operations considerably.

- **NDMS, DHS, and USTRANSCOM should jointly review and revise aeromedical evacuation strategies.** Plans must accommodate the large number of patients requiring transport during a CHE, assuming that many patients will be ambulatory, and that crisis standards of care (see below) will be employed for the transportation process.

Alternative ground transport also must be considered. The capacity of many EMS to respond to large scale disasters is very limited.[38] Local ambulance capacity could be augmented through recruitment of private ambulance companies by local emergency management authorities. However, even with those resources in place, there would be a large gap between the number of ambulances available and the number required. Additional ambulances from neighboring jurisdictions and states could also be utilized, but even then, the number would not be sufficient to meet the needs of most CHE scenarios. Furthermore, ambulances may be needed by their own jurisdictions to transfer patients between healthcare facilities. Ambulances from remote parts of the country also could be recruited to aid in response, but they may take several days to reach an affected area.[39]

While improvised use of alternative vehicles is predictable, advanced planning and exercises would optimize success. A comprehensive review of options could be explored, advantages and disadvantages of various vehicles could be weighed, and potential problems anticipated and resolved. Normally, patient transport is highly regulated and requires licensed ambulances and trained emergency medical technicians. To permit advanced planning with the public and private sectors, there must be resolution of legal, regulatory, and ethical issues related to the allocation of scarce medical transportation resources and the use of non-medical vehicles to augment evacuation.

- **Federal and state governments should develop and disseminate guidance and best practices for patient transport planning efforts.** CHE response will be local, and patient transport plans must be customized to fit the needs of a jurisdiction or a state. There is a need, however, for sharing best practices to help guide planning and support development of a consistent national framework.

Transport triage and disaster transport standards will be needed. Standards for types of vehicles, triage, and levels of medical care provided during transport will have to be shifted to crisis standards in order to accommodate response needs following a CHE. Triage will have to account for both severity of illness or injury and a patient's ability to travel. For patient transport over relatively short distances (perhaps up to 100 miles), it is conceivable that alternative, nontraditional ground transportation could be used, such as school or transit buses. In addition, buses or other vehicles may be modified to support patient litters and thus would be able to transport non-ambulatory patients who are not critical.

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38 Institute of Medicine. *Emergency Medical Services at the Crossroads.* June 14, 2006. http://www.iom.edu/Reports/2006/Emergency-Medical-Services-At-the-Crossroads.aspx. Accessed September 26, 2009.

39 In 2007, FEMA contracted with a private ambulance company to augment federal and local transportation resources in response to mass casualty events. More information on this contract can be found in *Appendix C* of this *Preparedness Report*, page 44.

- **HHS and DHS should jointly commission a detailed study of crisis standards of care related to patient transportation.** Although work has been done on crisis standards of care in general, specific focus is needed on crisis standards for disaster transport.

Development of crisis standards of care should be expanded, and their consistent implementation within and across states should be promoted.

Unintended consequences of shifting to crisis standards of care can be reduced through advanced planning. By definition, a CHE would involve some period of time during which available healthcare needs would exceed available capacity and capabilities in some locations. The U.S. has just enough capacity in its healthcare system to manage normal patient volume. Even relatively small surges in the number of patients, such as occur during flu season, can significantly stress the system and change the way in which patient care is provided. Depending on the scenario, this imbalance between need and capacity could be profound, prolonged, and widespread, prompting changes in the way care is provided, whether planned for or not. If not planned for, a shift to crisis standards of care could lead to unnecessary injury or loss of life, actual or perceived inequities in care, and liability exposure for responders. These potentially devastating consequences could be reduced through advanced planning for both allocation of scarce medical resources and implementation of crisis standards of care in resource-limited settings. Such crisis standards of care would focus on doing what is best for the population as a whole, rather than focusing on the best interest of individuals (as care normally is provided in non-disaster situations). Developing crisis standards of care is difficult because guidance is limited, and many complex medical, legal, and ethical issues involving multiple public and private sector stakeholders must be addressed. Those stakeholders include hospitals, physicians, and public health department planners. Conceptions of acceptable standards of care may vary by community or region.

Crisis standards of care should be used only when all other avenues of resource allocation have been exhausted. When needed, in order to be most effective and limit perceptions of inequity, standards should be implemented in as coordinated a way as possible across communities and regions. Healthcare coalitions could play a pivotal role in achieving consistent development and implementation of approaches. The recent IOM guidance on crisis standards of care emphasizes and provides a platform for consistency.[40]

Standards of care are fundamentally a local and state issue, based largely on local practice and state law. However, many of the medical and ethical aspects are similar across the country, so national guidance is helpful for planners at the state and local levels, and it would foster and facilitate consistency in planning. Significant work has been conducted on this topic at national and state levels,[41] but additional and continued national guidance and improved access to information on existing standards of care are needed to continue to advance state and local planning efforts. For instance,

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40 Institute of Medicine, Committee on Guidance for Establishing Standards of Care for Use in Disaster Situations. *Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report.* September 2009.

41 See, eg, Institute of Medicine, Committee on Guidance for Establishing Standards of Care for Use in Disaster Situations. *Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report.* September 2009 • U.S. Agency for Healthcare Research and Quality. *Altered Standards of Care in Mass Casualty Events.* AHRQ Publication No. 05-0043. 2005 • U.S. Agency for Healthcare Research and Quality. *Mass Medical Care with Scarce Resources: A Community Planning Guide.* AHRQ Publication No. 07-0001. 2007 • Devereaux A, Christian MD, Dichter JR, et al. Summary of suggestions from the Task Force for Mass Critical Care Summit, January 26-27, 2007. *Chest*. 2008;133(5):1S-7S.

guidance is needed for pediatric and geriatric populations, community engagement, consistent or national liability protections, triggers, exercises, involvement of community providers, and processes for returning to normalcy.[42] And a clearinghouse that includes state and local documents on standards of care would be helpful.

- **HHS should continue to provide leadership on crisis standards of care and should provide a clearinghouse of information to facilitate state and local planning efforts.** Future HPP guidance should specify crisis standards of care planning, as well as intrastate and interstate consistency in crisis standards, as planning priorities for grantees.

A national framework for healthcare response to CHEs should be developed to guide states, jurisdictions, and local entities in developing ConOps for medical and public health activities.

To enable effective response to a CHE, plans must be established, disseminated, and exercised in advance. Critical lifesaving activities would occur in the first few hours and days following most CHEs. Unfortunately, this would also be the time when situational awareness is most difficult to achieve and when most levels of government would be working around the clock to activate command and coordination structures and mobilize resources. Hence, communities are expected to be prepared to manage response on their own for hours to days. During this early phase of response to a CHE, the full spectrum of incident management as envisioned in the National Incident Management System (NIMS) and the National Response Framework (NRF) will be just getting established and will not be available immediately. Therefore, as has been demonstrated in Israel,[43] each party involved in the immediate response must know in advance his/her precise role, responsibility, and expected actions so that all participants know what to do and what to expect from others. Just as in a fire drill or a "code blue" in a hospital, the initial actions taken by each responder must be automatic and immediate. To enable such a response there must be in place, in advance, a plan or a series of integrated and coordinated plans that are known to all and have been well exercised. Plans must be integrated and coordinated throughout the wide geographic areas likely to be involved in a CHE. Such a ConOps plan must include information on individual roles at all levels, from federal officials to healthcare providers at the local hospitals.[44] Recognizing that each state, jurisdiction, and institution is different (eg, different laws, political structures, and customs), it is not possible to create a national template that will work perfectly for every location. Instead, the ConOps plan could be a framework that individual states, jurisdictions, and local entities would use to create their own customized plans.

- **DHS and its federal partners should expedite the development of federal Concept of Operations (ConOps) for CHEs.** Key stakeholders from state and local government and the private sector, and especially hospitals, should be involved early in the process in order to help shape a plan that meets their needs.

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42 Institute of Medicine, Committee on Guidance for Establishing Standards of Care for Use in Disaster Situations. *Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report.* September 2009.

43 Peleg K, Kellermann A. Enhancing hospital surge capacity for mass casualty events. *JAMA.* 2009;302(5):565-566

44 Ibid.

- **HHS should create a work group of federal planners and stakeholders to sketch a national ConOps for medical and public health activities (ESF-8) following a CHE, using a Tier 1 UASI region.** The plan would define roles, and clearly address responsibilities and actions for each type of entity (eg, hospitals, healthcare coalitions, EMS, public health, and state and federal government) involved in the medical response to a CHE, from the federal level down to the local hospital. The plan would supplement, not supplant, the tiered framework described in the MSCC and NRF. This "straw man" national ConOps and lessons learned during its development could help the rest of the nation be ready more quickly for a CHE.

Conclusions

As demonstrated in the earlier report, *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward*, much progress has been made in healthcare preparedness in recent years, especially in the realm of building coalitions of hospitals and public health entities for disaster preparedness and emergency response. In many places, this progress has improved response to common medical disasters. However, the Center's research and analysis concludes that individual hospitals, cities, states, and the country as a whole remain unprepared for a catastrophic health event that results in thousands or tens of thousands of sick or injured persons.

Improved preparedness and response for CHEs is possible and should be built on the successful work already completed by hospitals, coalitions, and their local, state, tribal, and federal partners. Ensuring the development of functional healthcare coalitions throughout the country is an important first step because such coalitions will enable all communities to respond effectively to common medical disasters and will create the necessary infrastructure for CHE response. Once established, healthcare coalitions will have to be linked together, and much greater patient transport capability will have to be established. A more detailed national plan for those actions is needed to guide the actions of providers in each tier of response to a CHE. The creation of crisis standards of care and some legal reforms are needed as well to make a national CHE response system truly functional.

The recommendations made in this report are feasible, but many of them will take time to accomplish. We are confident that concrete progress toward the goal of CHE preparedness can be achieved through the series of actions outlined in this report, but that work will require sustained effort at the federal, state, tribal, and community levels for a number of years and funding sufficient to support those efforts.

Appendix A. List of Acronyms

AAR	After Action Report
AHRQ	Agency for Healthcare Research and Quality
AMR	American Medical Response
ARS	Acute Radiation Syndrome
ASPR	Assistant Secretary for Preparedness and Response
CBRNE	Chemical, Biological, Radiological, Nuclear, and Explosive
CMRFC	CBRNE Consequence Management Response Force
CDC	Centers for Disease Control and Prevention
CHE	Catastrophic Health Event
ConOps	Concept of Operations
CMS	Centers for Medicare and Medicaid Services
CRAF	Civil Reserve Air Fleet
DHS	Department of Homeland Security
DMAT	Disaster Medical Assistance Team
DoD	Department of Defense
ECP	Emergency Care Partnership Program
EDs	Emergency Departments
EMA	Emergency Management Agency
EMAC	Emergency Management Assistance Compact
EMEDS	Expeditionary Medical Support
EMTALA	Emergency Medical Treatment and Labor Act
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
ESAR-VHP	Emergency System for Advance Registration of Volunteer Health Professionals
ESF-8	Emergency Support Function 8
FEMA	Federal Emergency Management Agency
FMS	Federal Medical Stations
HFPP	Healthcare Facilities Partnership Program
HHS	Department of Health and Human Services
HIT	Health Information Technology
HPP	Hospital Preparedness Program
HRSA	Healthcare Resources and Services Administration
HSEEP	Homeland Security Exercise and Evaluation Program
HSGP	Homeland Security Grant Program
HSPD-21	Homeland Security Presidential Directive 21
HVA	Hazard Vulnerability Analysis
ICS	Incident Command System
ICU	Intensive Care Unit
IND	Improvised Nuclear Device
MMRS	Metropolitan Medical Response System

Appendix A. List of Acronyms

MOU	Memorandum of Understanding
MRC	Medical Reserve Corps
MSCC	Medical Surge Capacity and Capability Handbook
NBHPP	National Bioterrorism Hospital Preparedness Program (now referred to as the NHPP)
NCR	National Capital Region
NDMS	National Disaster Medical System
NHPP	National Healthcare Preparedness Program (formerly the HPP)
NHSS	National Health Security Strategy
NORTHCOM	United States Northern Command
NPS	National Planning Scenario
NRF	National Response Framework
OPEO	Office of Preparedness and Emergency Operations
PAHPA	Pandemic and All-Hazards Preparedness Act (Public Law No. 109-417)
PAR	Population at Risk
PHEP	Public Health Emergency Preparedness Program
RTR	Radiation Triage, Treatment, and Transport system
SNS	Strategic National Stockpile
SPEARR	Small Portable Expeditionary Aerospace Rapid Response
TCL	Target Capabilities List
UASI	Urban Area Security Initiative
USTRANSCOM	United States Transportation Command
VA	Department of Veterans Affairs
VHA	Veterans Health Administration
VMI	Vendor Managed Inventory
WMD	Weapons of Mass Destruction

Appendix B. Assessment Criteria for the Future

Provisional Criteria for the Assessment of Progress toward Healthcare Preparedness

Rationale

Widely used standards exist for individual healthcare facilities: The provisional criteria for the assessment of progress toward healthcare preparedness presented in this document are derived from the preceding phases of this project and are designed to be consistent with the recommendations in the *Preparedness Report*. Our previous research and analyses have identified gaps in preparedness evaluation criteria available for both individual healthcare facilities and healthcare coalitions.

Specifically, as noted in the *Descriptive Framework*, we found that the 2008 Joint Commission Emergency Management Standards reflect preparedness capabilities for individual healthcare institutions well.[45] These standards are familiar to individual healthcare institutions, and share much in common with other well established assessment criteria such as the *Emergency Preparedness Checklist* from the CMS,[46] the *Target Capabilities List* (TCL) from DHS,[47] the *Comprehensive Emergency Management Program criteria* from the VHA,[48] and current HPP guidance. Work based on these standards has contributed to significant progress in healthcare preparedness; therefore, we recommend that the HPP utilize the Joint Commission Emergency Management Standards, along with these existing assessment criteria and metrics, as the basis for future assessment of preparedness in individual healthcare facilities.

No assessment criteria exist for healthcare coalitions: Some of the challenges associated with responding to mass casualty or CHEs are so great that an adequate response is possible only through healthcare coalitions that involve many community partners. Such challenges include, but are not limited to, transporting and distributing patients, sharing assets and resources, coordinating volunteers, operating alternate care facilities, and allocating scarce resources. Healthcare coalitions are needed to address mass casualty preparedness and response challenges that cannot be addressed by individual healthcare institutions on their own. Coalitions include, at a minimum, hospital, non-hospital healthcare providers, and public health departments, and they are closely tied to EMS and EMAs.

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45 The Joint Commission. *History Tracking Report: 2009 to 2008 Requirements.* Accreditation Program: Hospital. Chapter: Emergency Management. 2008. http://www.jointcommission.org/NR/rdonlyres/D5607767-744C-462D-9527-B9B0E464C524/0/HAP_EM_09_to_08.pdf. Accessed July 1, 2009.

46 U.S. Department of Health and Human Services, Centers for Medicare & Medicaid Services. *Emergency Preparedness Checklist: Recommended Tool for Effective Health Care Facility Planning.* http://www.cms.hhs.gov/SurveyCertEmergPrep/downloads/S&C_EPChecklist_Provider.pdf. Accessed September 10, 2009.

47 U.S. Department of Homeland Security. *Target Capabilities List, A Companion to the National Preparedness Guidelines.* September 2007.

48 U.S. Department of Veterans Affairs, Veterans Health Administration, Office of Public Health and Environmental Hazards, Emergency Management Strategic Health Care Group. *VHA Comprehensive Emergency Management Program Analysis Capabilities Description.* January 24, 2008.

Healthcare coalitions are playing an emerging role in disaster response and will be central to the national strategy for catastrophic health events discussed in the *Preparedness Report.* While it is now possible to assess progress in individual institutions, criteria to assess the successful contribution that coalitions make to preparedness have not yet been proposed; assessment is essential to measuring progress of healthcare preparedness within healthcare coalitions.

Sources and Methods

These *Provisional Assessment Criteria for Healthcare Coalitions* were derived from the following earlier reports and deliverables:

- *Descriptive Framework:* An extensive review of the literature on medical preparedness and lessons learned from actual mass casualty events and exploration of the response needs that might result from potential future large scale disasters, such as those described in NPS, was used in the development of the *Descriptive Framework* on which the assessment criteria are based.
- From this review and the crosswalk analysis of commonality with other assessment criteria, *Assessment Criteria for Individual Healthcare Facilities and Early Healthcare Coalitions*, which were developed and tested in interviews and discussions with 133 subject matter experts from the 62 HPP states and municipalities who took part in the *Evaluation Report* Virtual Working Group.
- Review of the findings of the *Evaluation Report* and assessment criteria in an Issue Analysis Meeting in the fall of 2008, where the development and functional capability of healthcare coalitions was identified as the best marker of progress toward preparedness. This marked the starting point of the development of the assessment criteria.
- Draft *Assessment Criteria for Healthcare Coalitions/Partnerships* used in the evaluation of the HFPP and ECP Program site visits and follow-up interviews. This evaluation project provided an opportunity to test the assessment criteria and modify them after feedback from coalition leaders and participants.

After the literature review, and Working Group and Issue Analysis Group discussion and input, *Provisional Assessment Criteria* were developed. Further testing and validation of criteria will be required in future assessments of performance of healthcare coalitions in structured exercises and real events.

Key Characteristics of Provisional Assessment Criteria for Healthcare Coalitions

Assessment criteria for coalitions based on functional capabilities: *The Provisional Assessment Criteria* are designed to measure the progress, maturity, and functional capabilities of healthcare coalitions. They primarily assess the ability to perform critical functions, such as engaging in effective planning and governance, providing situational awareness during a disaster, and maintaining and operating reliable and redundant communications. These criteria were chosen for the following reasons:

- They are relatively straightforward to assess.

- Our previous research indicates that these are good indicators of prepared coalitions.
- They are adaptable and so can accommodate the varied challenges and priorities of coalitions in urban and rural areas, across densely and sparsely populated areas, and among coalitions covering large geographical areas.

Applicable for local, state, and federal levels: This provisional criteria can be used by local, state, and federal authorities to assess the structure and functional capabilities of emerging coalitions, to assess the degree to which coalitions have advanced their collaboration for the development of community surge capacity goals, and to promote the development and continued maturation of healthcare coalitions.

Future Performance Measures

Performance measures that are consistent with these assessment criteria are needed: Self-assessment surveys and structured after-action reports (AARs) of actual events or realistic exercises will be most important in helping coalitions assess their progress. Instruments should include the following:

- Vulnerability analysis of pre-existing hazards and documentation of gaps in capabilities within the coalition region.
- Documentation of how gaps were addressed during exercises or drills and the progress that was achieved in meeting those needs.
- Documentation of problems encountered during previous events or exercises and how they were addressed and corrected during subsequent events or exercises.
- Results of repetitive comprehensive testing of communications procedures and equipment.
- Self-assessment surveys that address the effectiveness of planning, governance, coordination, cooperation, and communication among partners within the coalition as well as among the coalition and local, state, and federal response agencies.

Provisional Assessment Criteria for Healthcare Coalitions

I. Planning, Process, Structure, and Organization

Boundaries: The geographic and jurisdictional boundaries of the healthcare coalition are clearly defined by the following:

- City
- County
- State
- Tribal
- Multiple jurisdictions
- Multistate region
- Alignment with public health, EMA, and EMS jurisdictional boundaries

Membership: All healthcare institutions/agencies in the geographic region of the healthcare coalition are represented:

- Hospitals
- Public Health Departments
- Tribal Health Departments
- Local EMA
- State EMA
- Local EMS
- State EMS
- Tribal EMS
- Cross-jurisdictional regional representation
- Non-hospital healthcare facilities (eg, nursing homes, dialysis centers, out-patient surgical centers)
- Private sector partners (eg, large retailers, direct service providers, manufacturers, transportation providers)

Organization and authorities: Member institutions are linked to each other, and the healthcare coalition is connected to state, tribal, and local authorities.

- The coalition is established through formal agreements (eg, a Memorandum of Understanding [MOU]).
- Mutual aid agreements exist between the healthcare coalition and outside organizations (private industry, adjoining regions, or adjoining states).
- The coalition is endorsed and supported during an emergency by the senior leadership of member institutions.
- The coalition has operational authority derived from or via local and/or state public health emergency authority.
- Connections exist with local/tribal/state authorities and other healthcare coalitions outside of jurisdictional boundaries:
    - The coalition, in collaboration with the public health agency, is linked to the EMA and incident command structure (ICS) through the ESF-8 function.
    - The coalition is linked to a multi-agency coordination group that includes at least public health, emergency management, and EMS.

- Linkages to multiple jurisdictions exist when coalition boundaries cross jurisdictional lines.
- Linkages exist directly to other healthcare coalitions.

Hazard Vulnerability Analysis (HVA): Threats to the community are jointly analyzed and prioritized. All coalition members use common hazard assumptions in developing individual HVAs and emergency operations plans (EOPs). At a minimum, the HVA includes the following:

- Local natural hazards
- NPS for catastrophic health events
- Disasters in which the community is cut off from outside support and/or the basic infrastructure is disrupted
- Large geographically remote events in which the community becomes a refuge for displaced or evacuated populations
- Planning for special needs populations.

Emergency operations plans and training: EOPs and training at individual institutions and throughout the healthcare coalition are consistent and fully integrated

- They are based on a shared HVA.
- There is a mechanism for collaborative planning.
- An inventory of relevant assets and resources was conducted among healthcare coalition entities.
- Joint training has been conducted for the workforces of individual institutions and agencies in the healthcare coalition.

Exercises and dynamic improvement: Healthcare coalition institutions and agencies jointly exercise EOPs.

- Joint exercises have been conducted based on coalition planning and training.
- Drills and full scale exercises are held in coordination with local and/or state or territory emergency management agencies.
- Unannounced drills are used for assessment.
- Evaluations and AARs are conducted following drills, exercises, and actual events; and the findings are incorporated into a corrective action plan.
- The Homeland Security Exercise and Evaluation Program (HSEEP) model for exercise evaluation is used.

II. Situational Awareness and Communications

Situational awareness: Systems are in place that provide the healthcare coalition with situational awareness during a disaster.

- The healthcare coalition serves as an information clearinghouse for healthcare institution data (eg, patient load, bed availability, and inventory of assets).
- The coalition provides healthcare situational awareness information to the state and local ICS.
- The coalition provides healthcare institutions with information from the state and local ICS.
- The coalition provides expert medical advice to government authorities.
- Situational awareness systems are tested during incidents, exercises, and drills.

Communications: Reliable, redundant, and interoperable communication systems (plans and equipment) among member institutions and agencies are operational and linked to state and local emergency management and incident command.

- The communication plan uses a multi-agency coordination center or mechanism to exchange information, track resource requests and allocations, and interface with appropriate state and local emergency operations centers (EOCs) and key private sector response partners.
- Internet-based systems exist for tracking patients and assets, and they are linked to similar systems in other communities.
- Redundant non-Internet-based communications systems exist for the coalition.
- Redundant two-way communication links exist to the state and local ICS and other key agencies.

III. Management of Staff, Supplies, and Equipment

Surge capacity: The healthcare coalition has planned for the development of surge capacity with defined procedures and authorities for matching patient load with available resources. Procedures are in place for recruiting, credentialing, training, and deploying volunteer healthcare workers.

- Plans exist for the use and function of Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP).
- Coordination exists with local Medical Reserve Corps (MRC) units.
- Plans exist for use of DMATs through NDMS.
- Joint purchasing agreements exist to ensure interoperable supplies and equipment.
- Standards exist for and training is conducted on interoperable equipment and communication systems.

IV. Healthcare for Affected Populations

Allocation of scarce resources: The healthcare coalition has developed coordinated decision making processes for the allocation of scarce resources, including the following:

- Use of local, tribal, regional, and national bed capacity and the appropriate distribution of patients
- Distribution of scarce resources
- Use of situational awareness to guide crisis standards when appropriate
- Evacuation and institution of disaster transport standards of care
- Management of fatalities
- Identification and operation of alternate care sites and mobile medical assets in conjunction with state, local, and tribal authorities
- Management and distribution of care of concerned individuals seeking evaluation for potential effects of a disaster.

Summary

Determining the capability and functionality of healthcare coalitions in communities across the country is essential for assessing progress toward national preparedness for catastrophic health events.

Assessment of healthcare coalitions is essential because a large mass casualty event will likely require the cooperation of multiple healthcare institutions, EMS, emergency management agencies, and public health agencies; response to a CHE will require regional collaboration and the response of multiple coalitions.

Assessment criteria for individual healthcare facilities in the *Descriptive Framework*, HPP guidance, and Joint Commission Emergency Management Standards have many similarities and should serve as the basis for ongoing evaluation. Several measurement tools to apply assessment criteria will be necessary, such as self-assessment surveys, structured AARs, site visits, and structured interviews (See Table 2). The assessment of progress toward healthcare preparedness requires evaluation of all tiers of the healthcare response structure, and no single set of criteria or metrics is appropriate for assessing capabilities and performance of all components in the tiers of the healthcare response system.

Table 2: Tools Available to Assess Progress toward Preparedness for Hospitals, Healthcare Coalitions, and States

Entity	Assessment Criteria	Measurement Tool	Reporting Mechanism
Individual Healthcare Facilities	• *Descriptive Framework* • HPP Guidance • Joint Commission Emergency Management Standards	• Self assessment surveys • Structured AARs of exercises • Agency for Healthcare Research and Quality (AHRQ) evidence based metrics • Joint Commission site visits • HPP (evaluation section or regional emergency coordinators) structured interviews	• Existing reports to state HPP coordinator • Proposed HPP structured interview reports • Joint Commission accreditation report
Healthcare Coalitions	• Joint Commission standards for planning and drills with multiple institutions • HFPP and ECP guidance • *Provisional Assessment Criteria*	• Self-assessment surveys • Structured AARs of coalition wide exercises • Expanded HPP reports to include elements of *Provisional Assessment Criteria*	• Existing reports to state HPP • Proposed HPP structured interview/site visit reports • Joint Commission accreditation report: community activity
States	• % of hospitals in states participating in HPP • % of hospitals in states participating in coalitions • % of hospital compliance with performance standards (summary of individual hospital reports)	• State report card • HPP state reporting requirements	• Reports to national HPP

Appendix C. Existing Systems for CHE Response

Existing Systems for National Response to a CHE

Over the past decade, many federal, state, tribal, territorial, and local government agencies have made substantial investments of money, time, and resources to improve the U.S. healthcare preparedness and response infrastructure. The following is a broad overview and discussion of the major response mechanisms likely to be employed in response to a CHE. It is provided as context for this report and to illustrate the extent and limits of the nation's capabilities. This review is not comprehensive in scope—its focus is specifically on structures or organizations that have a well defined role in the healthcare response to a CHE. Furthermore, while the contents of this review are current as of this report's publication date, the disaster response landscape is evolving continuously, so the response mechanisms described here may also change.

I. Organization of the Federal CHE Response

The National Incident Management System: NIMS is the guiding all-hazards response management system for all levels of government.[49] This system provides a standard set of processes and terminology for organizing and managing response to an incident, regardless of size or geographic location. Responders trained in NIMS should know how to execute a local response and how to escalate that response up the chain of command to a sub-state regional, state, interstate, and federal response if necessary. All emergency management professionals and traditional first responders (ie, fire, police, and emergency medical services) are trained in NIMS, as are many representatives in public health agencies. NIMS has only recently been applied to the healthcare system, the culture of which has historically been less hierarchical than first responder agencies. This system is still a relatively new concept for the healthcare sector, which, for the most part, is made up of private organizations. Nonetheless, hospitals and other healthcare organizations now have employees trained in NIMS, and progress is being made, in large part due to the NIMS training requirement HPP grant guidance.

National Response Framework: NRF is an all-hazards framework that builds upon NIMS by describing federal roles and assets used during large incidents that require a federal response.[50] Under the NRF, ultimate authority rests within the White House. Operational and logistical actions will be coordinated by a lead federal agency that will be determined by the nature of the disaster. The NRF also illustrates the process for requesting federal assistance in a disaster and some basic high-level response actions that state and federal agencies should take in anticipation of and in response to a disaster. While the NRF does provide a high-level framework for response, it does not provide operational details for healthcare response to a disaster or CHE.

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49 U.S. Department of Homeland Security. *National Incident Management System.* December 2008. http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf. Accessed October 14, 2009.

50 U.S. Department of Homeland Security. *National Response Framework.* January 2008. http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf. Accessed October 14, 2009.

Emergency Support Function: (ESF)-8 is the component of the NRF that describes federal planning for the public health and medical response to a CHE.[51] Under ESF-8, the HHS is identified as the lead federal agency. Within HHS, ASPR is charged with the coordination of the response. In addition to HHS, 14 other federal agencies have a supporting role under ESF-8 and may contribute resources as the situation dictates. In the event of a CHE, the federal government, through HHS, is responsible for coordinating federal support to state and local authorities in the following core functional areas:

- Assessment of public health/medical needs
- Health surveillance
- Medical care personnel
- Health/medical/veterinary equipment and supplies
- Patient evacuation
- Patient care
- Safety and security of drugs, biologics, and medical devices
- Blood and blood products
- Potable water/wastewater and solid waste disposal
- Food safety and security
- All-hazard public health and medical consultation, technical assistance, and support
- Behavioral health care
- Agriculture safety and security
- Public health and medical information
- Vector control
- Mass fatality management, victim identification, and decontaminating remains
- Veterinary medical support
- Medical surge capacity and capability

Medical Surge Capacity and Capability Framework: HHS released the MSCC Framework in September 2007.[52] This management system pertains specifically to the healthcare response for mass casualty and catastrophic events. The MSCC is specifically designed to be integrated with NIMS, and is based on a framework of 6 coordination and response tiers, as illustrated in the figure below.

It should be noted that the resources of a lower tier do not have to be exhausted before a request for assistance can be made to a higher tier. Because of a CHE's extraordinarily destructive nature, the management of these events will likely necessitate a rapid escalation to Tier 6 of the MSCC structure. A recent update to the MSCC—the Tier 2 handbook—focuses specifically on healthcare coalitions.[53]

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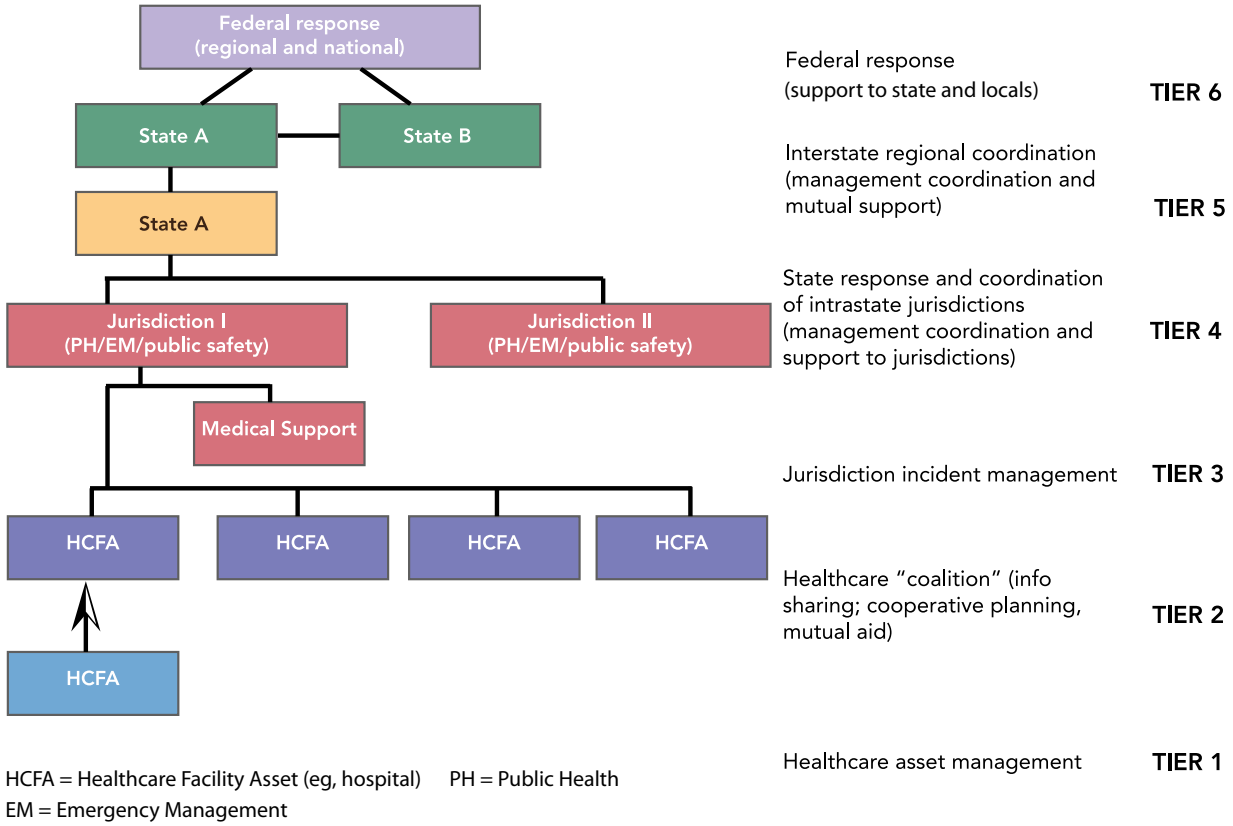
51 U.S. Department of Homeland Security. *National Response Framework – Emergency Support Function 8.* January 2008. http://www.fema.gov/pdf/emergency/nrf/nrf-esf-08.pdf. Accessed October 14, 2009.

52 U.S. Department of Health and Human Services. *Medical Surge Capacity and Capability Handbook, 2nd ed.* September 2007. http://www.hhs.gov/disasters/discussion/planners/mscc/. Accessed September 14, 2009.

53 U.S. Department of Health and Human Services. *Medical Surge Capacity and Capability: The Healthcare Coalition in Emergency Response and Recovery.* Prepared for HHS Under Contract # HHSP23320064154EB. May 2009.

Figure 2. HHS Medical Surge Capacity and Capability (MSCC) Framework



Homeland Security Presidential Directive (HSPD)-21: In October 2007, the White House issued HSPD-21, which called for an enhanced medical and public health response capability that could protect the health and well being of American people to the greatest extent possible.[54] To this end, HSPD-21 focuses primarily on development of 4 response capabilities:

- Biosurveillance system capable of identifying the occurrence of a biological attack or naturally occurring disease outbreak.
- System for stockpiling and distributing medical countermeasure to provide large populations with vaccination, prophylaxis, or treatment "within 48 hours of the decision to do so."
- "Disaster medical capability that can immediately re-orient and coordinate existing resources within all sectors to satisfy the needs of the population during a catastrophic health event."
- Plan to promote building "resilient communities."

54 The White House. *Homeland Security Presidential Directive 21: Public Health and Medical Preparedness.* October 18, 2007. http://www.dhs.gov/xabout/laws/gc_1219263961449.shtm#1. Accessed November 12, 2009.

National Disaster Medical System: NDMS is a federal medical response system administered by ASPR. NDMS currently includes 3 major response components: (1) a mobile medical asset component comprising approximately 80 mobile medical response teams (including approximately 50 DMATs) that are deployed rapidly to provide personnel and equipment and supplies sufficient to sustain operations for 72 hours; (2) a patient evacuation component, utilizing military transport, led by the U.S. Department of Defense's (DoD) USTRANSCOM; and (3) a definitive care component, comprising private, VA, military, and public hospitals around the country that voluntarily contribute a virtual number of staffed beds to NDMS to accommodate patients evacuated from a disaster area.[55]

NDMS is a core component of the planned federal response to CHEs, but its assets are limited. DMAT and other NDMS deployable teams are staffed by working medical professionals. A majority of the DMATs are trained in general triage and disaster care and are supplemented by a few DMATs trained in specialties such as burn care and crush injuries. For the most part, DMATs are deployed to a disaster site with general disaster training and only enough equipment to last for 72 hours on their own. Therefore, NDMS teams have very limited capacity for providing inpatient-like care. However, these teams have proven to be important assets for performing triage and providing basic care to disaster victims if they arrive to the affected area in time. In a national disaster, NDMS teams are deployed for 2-week intervals, and their equipment and supplies can be supplemented by other federal medical assets, such as Federal Medical Stations (FMS) from the Strategic National Stockpile (SNS). An FMS is "a cache of medical supplies and equipment that can be used to set up a temporary non-acute medical care facility. Each FMS has beds, supplies, and medicine to treat 250 people for up to 3 days."[56]

The vast majority of NDMS patient transport assets for a national disaster are provided through DoD's USTRANSCOM.[57] However, it takes time for these transportation assets to arrive at the scene of a domestic disaster—days to weeks depending on available resources and circumstances. Transport assets depend on the availability of military vehicles and personnel. Patients are transported mainly via military fixed wing aircraft that must be converted to accommodate acutely ill patients, and there are a limited number of military personnel who are trained to care for patients in flight. Because of these limitations, only small numbers of acutely ill patients can be transported by this method each day. NDMS also holds a contract with the CRAF to make commercial aircraft available to the government in an emergency.[58] However, this contract does not include provision of medical personnel, and converting commercial planes into planes configured for aero-medical transport, as contracted, may take days to weeks to accomplish. Reliance on the CRAF is further complicated by the findings of a recent U.S. Government Accountablilty Office (GAO) report, that noted, "although DOD depends on CRAF charter

55 National Disaster Medical System website. U.S. Department of Health and Human Services. http://www.hhs.gov/aspr/opeo/ndms/index.html. Accessed October 13, 2009.

56 U.S. Centers for Disease Control and Prevention. Division of Strategic National Stockpile. Federal Medical Station Profile. http://www.texasjrac.org/documents/FMSfactsheetv3-1.pdf. Accessed October 13, 2009.

57 Department of Defense. *Department of Defense Directive: National Disaster Medical System (NDMS).* January 21, 2003. http://www.dtic.mil/whs/directives/corres/pdf/601022p.pdf. Accessed October 13, 2009.

58 U.S. Air Force. *Civil Reserve Air Fleet Factsheet.* July 2007. http://www.af.mil/information/factsheets/factsheet.asp?id=173. Accessed October 13, 2009.

passenger aircraft to move more than 90 percent of its peacetime needs, there has been nearly a 55 percent decline in this CRAF capacity since 2003."[59]

Stafford Act: Managing a CHE will quickly overwhelm the resources of local, state, and regional authorities. As part of a broader request for federal assets, a governor's office can make a request for federal aid through the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Stafford Act),[60] which provides the statutory authority for most federal disaster response activities. The Stafford Act authorizes the president to issue major disaster or emergency declarations in order to provide specific federal aid for response to incidents that overwhelm the capabilities of local and state governments. Under a major disaster declaration, the president may provide, without a cost ceiling, a wide range of aid. Aid may include the assistance of federal agencies, coordination of assistance, and/or distribution of supplies. An emergency declaration offers more limited assistance than a major disaster declaration (eg, a limit of $5 million, unless the president determines otherwise and notifies Congress). A Stafford Act declaration may also be a necessary step in the authorization of certain types of federal medical responses, such as waiving sanctions for noncompliance with Emergency Medical Treatment and Active Labor Act (EMTALA).

National Healthcare Preparedness Program: Established by the HHS in 2002, the goal of the National Healthcare Preparedness Program (previously called and still referred to as the Hospital Preparedness Program [HPP]) is to enhance the ability of hospitals and healthcare systems to prepare for and respond to bioterrorist attacks and other public health emergencies, including an influenza pandemic and natural disasters. Current HPP priorities include strengthening hospital capabilities in the areas of interoperable communication systems, bed tracking, personnel management, and planning for fatality management and hospital evacuation. Past accomplishments have included developing and advancing bed and personnel surge capacity, decontamination capabilities, and isolation capacity; the purchase and stockpiling of pharmaceutical supplies; and training, education, drills, and exercises.[61] The NHPP as it has been structured to date has focused on preparedness and has not had a major role in response.

Public Health Emergency Preparedness Program: In 2002, Congress authorized funding for PHEP, to be administered by the CDC. PHEP provides funding to support preparedness and response activities in state, local, tribal, and territorial public health departments across the nation. These grants allow for an enhanced public health response to a variety of public health events, including terrorist attacks, infectious disease outbreaks, and natural disasters, as well as biological, chemical, nuclear, and radiological emergencies. These efforts to create emergency-ready public health departments support the NRF and the NIMS. In FY2009, $688,914,546 was made available to upgrade the preparedness of public health jurisdictions.[62] Accomplishments of the PHEP include an increased number of laboratories able to detect top priority biological weapons agents, up from 83 in 2002 to 150 in 2008, and a doubling

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59 U.S. Government Accountability Office. *DoD Should Take Steps to Strengthen Management of the Civil Reserve Air Fleet Program.* September 2009. www.gao.gov/highlights/d09625high.pdf. Accessed October 13, 2009.

60 U.S. Department of Homeland Security. *Overview of Stafford Act Support to States.* January 2008. http://www.fema.gov/pdf/emergency/nrf/nrf-stafford.pdf. Accessed October 14, 2009.

61 Center for Biosecurity of UPMC. *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward.* Prepared for the U.S. Department of Health and Human Services under Contract No. HHSO100200700038C. 2009.

62 Marquez M, Patel P, Raphael M, et al. The danger of declining funds: Public health preparedness in NYC. *Biosecur Bioterror.* 2009;7(3):337-345.

of the number of epidemiologists in public health departments working in emergency response (from 115 in 2001 to 232 in 2006). Additionally, all 50 states and the District of Columbia have staff trained in their roles and responsibilities during an emergency, and all state health departments have staff on call continuously. Only 12 states had these capabilities in 1999.[63]

Strategic National Stockpile: The SNS is one of the most tangible federal assets.[64] This large inventory of medical countermeasures and related medical equipment is managed by the CDC, and its supplies are intended to supplement and resupply state and local public health agencies in the event of a large scale disaster. SNS inventory includes antibiotics, antitoxins, vaccines, critical care medications, airway management equipment, and intravenous administration supplies. The SNS is not held in a central location; rather, it is divided into separate caches that are located strategically across the nation to facilitate the rapid delivery (within 12 hours) of prepackaged assets (aka "push packs") to affected states. A sustained supply of event specific supplies may follow. In addition to the directly held stockpile, the SNS coordinates with pharmaceutical and medical equipment manufacturers to maintain a vendor managed inventory (VMI). With both inventories, the SNS has sufficient assets to "protect people in several large cities at the same time."

The deployment of the SNS is an exercise in cross-jurisdictional interaction and cooperation. When a governor's office requests SNS assets, CDC triages that request and may deploy assets to that state. After the shipment has been made, it is the responsibility of state and local officials to distribute the supplies to the scene of the CHE. It should be noted that it is not necessary for a state's pharmaceutical supplies to be exhausted before a request for federally held assets can be made. For example, the federal government has "leaned forward" assets in anticipation of a request from a governor's office.

Federal Ambulance Contract: In August 2007, FEMA awarded a Federal Ambulance Contract to a privately owned emergency services provider, American Medical Response (AMR), to augment local EMS capacity during a CHE.[65] AMR has agreed to respond to public health emergencies in 21 states in the Gulf and Atlantic coast regions (contractual details allow for response in the remaining states on an as-needed basis). The contract calls for a transport capacity of up to 600 ground ambulances, 50 air ambulances, and low acuity "para-transit" for up to 7,000 individuals. In addition to patient transport, AMR personnel will provide triage and treatment and will redistribute stable patients to outlying facilities to decompress hospitals that are in close proximity to the site of the CHE. The identification, coordination, dispatch, and transit of responding units will require 1 or more days from the time assets are requested to their arrival at the scene of the CHE. In addition, these ambulances are in use daily in various communities. In order to respond, AMR will have to suspend normal operations and engage subcontractors to provide coverage for the regions they serve.

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63 Vanderwagen WC. Testimony before the Committee on Homeland Security, United States House of Representatives. July 22, 2008. http://www.hhs.gov/asl/testify/2008/07/t20080722a.html. Accessed November 25, 2009.

64 Strategic National Stockpile website. U.S. Centers for Disease Control and Prevention. March 2009. http://www.bt.cdc.gov/stockpile/. Accessed October 14, 2009.

65 FEMA awards AMR disaster response contract [news release]. Greenwood Village, CO: American Medical Response; August 2, 2007. http://www.amr.net/getattachment/db8ebec5-054a-4d72-82c2-e830640cb8ad/FEMA-Awards-AMR-Disaster-Response-Contract.aspx. Accessed October 14, 2009.

CBRNE Consequence Management Response Force: United States Northern Command (NORTHCOM), DoD's organizational structure for operations within the U.S., has established a chemical, biological, radiological, nuclear, and explosive (CBRNE) Consequence Management Response Force (CCMRF). When fully implemented, this force will comprise 1 unit of approximately 4,500 troops, drawn from all branches of the military, with the mission of providing military support to civilian response operations in the event of a large scale disaster. Once an incident has been confirmed, these units will be deployed and arrive at the disaster site within 48 to 96 hours. Their capabilities include search and rescue, biological agent detection and identification, emergency medical care, and decontamination. While the added manpower and resources will be of use during the response to a CHE, a recent GAO report noted that the DoD response effort is not well integrated with civilian response plans.[66]

III. State, Tribal, and Local Response Structures, Programs, and Resources

Under the NRF, responsibility for disaster preparedness and response efforts rests primarily with local authorities. Additionally, the concept of a tiered response requires that an event is managed at the lowest possible level. As a result, building an equally robust local response capability remains a priority and an ongoing process for communities across the country.

Most federal preparedness grants, including the HPP, require that public health and emergency management officials at the state and local levels conduct individual hazard vulnerability analyses as a condition of funding. Based on the threats identified by the (HVAs), plans are then made in an effort to prepare for a prompt and efficacious disaster response. The following graphic from FEMA's *Comprehensive Preparedness Guide* [67] illustrates FEMA's vision of how federal, state, tribal, and local planning efforts would be integrated.

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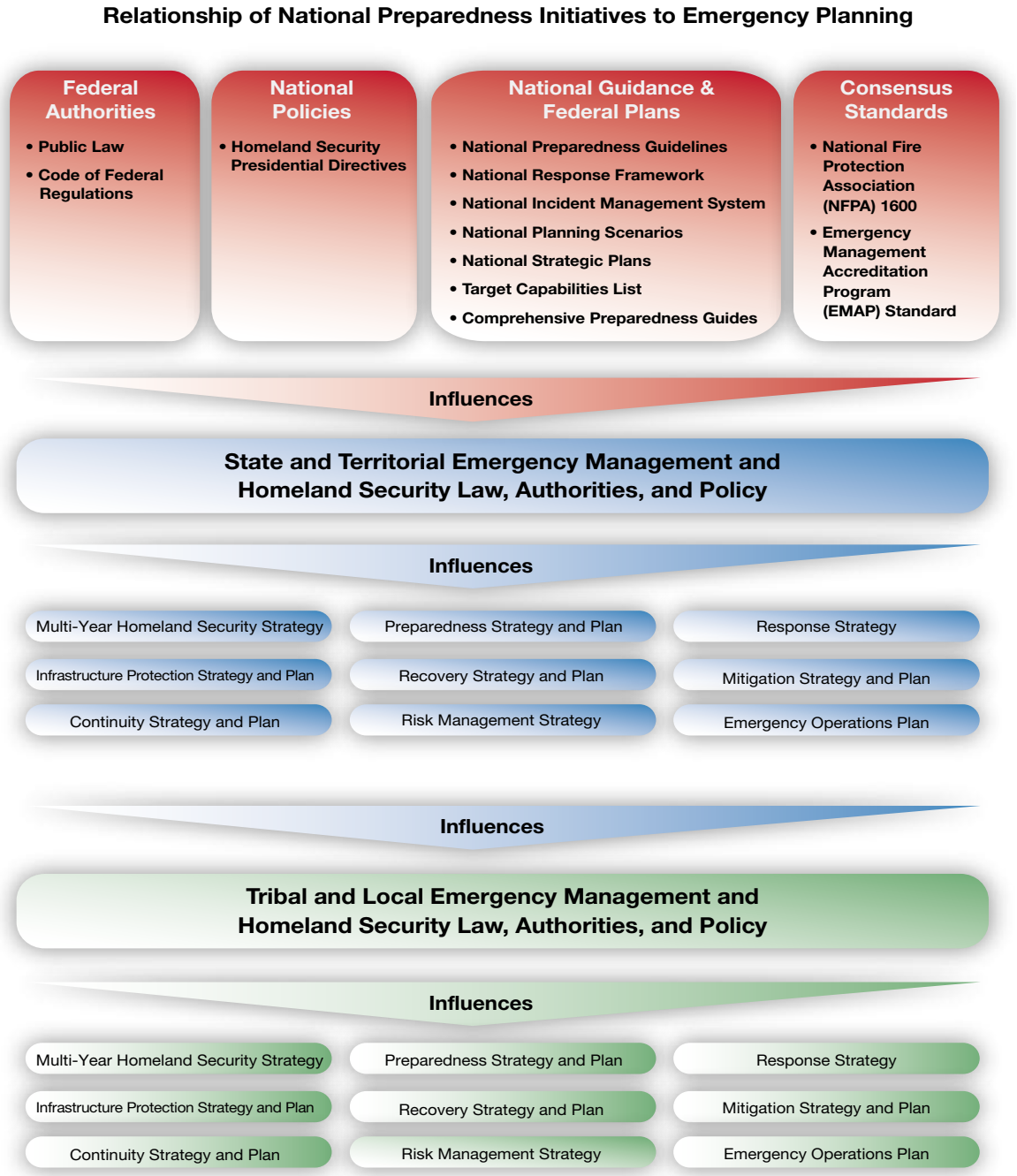
66 U.S. Government Accountability Office. *Planning, Resourcing, and Training Issues Challenge DoD's Response to Domestic Chemical, Biological, Radiological, Nuclear and High-Yield Explosive Incidents.* October 2009. http://www.gao.gov/products/GAO-10-123. Accessed October 14, 2009.

67 U.S. Department of Homeland Security. Federal Emergency Management Agency. *Comprehensive Preparedness Guide 101*. March 2009. http://www.fema.gov/about/divisions/cpg.shtm. Accessed January 22, 2010.

Figure 3. FEMA Comprehensive Preparedness Guide Illustration of National Preparedness Initiatives and Their Relationship to Ongoing Emergency Planning



U.S. Department of Homeland Security Federal Emergency Management Agency. *Comprehensive Preparedness Guide: Developing and Maintaining State, Territorial, Tribal, and Local Government Emergency Plans.* March 2009. Page 4-3. http://www.fema.gov/pdf/about/divisions/npd/cpg_101_layout.pdf. Accessed January 21, 2010.

Metropolitan Medical Response System: MMRS is designed to enhance local medical response capabilities in major cities during a disaster until state and federal resources become available. The MMRS is unique in that it is one of few currently operating disaster response systems that pre-dates the 2001 terror attacks. It was originally developed in the National Capital Region (NCR) and 29 other cities in the mid-1990s, following 2 separate terrorist attacks: Aum Shinrikyo's sarin gas attack on a Tokyo subway, and the Oklahoma City bombing. MMRS grew by approximately 25 cities each year from 1999-2002. By 2002, the MMRS was established in 124 of the nation's most populous cities. The system is currently administered by the DHS through FEMA and is funded through the Homeland Security Grant Program (HSGP).[68] MMRS activities are intended to be coordinated with CDC PHEP and ASPR NBHPP grant activities. Participation from all sectors is expected, including first responders, fire departments, Public Health, Emergency Management, law enforcement, and medical and mental health services.

Medical Reserve Corps: Following the 2001 attacks on the World Trade Center and the Pentagon, an influx of volunteers, some of whom had medical training, responded to those locations independent of traditional first responders to offer aid. However, much of the help they offered was turned away due to an inability to verify a volunteer's identities and/or skills. Recognizing the potential contributions of nontraditional responders that include physicians, nurses, and public health professionals, the Office of the Surgeon General, in 2002, established the MRC.[69] An MRC unit is a community-based organization that recruits, organizes, trains, and certifies (often through the ESAR-VHP) medical volunteers who work to improve the health and safety of the community throughout the year, and who can be deployed to the scene of a disaster in order to augment medical staffing. To date, the MRC comprises 856 units and 188,863 volunteers.[70] The skill level of many volunteers is variable because many MRC participants are retired healthcare professionals and others are lay persons. It is also unclear how many of these volunteers have experience providing care outside of the hospital environment.

National Guard and Expeditionary Medical Support: The NG is a disaster response resource available to all state governments. As an institution, the NG's mission has varied throughout its history. Its current responsibilities include assistance in the medical response to a domestic disaster. The NG's primary medical response asset is the Expeditionary Medical Support (EMEDS).[71] EMEDS is a scalable medical response capability used primarily to stabilize soldiers in the field prior to transport to definitive care. During the response to a CHE, EMEDS would serve the same purpose. EMEDS is organized into the following units:

- **Small Portable Expeditionary Aerospace Rapid Response (SPEARR):** 12 medical providers, 1 tent, and associated equipment; appropriate for a population at risk (PAR) of up to 500; provides rapid response; used primarily to gain situational awareness.
- **EMEDS Basic:** 28 medical providers, 3 tents, and additional equipment; PAR = 500 to 2000; located in every state, Washington, DC, and Puerto Rico.

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68 FY 2009 Homeland Security Grant Program webpage. U.S. Department of Homeland Security. June 2009. http://www.fema.gov/government/grant/hsgp/index.shtm. Accessed October 14, 2009.

69 Middleton G. Medical Reserve Corps: Engaging volunteers in public health preparedness and response. *Biosecur Bioterror.* 2008;6(4):359-360

70 U.S. Surgeon General. Medical Reserve Corps website. http://www.medicalreservecorps.gov/HomePage. Accessed October 14, 2009.

71 U.S. National Guard. *EMEDS Factsheet.* February 2009. http://www.ng.mil/media/factsheets/EMEDS.pdf. Accessed October 14, 2009.

- **EMEDS 10:** 57 medical providers, 6 tents, and additional equipment; PAR = 2000 to 3000; 17 units located throughout the U.S., at least 1 per FEMA region; these units are known as chemical, biological, explosive, radiological, nuclear, and high-yield explosive Enhanced Response Force Packages (CERFP). They specialize in search and rescue, decontamination, and medical operations.
- **EMEDS 25:** 84 medical providers, 9 tents, and additional equipment; PAR = 3000 to 5000; EMEDS 25+ package can provide care for up to 25 medical and surgical inpatients. Three existing units based in the mid-Atlantic, midwest, and Pacific Northwest regions. Five additional units are planned.

The Emergency Management Assistance Compact: EMAC is a mutual aid agreement among states that facilitates cooperation and resource sharing during a disaster.[72] The legal framework provided by an EMAC agreement allows for an improved regional response capability when the resources of one state have been overwhelmed by a CHE. In locations where healthcare coalitions cross state lines, EMAC agreements have been integrated into preparedness planning, as they offer a mechanism to permit the sharing of scarce resources.

Healthcare Coalitions: An important outcome of recent preparedness efforts has been the development of healthcare coalitions of hospitals and public health and emergency response agencies that are beginning to work together in some locations to plan for and respond to mass casualty events. These healthcare coalitions currently embody a range of structures, membership, and functional capacities, but several core functions critical to preparedness are shared by the most successful coalitions.[73]

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72 EMAC website. National Emergency Management Association. http://www.emacweb.org/. Accessed October 14, 2009.

73 Center for Biosecurity of UPMC. *Hospitals Rising to the Challenge: The First Five Years of the U.S. Hospital Preparedness Program and Priorities Going Forward.* Prepared for the U.S. Department of Health and Human Services under Contract No. HHSO100200700038C. 2009.

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