Bioterrorism
and Health System Preparedness

Developing Alternative Approaches to Mass Casualty Care:

The Role of the Agency for Healthcare Research and Quality

The Agency for Healthcare Research and Quality (AHRQ) is the lead agency charged with supporting research designed to improve the quality of health care, reduce its cost, address patient safety and medical errors, and broaden access to essential services. AHRQ sponsors and conducts research that provides evidence-based information on health care outcomes; quality; and cost, use, and access. The information helps health care decisionmakers—patients and clinicians, health system leaders, and policymakers—make more informed decisions and improve the quality of health care services.

> *Surge capacity is "a health care system's ability to expand quickly beyond normal services to meet an increased demand for medical care."*

A bioterrorist attack, a naturally occurring disease outbreak, or some other large-scale public health emergency all have the potential to result in enough casualties to overwhelm patient care resources. In response to that threat, health care organizations and systems at the local, regional, State, and Federal levels have taken steps to develop surge capacity, which is defined by the U.S. Department of Health and Human Services (HHS) as "a health care system's ability to expand quickly beyond normal services to meet an increased demand for medical care." Within HHS, the Agency for Healthcare Research and Quality has

been assigned responsibility for developing and assessing alternative approaches to ensuring health care surge capacity for mass casualty events.

Background

HHS has developed a Department-wide strategic plan to delineate priorities and assign responsibilities for bioterrorism preparedness. The Office of the Assistant Secretary for Public Health and Emergency Preparedness (OASPHEP) is responsible for coordinating and directing the Department's emergency preparedness and response programs, including antibioterrorism efforts. The HHS agencies with the most national visibility in bioterrorism preparedness are the Centers for Disease Control and Prevention (CDC) and the Health Resources and Services Administration (HRSA). The National Institutes of Health and the Food and Drug Administration also play key roles.

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The Agency for Healthcare Research and Quality (AHRQ) has been working steadily since 2000 to sponsor research that provides the evidence base for tools and resources needed for bioterrorism planning and response. AHRQ has funded more than 50 research projects, workshops, and Web conferences. Based on HHS priorities, AHRQ-sponsored research in 2004 focused on health system preparedness for surge capacity and in 2005 focused on mass casualty care. This Issue Brief reviews AHRQ's research on mass casualty care.

Planning

Health system preparedness for mass casualty care requires exceptional planning and coordination among health systems at the local, State, and regional levels. The projects described here are major contributions to that effort.

The Rocky Mountain Regional Care Model for Bioterrorist Events

This model was developed under a contract with Denver Health and its partners in AHRQ's Integrated Delivery System Research Network (IDSRN). The model was developed specifically for Federal Region VIII (Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota), but can be used by other States as well. The report is available on the AHRQ Web site at http://www.ahrq.gov/research/altsites.htm. Key parts of the report have been modified to be used as examples by other regional, State, and local public health agencies. Those tools are available on the Denver Health Web site at www.denverhealth.org/bioterror/Tools.htm.

Profile of Regional Medical Resources is a comprehensive inventory of the medical resources available in the region. Included are medical care facilities (number, type, location, and total physical beds of hospitals in the region); medical care providers (physicians, physician assistants, nurse practitioners, registered nurses, licensed practical nurses, and respiratory therapists); and hospital resources and infrastructure (including personal protective equipment, negative airflow isolation rooms, isolation beds, and decontamination capability). The tool provides an example of a methodology and includes citation of resources that are available to all States.

Supply and Staffing Options for an Alternative Care Site is predicated on the assumption that situations involving mass casualties will require either augmentation to a hospital's patient medical resource capacity or establishment of an alternative site for care. Lists for three levels of supplies are provided: a hospital augmentation cache (50-bed unit); a regional alternative site cache of medical supplies for a 500-bed unit; and a comprehensive cache, including equipment and supply lists, for a 50-bed alternative care site. A table on staffing requirements for a 50-bed alternative care site provides the minimum number of staff required per 12-hour shift for three types of events: infectious, noninfectious, and quarantine.

Two other resources are appended to the *Supply and Staffing* tool. One addresses oxygen supply options. A supply of oxygen is critical if the agent involved affects the respiratory tract (e.g., smallpox, anthrax, pneumonic plague, hemorrhagic fevers, ricin). Any

possible solution to a deployable oxygen supply, however, is both complex and costly. This appendix presents the issues that must be addressed. The second appendix is a collection of draft gubernatorial orders that were developed by the Colorado Department of Public Health and Environment to address health care licensing and other legal issues that would arise in the event of a mass casualty situation.

To provide a tool that can quantitatively predict the best choice for an alternative care site, the Denver Health project developed the Alternative Care Site Selection Matrix. This tool is available in a Web version and an Excel spreadsheet. The Matrix helps identify the strengths and weaknesses of possible alternative care sites (such as a school, stadium, recreation center, or armory) in a geographic area.

The fourth tool, Regional Measures of Preparedness, takes data collected using the Profile of Regional Medical Resources and the Supply and Staffing tools and compares them with established benchmarks created by HRSA and others. Measures of preparedness include additional hospital beds, medical staff, equipment, and infrastructure. The tool provides examples of measures and the methodology for developing them that can be replicated by other States and regions.

Models for Emergency Preparedness: Personal Protective Equipment, Decontamination, Isolation/Quarantine, and Laboratory Capacity

Planning for response to a bioterrorism event or other public health emergency

must include the equipment and facilities to accommodate the surge in patient loads. Science Applications International Corporation (SAIC) developed models for personal protective equipment, decontamination, isolation/quarantine, and laboratory capacity to serve as evidence-based user tools for operational planning based on best-demonstrated practices.

> *The preparedness plan should be tailored to the community, be communicated to the community, and involve both the health system and emergency providers.*

Development of each model took into consideration factors such as:

▲ adaptability for use in different regions of the country and in different settings (e.g., urban vs. rural);

▲ cost, including supplies, logistics, and training;

▲ level of training required;

▲ resources required, including whether the model could be built using existing practices and infrastructure;

▲ impact on morbidity and mortality; and

▲ regulatory compliance.

This report is available on the AHRQ Web site at http://www.ahrq.gov/research/devmodels/. A common thread in the findings is the importance of the community in emergency preparedness. The preparedness plan should be tailored to the community, be communicated to

the community, and involve both the health system and emergency providers.

Building Blocks for Mass Prophylaxis

One of the first projects funded by AHRQ in 2000 was the development by Weill Medical College of Cornell University of a computer simulation model for planning a citywide response to a bioterrorist attack. Four additional products funded by AHRQ have grown or are growing out of that original model:

▲ *Community-Based Mass Prophylaxis: A Planning Guide for Public Health Preparedness* (http://www.ahrq.gov/research/cbmprophyl/cbmpro.htm) explains in detail the components a community must have in place to prepare for mass prophylaxis.

▲ *Bioterrorism and Epidemic Outbreak Response Model (BERM)* (http://www.ahrq.gov/research/biomodel.htm), a companion tool to the Planning Guide, is an interactive database that allows planners to calculate the numbers of facilities and staff they will need in their communities to administer mass prophylaxis.

▲ *The Regional Hospital Caseload Calculator* (in process) starts with the community's capability to administer mass prophylaxis and computes the number of people who can be reached daily with prophylaxis and the number who will become ill and require hospitalization.

▲ *Modeling U.S. Health System's Epidemic Response Capacity* (in process) will start with the capability to administer mass prophylaxis, add local hospital bed

capacity, and calculate pre-hospital response, hospital-based response, and the need for assistance from outside the region.

Taken together, these four tools constitute building blocks for community preparedness for mass prophylaxis.

Pediatric Preparedness for Disasters and Terrorism: A National Consensus Conference and Executive Summary

One concern of health system preparedness for surge capacity is providing care for special populations. AHRQ has taken a lead role in funding research for pediatric preparedness. Children comprise approximately 25 percent of the U.S. population, and more than 20 million of them are under the age of six. Thus, children should be included in any jurisdiction's preparedness plan.

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The specific elements of pediatric preparedness were developed at a conference in February 2003 that was funded by AHRQ, the Emergency Medical Services for Children Program in HRSA's Maternal and Child Health Bureau, and the Phoenix Foundation. The Execuitve Summary from Pediatric Preparedness for Disasters and Terrorism: National Consensus Conference provides the first and only set of pediatric emergency preparedness guidelines and treatment recommendations. The report also includes guidance for pre-hospital and hospital care, recommendations on

training, and specific guidance regarding numbers of equipment, numbers of providers, actual dosages, and treatment protocols across the range of possible disasters, terrorism, and other public health emergencies. The conference's executive summary can be found on the CDC Web site at http://www.bt.cdc.gov/children/pdf/working/execsumm03.pdf.

Reopening Shuttered Hospitals to Expand Surge Capacity

Researchers at Abt Associates and Partners Healthcare (Brigham and Women's Hospital and Massachusetts General Hospital) have developed a guidebook on the possible conversion of former inpatient hospitals into temporary facilities for low-acuity patients during a mass casualty event.

The report examines what closed and/or converted hospitals could potentially contribute in an emergency; and what would need to be done in advance to prepare to rapidly expand a hospital's surge capacity. Regulatory requirements and barriers are explored in an extensive appendix.

The report is accompanied by a Surge Tool Kit and a Facility Checklist for use in evaluating specific hospitals.

Training

Training has been one of AHRQ's priorities since the beginning of its bioterrorism preparedness program. Two projects relevant to training for mass casualty care are described here.

Bioterrorism and Emerging Infections Web Site

Development of this Web site at the University of Alabama at

Birmingham was one of the first projects funded by AHRQ in 2000. The site offers nine online continuing education case-based modules and free continuing medical education (CME) credit. The tool helps users identify potential bioterrorist microorganisms, and common syndromes associated with emerging infectious diseases or bioterrorist agents and recognize an outbreak resulting from bioterrorism or from rare infectious diseases. The Bioterrorism and Emerging Infections Web site is available at http://www.bioterrorism.uab.edu/.

Evaluation of Hospital Disaster Drills: A Module-Based Approach

A critical focus for hospital disaster planning has been the use of drills to train employees in and to test aspects of hospital response. The evaluation modules provided by this tool, available at http://www.ahrq.gov/research/hospdrills/hospdrill.htm and designed by the Johns Hopkins University Evidence-based Practice Center, make it possible for planners to identify specific weaknesses for improvement and promote continuing efforts to strengthen hospital disaster preparedness. Modules cover topics such as incident command, decontamination, triage, and treatment

A module on training provides guidance on objectives, drill preparation, evaluator training, and other relevant issues. Pre-drill and debriefing sections are also provided.

Response

AHRQ has also funded the development of tools to facilitate response capability in a mass casualty incident.

Emergency Preparedness Resource Inventory (EPRI)

This Web-based tool developed by Abt Associates can be used to assemble an inventory of critical resources for response to bioterrorism and other emergencies. EPRI is intended to store and routinely update information from diverse service providers and responders in a region, especially a rural region, for both planning and incident response. Information includes available equipment, personnel, and supplies. The tool allows the host/administrator to specify what types of organizations to include, what types of resources, how often to update, who has access to various levels of inventory reports, and other parameters.

Use of the application requires a high-speed connection and a secure Web page to ensure confidentiality of the data. In addition to the software tool, the application includes an implementation report that explains the concepts and operation of the tool and describes lessons learned from the pilot test in an eight-county region in rural Pennsylvania. A technical manual summarizes the installation process and system functions.

Planners can use the tool to determine the variety of resources available in the region and to identify gaps in those resources. Incident response managers can use the tool to deploy resources in response to a particular incident. The tool and accompanying supporting documents are available on the AHRQ Web site at http://www.ahrq.gov/research/epri/.

Health Emergency Assistance Line and Triage Hub (HEALTH) Model

One of the key components of surge response is risk and crisis communication: informing the public of an emergency and of resources available to help them. Good communication reduces the number of "worried well"— people presenting to health care facilities who may not need to be seen. This allows hospital resources to be used more effectively to treat those who need them the most.

The *HEALTH Model* report describes how the Denver Health Medical Information Centers determined the requirements, specifications, and resources needed to develop a public health emergency contact center that is integrated with public health agencies.

The *HEALTH Contact Center Assessment Tool* assists agencies in developing the capabilities and functions of the *HEALTH Model.* This workbook contains step-by-step instructions for completing five component parts:

▲ *Contact Surge Calculator*—Provides a simple way to predict the volume of contacts (phone, Web site, e-mail, fax) that may be expected by a public health agency in a public health emergency.

▲ *Staffing/Resource Calculator*—Provides a simple way to determine personnel needed to handle a given number of contacts, based on industry standards. This tool will help agencies understand staffing and basic resource requirements for an internal contact center or hotline.

▲ *Capital & Technology Expense Calculators*—Help assess the facilities, technology, and equipment needed to handle a given number of contacts. These tools calculate the potential capital needed for resources not currently available and help agencies understand potential costs associated with an internal contact center or hotline.

▲ *Surge Options Matrix*—Provides a way to assess an agency's capabilities for implementing an emergency contact center or hotline and suggests options.

The report and tool are available on the AHRQ Web site at http://www.ahrq.gov/research/health/.

National Hospital Available Beds for Emergencies and Disasters (HAvBED) System

The *National Hospital Available Beds for Emergencies and Disasters (HAvBED)* System explores the feasibility of a national real-time hospital-bed tracking system to address a surge of patients during a mass casualty event. The model is an exportable system that allows Federal, regional, or State command centers to access standardized information across the entire Nation.

The model, developed by Denver Health and tested during the summer of 2005, is described and evaluated in a report at http://www.ahrq.gov/research/havbed/. The model collected and integrated data from existing reporting systems and from hospitals outside those systems that entered data via a secure Web site.

The report includes:

▲ A discussion of the components of the *HAvBED* System, including the communications protocol, database, and Geographic Information System.

▲ A virtual tour of the system.

▲ Standardized hospital bed definitions to provide uniform terminology for organizations tracking bed availability.

▲ Reviews of existing bed-tracking systems.

▲ Conceptual and technical recommendations.

The results in this report currently are being reviewed by Federal agencies and others to determine next steps in making the model operational.

Altered Standards of Care in Mass Casualty Events

Altered Standards of Care in Mass Casualty Events is the product of a 2004 meeting by AHRQ and OASPHEP. In that meeting, experts in the fields of bioethics, emergency medicine, emergency management, health administration, health law and policy, and public health addressed the possibility that a mass casualty event could compromise the ability of health systems to deliver services consistent with established standards of care. The full report is available on the AHRQ Web site at http://www.ahrq.gov/research/altstand/. The report's recommended action steps for planning and implementing health care during a mass casualty event provide a potential framework for future research:

▲ Develop general and event-specific guidance for allocating scarce health and medical care resources.

▲ Develop and implement a process to address non-clinical issues related to the delivery of health and medical care.

▲ Develop a comprehensive strategy for risk communication with the public.

▲ Identify, analyze, and consider modification of Federal, State, and local laws and regulations that may affect the delivery of health and medical care.

▲ Develop a means for verifying credentials of medical and other health personnel in advance and on site.

▲ Create strategies to ensure health and medical leadership and coordination for the health and medical aspects of system response.

▲ Continue and expand efforts to train providers and others to respond effectively.

▲ Develop and support a research agenda specific to health and medical care standards.

▲ Develop a Community-Based Planning Guide for Mass Casualty Care.

▲ Identify and support States, health systems, and regions to develop mass casualty and health and medical care response plans based on the Planning Guide and to share their results widely.

Web Conferences and Issue Briefs

AHRQ has sponsored a series of Web conferences focused on surge capacity and mass casualty care. Each Web conference includes presentations by AHRQ grantees and contractors who summarize projects in progress or recently completed. Other presentations are made by representatives of other Federal, State, and local government agencies and grantees involved in preparations for surge capacity and mass casualty care.

The conferences are available as streaming presentations and transcripts with presenter slides on the AHRQ Web site at http://www.ahrq.gov/browse/bioterbr.htm. They also are summarized as Issue Briefs, available on the site.

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