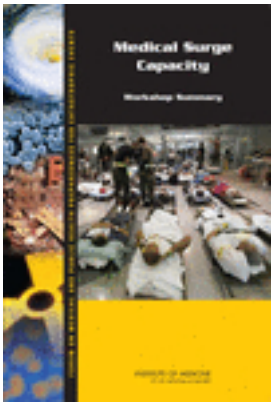

Medical Surge Capacity: Workshop Summary

Bruce M. Altevogt, Clare Stroud, Lori Nadig, Matthew Hougan, Rapporteurs; Forum on Medical and Public Health Preparedness for Catastrophic Events; Institute of Medicine

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Medical Surge Capacity

Workshop Summary

Bruce M. Altevogt, Clare Stroud, Lori Nadig,
Matthew Hougan, *Rapporteurs*

Forum on Medical and Public Health Preparedness for Catastrophic Events

Board on Health Sciences Policy

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Willing is not enough; we must do."
—Goethe

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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process. We wish to thank the following individuals for their review of this report:

Knox Andress, Louisiana Poison Center
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Lori Upton, Texas Children's Hospital

Although the reviewers listed above have provided many constructive comments and suggestions, they did not see the final draft of the report before its release. The review of this report was overseen by **Frederick M. Burkle, Jr.,** University of Hawaii. Appointed by the Institute of Medicine, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

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Workshop Summary[1]

INTRODUCTION

In June 2009 the Institute of Medicine's (IOM's) Forum on Medical and Public Health Preparedness for Catastrophic Events held a workshop with the goal of convening many of the best minds in health preparedness for a wide-ranging update on preparations for a major public health threat.

For the health community, a primary issue at hand before and during a catastrophic incident is how to provide care to thousands or tens of thousands of individuals through a health system that will go beyond capacity. Much work on this subject has been done, but responses to incidents continue to show that gaps in the system remain and further refinement is required. Some of the work is as simple as creating common language: defining medical surge capacity, and creating standards and metrics to guide planning so that the highest priority requirements can be addressed in a timely manner. Some of the work is blisteringly complex, such as developing data systems that reach across the boundaries of states and regions, public and private healthcare systems, and outside the healthcare environment into the work of emergency management organizations. How do the medical system, public health system, and emergency management system provide care to those who need it with limited resources and staff? How can facilities prepare to meet the surge

[1]The planning committee's role was limited to planning the workshop. The workshop summary has been prepared by the workshop rapporteurs as a factual summary of what occurred at the workshop.

and, simultaneously, what procedures, policies, and planning can be done to reduce the requirement to surge?

Coincident with the second day of the workshop, the World Health Organization officially declared the H1N1 virus to be pandemic, based on viral activity in the Southern hemisphere. The United States had already recorded 27 deaths and 13,217 confirmed cases of H1N1 influenza by June 5, and was beginning to gear up for many more in cases in fall 2009. Emergency departments in certain parts of the country were overloaded with patients either ill with virus, or concerned they were. Schools in cities such as New York City (NYC) were closing in response to massive absenteeism, either due to illness or anxious parents keeping their children home.

As Gerry Parker, principal deputy assistant secretary for Office of the Assistant Secretary for Preparedness and Response (ASPR) in the Department of Health and Human Services (HHS), explained to workshop attendees: "The country stands at a moment in history in which we face continued and complex challenges, but also ample opportunities. As we address the issues of healthcare reform, the creation of the first national health security strategy and the realities of a potential pandemic influenza, we must also continue our efforts to seek solutions and mitigation efforts for all health threats of natural disasters, emerging effects of diseases, bioterrorism, and terrorism."

GOALS AND OBJECTIVES

The Hospital Preparedness Program (HPP) in HHS's ASPR sponsored the workshop on medical surge capacity. HPP's mission is to help prepare the nation's healthcare system to respond appropriately to mass-casualty incidents, whether due to bioterrorism, natural disaster, or other public health emergencies. Ultimately, this effort comes down to preparedness and efficiency—health systems must develop a disaster medical capability that is rapid, flexible, sustainable, integrated, and coordinated, and that can deliver appropriate treatment in the most ethical manner with the resources and capabilities available.

The workshop, held in Washington, DC, on June 10–11, 2009, featured presentations and discussions on the following topics, including the role of HPP in facilitating each of these efforts:

- Definitions of medical surge, standards, and metrics;
- Creating an integrated approach to an alternate care system, and establishing alternate care facilities;
- The capability and tools available to local, state, territorial, tribal, and federal government entities to provide situational awareness during operations, and to assess the current status of preparedness for medical surge operations;
- Strategies to facilitate public- and private-sector work to improve surge capability for victims and the distressed, including vulnerable populations; and
- Issues related to financing surge and preparedness.

The forum brought together leaders in the medical and public health preparedness fields, including policy makers from federal agencies and state and local public health departments, providers from the healthcare community (including representatives from nursing, emergency medical services [EMS], mortuary services, and other providers), and healthcare and hospital administrators.

About This Summary

This document highlights and summarizes the work that was presented at the workshop with the hope that this information will encourage cooperation across regions, illuminate best practices, and prevent the need to "reinvent the wheel." Whenever possible, unique ideas or concepts presented at the meetings are attributed in this report to the individual who first advanced those concepts. In situations where many attendees made similar points, the recurring themes are identified. In addition, the chairs from most of the panels were commissioned to draft white papers that were distributed at the workshop and served as a starting point for the panel discussions (see Appendixes D-I). Authors were asked to highlight some of the on-the-ground successes and address questions such as:

- What is the state of the art?
- What short- and long-term goals should be identified?
- What will it take to get there?
- What are the research needs?
- How can the HPP program help facilitate advancement?

THE COMMUNICATIONS CHALLENGE: DEFINITIONS, STANDARDS, AND METRICS

During an emergency—be it a mass-casualty event or pandemic—communication is critical to providing quality healthcare and relief services. If those involved in disaster planning and response do not speak the same language, use common terminology, and work with compatible technologies (both literal and figurative), the ability to cope with a crisis is hampered.

"The old adage goes, 'Every plan survives only the first minutes of a disaster,'" said Jeffrey Runge, who served as the first chief medical officer and assistant secretary for the Department of Homeland Security (DHS) Office of Health Affairs and is now president of Biologue, Inc. "But at least the confusion is reduced when people understand what the definitions and terminologies are."

One of the first workshop sessions addressed the importance of developing consistent definitions, terminology, and metrics. Standardizing the terminology used to prepare and respond to a crisis is a critical step in the development of both high-quality, fundamental research, as well as metrics and practical standards to guide future work, Runge explained.

If the healthcare system can not measure its preparedness and judge the effectiveness of different practices, it is unlikely to be able to appropriately compete for funding. "We can't grant our way into success here," said Runge. "We absolutely have got to find ways for sustainable funding to fund preparedness. It is not going to happen without definable metrics that the funding agencies can actually say 'Yes, you have done this.'"

Medical Surge Capacity: Conventional, Contingency, and Crisis Capacity

The term "medical surge capacity" has many different meanings to many different people. This can cause confusion and even an inability to have a meaningful discussion about the issues.

Does spare capacity mean the number of free beds a hospital has at this moment? Does it mean the number of beds that can be vacated in the next hour through early discharge or the transfer of patients to other facilities? Is it the number of cots an off-hospital facility has in the basement that can be set up in a cafeteria somewhere?

"Unfortunately there has been quite a bit of variability in the use of the term 'surge capacity,'" explained John Hick, medical director for emergency preparedness at Hennepin County Medical Center, MN. "It has become a little bit of a wastebasket" term.

Hick presented a conceptual framework from the Medical Surge Capacity and Capability project at HHS. Grossly defined for the workshop's purposes, surge capacity is the ability to rapidly accommodate a large number of patients from a defined mass-casualty incident or pandemic. Hick's work looks at surge capacity on a continuum with three distinct stages:

1. *Conventional capacity:* Traditional and normal patient-care facilities and staff meet their normal goals in providing care. Status quo.
2. *Contingency capacity:* Minor adaptations are made that may have minor consequences for standards of care, but adaptations are not enough to result in significant changes to standards of care.
3. *Crisis capacity:* A fundamental, systematic change into a system in which standards of care are significantly altered. When crisis capacity is reached, Hick noted, the institutional focus should shift: "It should prompt the institution to either get the right resources in, transfer the excess patients out, or look for additional relief."

These definitions and distinctions do not just relate to the beds or equipment available, but also to the staff needed to provide care and the tasks that staff will be required to perform. This same continuum can be extended into EMS and the public health planning sector.

Establishing a common continuum provides the opportunity to define the triggers associated with movement from one stage to the next. However, many organizations are unclear about what sequence of events announces the move from one phase to the next. "Perhaps we have an opportunity here to build off of this Conventional–Contingency–Crisis [Capacity] framework to do exactly that," Hick said.

An example of one easy trigger to define is when circumstances require the use of staff in a capability outside of their usual training, or the use of facilities for unintended purposes. When these situations occur, they should be automatic triggers for the institution to recognize the

severity of the situation and attempt to take actions that would enable the institution to return to conventional operation.

A common terminology around "surge" can also facilitate information sharing and create an opportunity to efficiently share resources throughout a region. If all of the facilities in a region use an agreed-on set of terms and triggers, resource gatekeepers can make much more cogent decisions about what resources belong where and when. Quite often, the resources to respond to a crisis are available—they are just not in the right place at the right time. A common framework helps to ease the movement of these resources. "If my hospital is asking for five nurses and the hospital next door is asking for five nurses, if I'm asking for them in a crisis situation and they are asking for them in a contingency situation, our needs get filled first," explained Hick. "This is, otherwise, a very difficult prioritization."

The Problem of (and Need for) Standards and Metrics

As discussed in further detail in Runge's white paper (Appendix D), there are distinct advantages to having standards to which the healthcare sector should aspire. First and foremost, achieving appropriate standards increases the chances of actually being prepared when the time comes. There are system advantages as well. Planning aimed at achieving standards will drive more concrete requirements, which in turn leads to more exacting and efficient use of funding. Healthcare systems can better compete with other sectors for homeland security grant funding when specific requirements are known.

However, where should standards originate? Who should set the definitions? What metrics should be developed? Should these ideas come from the federal government, be left to individual states, or filter up organically from local healthcare systems? All of these questions were discussed throughout the workshop. But although it is premature to determine who should set standards or how strict they should be, many participants commented on the need for additional guidance, metrics, and benchmarks.

"In order to move forward in the field of emergency and disaster preparedness, we do need quantitative parameters," said Jamil Bayram, a workshop attendee. "We need metrics, after we agree on definitions."

Unfortunately, many at the workshop believed much of the current research in the area of emergency and disaster preparedness is fundamen-

tally qualitative, not quantitative. "It seems that what we are doing now is putting out resources and papers and literature and documents and waiting for some sort of magical process of spontaneous combustion or the big bang to happen," suggested Jeffrey Duchin, chief of communicable disease control in the Epidemiology and Immunization Section for Public Health in Seattle and King County, WA. "I am wondering where the leadership is going to come from to actually pull us as far down the road as we can get with the currently available information, as quickly as possible."

However, some cautioned that although this work is critical, care needs to be taken to ensure the standards are not too rigid and prescriptive to be valuable. Evidence-based standards are notoriously difficult to establish even in the most mathematically precise fields of medicine. When dealing with people and organizations, getting quantitative and definitive information is a challenge. Workshop participants suggested the best way forward may lie with organizations that already touch most components of the nation's healthcare system—for example, the Joint Commission and the Centers for Medicare & Medicaid Services (CMS)—to partner with stakeholders and begin setting evidence-based standards for the health system.

LEGAL AUTHORITIES AND GOVERNMENT SUPPORT

Large-scale, catastrophic mass-casualty events and pandemics are by definition beyond the capacity of the normal healthcare system. That system has been designed to provide the best possible care to every patient, and an elaborate system of checks and balances has been put in place to ensure quality care, patients' rights, and accountability. When a crisis occurs, the processes, standards of care, and resources require change, and so must the laws governing these actions (IOM, 2009a).

Since the passage of the Pandemic and All-Hazards Preparedness Act of 2006, the Secretary of HHS has been responsible for all federal public health and medical responses to public health emergencies covered by the National Response Framework. HHS has broad authority to reshape critical parts of the legal landscape to enable an effective response during a disaster. In order for HHS and others to act, however, a public declaration of a disaster or of a public health emergency is required.

Declaring Federal Disasters: Implications for Public Health Emergencies

Declaration of a major disaster by the President of the United States under the Stafford Act grants the HHS Secretary the authority to implement various public health actions to respond to the emergency. The HHS Secretary also has the ability to declare a public health emergency, independent of the President's authority, should the situation require it. Once a public health emergency has been declared, Susan Sherman the general council at ASPR, noted, "The Secretary can also consider whether or not to waive certain Medicare/Medicaid and CHIP [Children's Health Insurance Program] requirements."

Other waivers can also come into play, as long as HHS has declared a public health emergency *and* the President has declared an emergency under the Stafford Act or the National Emergencies Act. These so-called 1135 waivers (named after Section 1135 of the Social Security Act) apply only within the emergency area during the emergency period. These waivers include:

- Waiver of Emergency Medical Treatment and Labor Act (EMTALA) sanctions for 72 hours, except in the case of pandemic infectious disease;
- Waivers concerning various conditions of participation, program participation requirements, certification requirements, and Stark self-referral sanctions for 72 hours;
- Waiver of deadlines and timetables for the performance of required activities; and
- Waiver of the requirements that healthcare providers hold licenses in the state where they provide services (for the purposes of Medicare, Medicaid, and SCHIP only).

The HHS Secretary can also work with and mobilize various groups during a public health emergency, including the following:

- The National Disaster Medical System is a coordinated effort of DHS, the Department of Defense (DoD), the Veterans Administration (VA), and HHS collaborating with states and public and private entities to provide health and related services to victims of a public health emergency;

- The Commissioned Corps of the U.S. Public Health Service led by the Surgeon General was founded to pursue public health through health promotion and disease prevention. In addition, there are emergency response teams that are trained and equipped to respond to disaster situations;
- The Medical Reserve Corps is made up of practicing and retired healthcare personnel (physicians, nurses, and others) who come together at a local or state level to assist with public health needs during large-scale emergencies; and
- The Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP) is a national system of state-based programs that include recruitment, advanced registration, licensure and credential verification, assignment of standardized credential levels, and mobilization of volunteers.

Licensing and Interstate Credentialing

During a catastrophic health event, the need for staff may go far beyond what is available within the local healthcare system, and volunteers may need to be used. In the wake of Hurricane Katrina, for instance, volunteers came from across the country and around the world. Each individual arrives on the scene with different skills and experience.

For a crisis coordinator on the scene, it is critical to know who can be involved, how they can be used, and what liability protections are in place to protect both the volunteers and the facilities in which they will be working, explained James Hodge from Johns Hopkins University's Center for Law and the Public's Health. Ultimately, these are questions of licensing, credentialing, and privileging.

To better understand these issues, the following definitions were provided:

- Licensing—The authority that comes from a state government, allowing an individual to practice a specific medical profession based on state-specific requirements.
- Credentialing—A general assessment of the qualifications of a specific, state-licensed healthcare practitioner to provide services within a given entity or organization.
- Privileging—A step added to credentialing; this means the ability to provide specific health services within a given organiza-

tion. This is not dictated by the state, but is related to how a specific organization operates.

In the practice of non-crisis medicine, these steps are sequential and pedestrian: A physician gets a state license, attains credentials in a certain organization, and is granted privileges to practice within a certain hospital system. But in a crisis, how these steps interact depends on who a volunteer is working for, and what types of emergency declarations have been made. In situations when the federal government uses out-of-state volunteers and authorizes them to provide services, everything is set. "Federal authority allows for anyone licensed in the state, working for the Feds, to go to any other facility authorized by the feds to provide services," said Johns Hopkins' Hodge.

Beyond that scenario, five situations can provide certain portability in licenses and credentials—and the liability coverage that goes with them—to out-of-state volunteers. Which one, or more, of the following applies in a particular location or crisis is entirely situational.

1. Certain states explicitly note in law that license reciprocity exists for the duration of a state of emergency, state of disaster, or state of public health emergency, as long as the license is in good standing in another jurisdiction.
2. A given jurisdiction may participate in interjurisdictional compacts such as the Emergency Management Assistance Compact (EMAC).
3. Mutual Aid agreements may exist among jurisdictions at local, state, and even unnecessary tribal levels that recognize the licenses of healthcare practitioners across those jurisdictions. For example, the Mid-America Alliance allows for the provision of services even outside of any declared emergency.
4. During an emergency, governors may issue orders formally recognizing out-of-state licenses, which happened in the aftermath of Hurricane Katrina.
5. Good Samaritan Laws in some jurisdictions may explicitly recognize out-of-state licensure in specific circumstances, such as the practice of emergency medicine.

Understanding what does and does not apply in a crisis is ultimately the responsibility of each organization participating. "In fact," explained Hodge, "The Joint Commission [the primary certifying organization for

hospitals] requires hospitals to be prepared and ready to do fast, rapid credentialing and/or privileging as needed to ensure that they can provide emergency patient care."

Although mechanisms may be in place to ensure a volunteer is legally licensed to practice, challenges remain. With an eager, legally licensed physician standing in front of you, how do you decide the scope of care that the physician will be given? This scope of practice is state-specific: A practitioner in one state may be authorized to provide a specific service that is provided by someone else in the neighboring state. Additionally, many volunteers are concerned with the liability issue: Will they be protected while they provide services out of their regular jurisdiction?

Even with a legal liability framework in place, a key factor in both answering this question and ensuring a smooth allocation of personnel is the advanced registration of volunteers. Many of the various protections and guidelines for license reciprocity are actually dependent on using volunteers who have registered in advance, been approved, and are ready to provide services. As Hodge noted, "Spontaneity is out. Spontaneous volunteers are disdained."

The problems don't go away with paid staff, either. Workshop participants noted that plans must be in place to suspend certain staffing rules in order for the group to function optimally in an emergency situation. One way to prepare for this is to have staffing waivers for union, Medicare, or other rules in place before an incident occurs.

Leslee Stein-Spencer, manager of quality improvement at the Chicago Fire Department, shared her experience. "We wrote a letter now requesting a staffing waiver in case of declared emergency. We need that for our unions and for our other response systems in place." With these triggered agreements in place, it means staff can focus on performing the necessary tasks in a time of crisis, not just the paperwork. "The letter is already written … in case an incident occurs, we will be able to move forward."

Most of the measures described above cannot be taken without formal declaration that an emergency exists. Generally speaking, this requires the official action of a state's governor or the federal government. Federal agencies cannot legally respond within a state unless they are requested or authorized by the state's government. This delayed some federal assets, including DMAT teams, from moving into affected areas in the chaotic days following Hurricane Katrina.

Without a formal government declaration, liability protections for disaster responders do not exist, and practitioners' licenses are not valid outside the issuing state. With the declarations, there are many ways to reassure volunteers that they can help and will be protected, as long as they provide care in accordance with their licensure.

The Role of Public Health in Medical Surge

A general theme of the workshop was that preparing for and responding to a surge event goes far beyond just the hospital. For example, federal agencies and local public health departments have important roles in planning and responding to mass-casualty events. While the medical care and emergency response systems—hospitals, physicians, pharmacists, emergency medical technicians (EMTs)—focus on *individual* patient care, the public health system focuses on *population* care. It is an important distinction because it shapes how public health entities can and will respond to mass-casualty events and pandemics. As summarized by Daniel Sosin, acting director of the Coordinating Office for Terrorism Preparedness and Emergency Response at the Centers for Disease Control and Prevention (CDC), many functions of public health related to medical preparedness include:

- Informing the medical response;
- Reducing the requirements for a medical surge;
- Informing medical-response decision making;
- Tracking the source, spread, and severity of health threats;
- Assessing the impact of these threats and how the public can be protected;
- Testing laboratory samples to identify the cause of infectious and non-infectious health threats;
- Educating the public on how to safeguard their health; and
- Working with elected officials and others to implement measures to protect the public.

As the nation's leading public health agency, the CDC's primary responsibility during a large-scale health emergency is to assist the response at the state and local levels. For example, the CDC develops and disseminates guidance for clinicians, laboratory professionals, and public health officials. It is active in surveillance and detection, working with

state and local public health laboratories, and in some cases it performs more complex laboratory tests. The CDC also maintains and provides resources through the maintenance and distribution of the nation's Strategic National Stockpile of medications and supplies that may be needed to meet extreme demands during events like the present 2009-H1N1 influenza outbreak or other public health emergencies.

Public health organizations—federal, state, and local—aim to ensure appropriate patient care through health monitoring, disease surveillance, and laboratory sciences. Additionally, the public health system acts as the expert system for tracking, predicting, and developing response tactics to disease outbreaks or other health threats. Furthermore, the public health system has a role in communicating prevention strategies as well as self-care and shelter-in-place strategies during a crisis. By getting the right messages to the right people in a clear and consistent way, those who are less sick, and those who are not ill be fearful of infection may be encouraged to seek care or reassurance in alternate settings so hospitals and emergency care facilities can focus their resources on those who need them most. This will ultimately help ensure a primary goal of public health, to mitigate transmission of the disease from infectious individuals to those who are well.

Hospital Surge Capacity Is Not Ideal

Professor of Emergency Medicine and Associate Dean for Health Policy at the Emory University of Medicine, Arthur Kellermann emphasized that "form follows finance" and the way hospitals are incentivized to generate revenue and control costs contradicts core principles of preparedness. In support of his position, he cited key findings from the 2007 IOM report of the IOM Committee on the Future of Emergency Care in the U.S. Health System titled *Hospital Based Emergency Care: At the Breaking Point* (IOM, 2007). That report made numerous concerning observations, including the fact that many hospitals in the United States routinely operate at or above capacity, large numbers of emergency rooms are crowded with admitted patients awaiting placement in an inpatient bed, and hospitals are diverting more than half a million ambulances per year due to emergency room overcrowding. "If we don't have sufficient capacity to manage tonight's 911 calls, how in the world are we supposed to manage the next mass-casualty event?" Kellermann asked. But because hospitals make most of their revenue from elective admis-

sions, and many lose money on admissions that enter the facility via the emergency department, they have a strong financial incentive to tolerate ER crowding and ambulance diversions in order to conserve inpatient capacity for elective cases.

To counteract these influences, Kellermann urged that hospitals institutionalize the practices they will need to apply during disaster situations, such as swiftly moving emergency room admissions to inpatient units, and when necessary, evenly spreading the burden for "boarding" emergency room admissions throughout the facility, rather than concentrating all of these patients in the hallway of the emergency department. The first time in patient nurses treat patients in a hallway should not be during a disaster, he observed.

Kellermann also called for more rigorous assessment of hospital surge capacity and independent drills of disaster plans, applying some of the techniques described by Dr. Peleg in his presentation about preparedness in Israel. Self-declarations of readiness aren't good enough. Citing a study that revealed that a number of public health departments did not properly handle mock reports of Anthrax and smallpox, he reminded attendees of President Reagan's famous saying, "Trust, but verify."

He also cautioned that hospitals must be prepared for many types of surge. Although hospitals have received substantial funding in recent years to prepare for bioterrorism, many are poorly prepared for a far more probable threat—terrorist use of explosives. Responding to terrorist bombings is difficult, he observed, because they can instantly generate a large number of casualties with highly complex, resource-intensive injuries. He cited a congressional staff report that found an alarming lack of surge capacity in seven U.S. cities at high risk for terrorist bombings, and a CDC report that termed such attacks "a predictable surprise."

AN INTEGRATED APPROACH TO ALTERNATE CARE

A mass-casualty event is by definition a complex, catastrophic, and multifaceted problem. Structuring an inter-organizational response to extreme events on a regional level should be a blueprint for emergency planners to use to ensure coordination, communication and common goals among all stakeholders in the planning for and response to catastrophic events. A successful response requires the coordination of a broad range of entities and disciplines on issues that often range far beyond the simple provision of healthcare services. Even with the public

declarations made and the legal authorities in place, that kind of coordination does not happen spontaneously, no matter how good the intentions of the participants are. If it happens—and it must—it happens because it's planned.

Captain Deborah Levy of the Division of Healthcare Quality Promotion's Healthcare Preparedness Activity for the CDC discussed efforts supported by the CDC to help communities plan in a truly broad and integrated way. She explained that the preferred framework is one in which the established healthcare system (hospital administrators and emergency departments, physicians, emergency medical services, community health clinics, pharmacists, and other caregivers) works closely with the public health community (local departments of public health), then explicitly brings the local emergency management agency into the process, "because in any incident, emergency management actually manages what goes on in the community." The alternate approach—one where each hospital, each fire department, and each community establish their own goals, objectives, and processes—is both inefficient and ineffective. "We have found that communities that are successful usually bring those three partners to the table," explained Levy. The goal is to create what she called "a community model for an alternate care system."

The importance of getting as many of the right partners to the table early in the planning process cannot be overemphasized, and was a consistent theme at the workshop and throughout the work of the forum (IOM, 2008, 2009a,b; Stroud et al., 2009). Only through broad, inclusive discussions are the gaps, inefficiencies, and incorrect assumptions revealed and ready to be addressed. "You need to bring them all together, plan together, and start thinking about how you deliver care together," said Levy. For example, Levy and the CDC work to bring together local leadership and individuals representing various stakeholders, including emergency 911 call centers, nurse help lines, EMS, emergency departments, hospital administrators, health system administrators, primary care providers, urgent care clinics, pharmacists, home health, long-term care facilities, hospice, public health, outpatient specialty services such as dialysis centers, medical examiners/coroners, and funeral directors.

Gamunu Wijetunge from the National Highway Traffic Safety Administration's Office of Emergency Medical Services agreed. "Health preparedness really requires a systems approach that is used on a day-to-day basis," he explained. "That systems approach needs to include multiple disciplines: medical homes, call centers, EMS transportation, public

health, hospitals, emergency management, the faith-based community, non-profit, [and] for-profit sectors."

Although many workshop participants considered this kind of cooperation to be the ideal, and a key to a coordinated and effective response, some also acknowledged that discussing this plan is much easier than implementing it.

Emergency Medical Services

EMS covers a wide range of support functions—functions that need to work together during times of high stress and confusion. To have a coordinated response, prior planning, unified command, and effective, interoperable communications are required.

The key is to build coordinated plans on the back of existing relationships and processes. As Robert Bass, executive director of the Maryland Institute for Emergency Medical Services Systems, said, "One axiom we have in public safety is that responses to major incidents work well when you build that response on what you do day to day." The processes that make an individual ambulance unit effective in responding to a house fire or a highway accident can form the basis of how that unit will respond to a mass-casualty incident. The challenge is to make sure the broader relationships are maintained through frequent contact and training. "Our experience over the years is that having those relationships prior to a disaster situation is very helpful," explained Bass. Plans "work well when you know the people you are working with—be it on the ground at the scene, or at the command level—and those relationships come from having worked in previous incidents or in drills or day to day."

One way to both build these relationships and test surge capacity outside the hospital is to look at large community events as "planned disasters" and use them to test operations and try alternate approaches. Richard Serino, former chief of the Boston EMS and current deputy administrator of the Federal Emergency Management Agency (FEMA), explained that four or five events in Boston each year provide these training opportunities, including the Boston Marathon and the Fourth of July concert and fireworks display. The Boston healthcare community uses each event to build relationships and fine-tune response plans. As an example, one year they tested using Radio Frequency ID tags to track patients during the Boston Marathon. The system failed due to interference

from an overabundance of communications equipment, TV trucks, and cell phone use. It was an important lesson to learn in a mass-population setting before getting into a real mass-casualty environment, where the crisis response may have depended on that patient tracking system.

Through these types of exercises, EMS can discover gaps and develop processes to close them before a disaster strikes. During an evacuation drill at Cook County Hospital in Chicago, for instance, administrators were forced to look at available beds outside the hospital and develop a plan for transporting patients. As a result, focus was put on the critical question of how to transport patients with significant illness. This forced a detailed look at the availability of ambulances and other alternative methods of transportation. By running the drill all the way through, they were able to expose weaknesses in the system and could thus develop plans to provide additional resources.

As part of these types of training exercises, Maryland's Bass stressed the need for effective regional medical-command structures and communications systems to coordinate and integrate hospital and pre-hospital response. Response needs to be coordinated locally and regionally so that one decision in one area does not cause difficulties in another. Unfortunately H1N1 provided an example of an uncoordinated response during its early stages: "We had the Board of Education telling all the kids that they could not come back to school without a note from the ED [emergency department] or from the physicians," recalls Leslee Stein-Spencer, manager of quality improvement at the Chicago Fire Department. "Our Children's Memorial saw three times the number of patients, most of them waiting for notes to get back to school." Clearly this is a case where a more effective communication and control infrastructure could have alleviated the surge in both patients and personnel.

Established healthcare communication systems can help coordinate pre-hospital and hospital care, patient distribution, and the sharing of information and resources. Such systems, however, are not free and require participation from every part of the emergency response system during training and drills, including dispatchers. "As we learned from H1N1, if they are not asking the right questions, how are they going to prepare our responders to actually get into the site, and [know] what to look for?" asked Stein-Spencer.

Unfortunately, according to Bass, fully operational and trained response centers seem to be the exception, rather than the rule. "They tend to be centers that are ramped up when there is a major issue, and they are not functioning on a day-to-day basis," he said.

Maryland's central communication and statewide medical system is one example of such a command and communications system that is used every day. It is a digital system that carries voice and data and is used both for incidents with a single patient as well as events with many patients. The system helps with situational awareness and plays an active role in distributing patients on a day-to-day basis, so that no one hospital gets flooded with patients, and patients are sent to the hospital that is best prepared to treat them.

Healthcare Coalitions: Spreading the Load

One critical factor that can be difficult for planners to overcome is jurisdiction. Our laws, funding agreements, and corporate structures are often discrete, while health emergencies may be spread throughout entire regions. Often, broad regional efforts are needed to address the totality of a medical surge incident.

Development of an integrated health response system requires building and maintaining working relationships, planning and conducting exercises jointly, and the sharing and dissemination of information in order to formulate an effective response plan. "Medical Operations Centers" facilitate and ensure this level of integration and coordination, while representing the public health and medical needs, using subject-matter experts.

One example of such a broad coalition, as described by Zachary Corrigan, is the Northern Virginia Hospital Alliance. After 9/11 and the anthrax incidents in 2001, medical facilities in Northern Virginia focused on improving the coordination in planning necessary to appropriately respond to public health emergencies. Corrigan, the executive director of the Alliance, helped to establish a not-for-profit 501(c)(6) company with the chief executive of each facility serving on the board of directors, allowing all facilities to have an equal voice, regardless of size or location. The new entity had the mission to build, develop, and maintain a regional emergency-preparedness program for its members. Along with creating standards for surge capacity, decontamination, and communications, the Alliance also built a regional hospital-coordinating center that functions like an emergency operations center. It has developed a "health emergency operations center" called the Regional Hospital Coordinating Center (RHCC), one of six throughout the Commonwealth of Virginia. It is a real-time entity staffed 24/7 by communications specialists, with a proto-

col to ramping up rapidly (30 minutes) with a full complement of staff who fill the command structure (IC, operations, planning, logistic, medical advisor, media, liaison to government agencies, etc.). During an emergency, the leadership of each facility in the Alliance comes together to oversee the regional coordination of its members.

Such a coalition was possible because the members agreed to redirect all of their individual federal funding for emergency preparedness into the Alliance for the benefit of the whole system. This pooling of resources not only allows for coordinated response, but also for collective purchasing of equipment and supplies to prepare for regional incidents.

The model has been adopted throughout Virginia, with the six regions of the state each mandated to have a hospital coordinating center and a regional plan. Each region also partners with local emergency management, public health, and law enforcement agencies for emergency preparedness.

An Alternate Approach: The Israeli System

The workshop also covered Israel's alternate approach to an integrated system. Through necessity, Israel has become adept at handling mass-casualty incidents, as described by Kobi Peleg, head of the Israeli National Center for Trauma and Emergency Medicine Research.

Israel is slightly smaller geographically than the state of New Jersey, and has a population of roughly 7.2 million people. More than 90 percent of the population lives in an urban setting. This is the setting in which the government provides health care, both day to day and in mass-casualty situations.

All hospitals in Israel are required to have standard operating procedures and checklists for various scenarios based on national doctrine. One such policy is that every hospital must be prepared to receive and treat patients that exceed bed capacity by 20 percent during mass-casualty events. Although the 20 percent figure is to some extent arbitrary, it provides a specific target for the plans. Without this target each entity would have planned around different metrics, which would have resulted in an inoperable system, Peleg suggested.

Training and Drills

Full-scale drills are conducted each year at each hospital. The Minister of Health determines the timing and type of event to be drilled, with the hospital notified only that a drill will occur during a specified window of time. A second hospital serves as a control so two hospitals are studied at once. Evaluators come from other hospitals and after-action reviews are held by the Minister of Health, with personnel from both hospitals involved.

Incident Plans

During an actual incident, the hospital closest to the incident is designated as a triage hospital with the charge to stabilize patients and determine priority for secondary evacuation. Within 10–15 minutes of the mass-casualty alert, the triage hospital's ED is emptied of patients by ED physicians who quickly decide whether to directly admit them to the wards or send them home. An alternative care facility near the ED is set up to receive minor casualties, leaving the ED to handle the more serious cases. Israel's experience has shown that only about 20 percent of casualties need to be seen in the ED, and the rest can be triaged and cared for in the alternate space. The severely injured casualties are distributed among several hospitals once they are stabilized.

To coordinate this plan, national and regional command and control centers are linked to every hospital by radio and landlines, allowing EMS to facilitate the flow of patients. These command and control centers are responsible for identifying and notifying the triage hospital to be prepared for casualties, and then EMS communicates with each hospital that will receive casualties.

For a biological mass incident, Israel's plan details that patients will be cared for in communities first, and will only go to a hospital after all community means of support have been exhausted. The benefit of this plan is that the community physicians and health centers work to keep hospitals from being overrun.

The example of Israel was not discussed at the workshop as a model for the development of medical surge capacity in the United States—there was broad understanding that Israel, with a national infrastructure, an urban and dense population, and a relatively small geography, faces very different challenges with very different resources. It does, however,

serve as an example of some basic tenets that may be used to build a more efficient system that can operate under a single, clearly defined set of expectations and responsibilities (Peleg, 2009). Many of the strategies Dr. Peleg recommends could be adapted in the United States, such as regional monitoring of hospital capacity, benchmarks for maintenance of surge capacity, a commitment to keep emergency departments from becoming gridlocked with admitted patients, and the rapid opening of alternate care sites for casualties that do not require emergency department care.

ESTABLISHING ALTERNATE CARE FACILITIES

During a mass-casualty incident, the health system will not be able to rely solely on the nation's hospitals to care for the population during large-scale disasters or pandemics—they would be quickly overrun. Kellerman cautioned, "Don't count on hospitalizing your way out of a mass-casualty event."

The problem of overreliance on hospitals was demonstrated all too clearly in the spring of 2009, at the beginning of the H1N1 pandemic. Even though the outbreak was fairly mild, emergency departments in cities across the country saw huge increases in patient visits due not just to illness, but to the masses of concerned individuals who flocked to hospitals for care.

In a mass-casualty incident or pandemic, both the sick and concerned individuals must be served, whether with medical treatment or simply preventative care and information. One big part of the solution, workshop participants agreed, is alternate care facilities that relieve the pressure on hospitals (and the healthcare system in general) in times of high demand.

Alternate care facilities come in many shapes and sizes, and can be used in a wide variety of ways. A recent example of coordinated alternate care facilities comes not from a mass-casualty incident, but from a large, celebratory event—the 2009 inauguration of President Barack Obama.

During the 2009 inauguration, four medical aid stations were deployed to do initial assessment and care for people seeking help on Washington's National Mall, where people gathered to hear the inauguration speeches. Of the 1,200 patients seen at the stations, only 250 required transport to local hospitals. On Inauguration Day, 300–400 slots

were available in area emergency departments. If even half of the people who sought care at the aid stations had gone to local emergency departments, the EDs would have been completely overwhelmed. "It's all about influence management," explained Dan Hanfling of Inova Health System. "It's trying to influence demand and trying to figure out if we have the mechanisms for managing what will be a rush on healthcare services."

This is just one example of what Hanfling referred to as "Main Street triage." But although alternate care facilities can be as simple as medical aid stations at marathons or inaugurations, they can also be much larger and complex, such as the Houston Astrodome after Hurricane Katrina.

The Seattle–King County area has done extensive planning for alternate care facilities. The Seattle system is focused on delivering care for non-life-threatening medical conditions in places where care is not normally provided when the healthcare system is overwhelmed. By offering non-complex care outside the hospital or even clinic setting, the goal is to allow the traditional healthcare facilities to focus on the more complex, life-threatening care.

Seattle's alternate care facilities can provide a wide range of services: urgent care, non-complex "inpatient care," end-of-life care, home health/long-term care, medical needs sheltering, and large-scale exposure screening. Because of this, it is important to look at the requirements of what each facility's task will be, then find the physical location that will best enable those tasks to be fulfilled.

Lewis Rubinson, senior medical advisor with the Office of Preparedness and Emergency Operations at HHS, noted the importance of location. "There are a number of characteristics you want to make sure are available," he said. While participants at the workshop discussed the importance of factors such as availability of back-up utilities, ability to secure a perimeter, and need for adequate space, nothing was seen as more important than location. It was also noted that not every site would be appropriate for every incident. Therefore multiple sites should be reviewed and plans made so that the right location can be chosen for a specific incident.

Throughout the workshop, participants highlighted the importance of thinking beyond the hospital walls. "The healthcare system is so dramatically larger than just hospitals," said Rubinson. "If our long-term assistance centers fail, they need to have another place to go. If we just focus on critical care, or we just focus on emergency department care,

we're not going to have fail-safe mechanisms to be able to handle other very important functions."

To accomplish the planning of something so complex, it is important to include a broad range of expertise. People with experience in logistics, communications, clinical specialties—including pharmacy and other outpatient services—all need to work with outside agencies such as the police department, fire department, and EMS. Although establishing alternate care facilities can be a daunting task, Rubinson noted that this type of planning "actually adds huge ability to keep your health system running."

Along with site choice, supply and staffing decisions must be made. In the Seattle system, they looked at what they thought could be taken from the existing healthcare system and what could not. Items that could not be appropriated easily were prioritized as the greatest need. For Seattle, cots that hold up to 500 pounds, liquid oxygen systems, and certain diagnostic equipment went to the top of the priority list.

Rubinson acknowledged that staffing these facilities can be difficult. In addition to pulling people from their everyday jobs, they are expected to quickly function well in an unfamiliar environment. To mitigate some of the confusion, the Seattle plan calls for each medical institution to staff a specific shift so they are working with colleagues they know. It also calls for the staffing to reflect care needs, ensuring that staff are performing the functions to which they are accustomed as much as possible, just in a different environment.

Demobilization

Workshop participants stressed the importance of the temporary nature of alternate care facilities. Rubinson of HHS stated, "Even though it's going to be the safest care we can provide, this is clearly not everyday care, and we need to close these down as soon as we can to make sure that we don't just do business as usual and start using this as a patchwork for a broken healthcare system." The solution is to make demobilization part of the core plan, creating the triggers and processes to quickly and cleanly take alternate care facilities offline as soon as they are not required.

In-Home Care

Perhaps the single most effective way of keeping patients from bogging down the healthcare system is for them never to leave home at all, particularly in a pandemic situation. In 2007, the CDC issued its community mitigation guidance for pandemic influenza with this in mind. "The three goals in that guidance were to push that pandemic off into the future if possible, to reduce surge on hospitals' infrastructure, and [to] reduce the number of people who got sick and who died," explained Lisa Koonin, senior advisor for Pandemic Preparedness Partnerships in the Influenza Coordination Unit at the CDC. "Keeping sick people at home aligns with the principles of social distancing," she continued. Social distancing—separating the sick from those who are well—is fundamental to containing the spread of a virulent disease. For centuries that's meant keeping people at home.

The reality is that during a severe pandemic, not all seriously ill patients can be in a hospital. A large portion of the sick population will need to be cared for at home by family members or friends. "This whole piece about home care is about building resiliency, and that is the backbone of our community preparedness and response structure," said Koonin.

To build resiliency, workshop attendees discussed the need to include the community and general public in the planning for pandemics and other incidences. "We need to really figure out how community and home-based care can be integrated into surge planning," said Hanfling. "It's going to be critically important to the success or failure—or survivability, if you will—of our communities, particularly if we face a pandemic or other catastrophic event."

Luckily, the public has experience with home care. Most times, parents treat their children's illnesses at home, calling their child's pediatrician to get questions answered. This same type of home care could be used during a pandemic. More importantly, the public has generally had a positive attitude about staying home during a pandemic. Koonin related the results of a study done by Robert Blendon at the Harvard School of Public Health. The results indicated that regardless of the ethnicity or socioeconomic level of a person, a large majority reported a willingness to stay home. Importantly, most would also have someone to care for them (Blendon et al., 2008).

More recently, studies done during the beginning of the H1N1 event in spring 2009 showed that 95 percent of the people surveyed reported

they would be willing to stay home if they were sick for 5 to 7 days. Fifty-seven percent reported that they had actually made preparations to do so.

For large-scale, in-home care to succeed, all parts of the healthcare system—from private physicians to large hospital systems—need to send out the same messages to the patient population. There cannot be multiple treatment regimes, or people will be confused and not trust the system. If one facility is handing out antivirals to anyone with a sniffle and another is not, people will overwhelm the facility that seems to be providing the more aggressive care.

Outside the healthcare system directly, there also needs to be support from the community. Businesses need to support employees' decisions to stay home if they or their families are sick. Finally, there needs to be support for those who are sick—phone numbers to call and websites to visit so an individual can feel confident that they are correctly treating themselves or their family members.

Barriers to In-Home Care

Although people may be willing to stay home, there are barriers to in-home care. There is a portion—some studies say as high as 25 percent—of people who will not have anyone at home to help care for them (Blendon et al., 2008). Some potential caregivers may be concerned with getting sick themselves and may not want the additional risk that comes from providing care. The medical system needs to be very clear on how informal care providers can protect themselves.

The situation is more complicated where there are pre-existing medical conditions, such as reliance on oxygen, home or outpatient dialysis, mental and medical fragility, and frailness. These people may fall outside the boundaries of an in-home response plan. "If they need to stay at home, [they] are going to need extra support," Koonin noted. To meet this need, the CDC has been developing information, including a booklet that explains how to care for sick people at home; the signs and symptoms of influenza; how to set up a sick room; how to care for people with fever, diarrhea, and vomiting or people who are feeling weak; and, importantly, how caregivers can protect themselves so that they don't become ill as well.

But pamphlets aren't enough. This important component of the health care system needs to be better integrated into preparedness

efforts. It is important to keep in-home caregivers from feeling like they have been abandoned. They need support so they can feel confident they can handle the situation. Support can come from many places. Workshop participants highlighted the important role of faith-based and community organizations.

Call Centers

One way to mitigate surge at the hospital is to give people the information they need to decide for themselves what level of care is appropriate. This first line of triage can be performed by call centers.

"These call centers really assist the public and providers in making informed decisions to care for themselves when appropriate," said Gregory Bogdan, research director and medical toxicology coordinator for the Rocky Mountain Poison and Drug Center at Denver Health. "It's something important every day, and essential when we talk about an emergency situation." They have the capacity to provide health information, triage and decision support, disease surveillance, quarantine support, information about medications, and guidance to healthcare providers.

Many examples highlighted the work that call centers are doing to prepare for medical surge. Colorado was frequently cited as having a particularly robust system of multiple call centers staffed to take care of a wide range of questions. For example, the Rocky Mountain Poison and Drug Center is actually a collection of call centers that provides poisoning information and management services to the public in five states—a patient population of 11.2 million people. Denver residents have access to a nurse line that provides support and triage services for callers. Additionally, there is the Health Emergency Line for the Public (HELP) that provides information from the state's health departments during emergency events. "The health emergency assistance line and triage line or health model was something that we envisioned as a strategy to really help alleviate that patient demand on the healthcare delivery system," explained Bogdan.

Depending on who is staffing the call centers, many different types of information and support can be offered. Staffing can be changed quickly in response to a mass-casualty event or public health emergency. Frederick Burkle, Senior Fellow at the Harvard Humanitarian Initiative, Harvard School of Public Health emphasized that there are many examples of call centers in other countries that are key. During SARS and

H1N1 the call centers educated the populace while contributing to the prevention of the transmission of the disease. During the SARS outbreak in Ontario, Canada, the existing 1-800-Telehealth hotline expanded services and became an essential health aid and intervention tool. The usual 2,000 calls per day expanded rapidly to over 20,000, and the call center was able to assist in helping to determine who was "probably exposed and required referral for care versus those who were not and needed shelter-in-place and useful information to keep them safe." The Ontario call volume fluctuation reflected directly on emergency department visits for respiratory illness, In the first 10–14 days many callers were experiencing fear and anger that they might already be exposed, a similar finding seen in past "silent disasters" (i.e., biological, radiation, and chemical events). Success was dependent on volunteer nurses and others trained in dealing with people suffering highly emotional and anxiety filled states, such as school counselors and flight attendants. Because of its success, the Ontario model is now integrated into the real-time syndromic surveillance system and as a first line of triage for all of Canada. Similar hotline systems and "disease-specific health lines" were used in China (more than 300,000 calls) and in New Zealand where data shows that the system was crucial as a sentinel surveillance site, in educating the public, and in preventing unnecessary health facility visits. Dr. Burkle adds that few communities in the United States have telephone hotlines as refined or organized as they are in other countries.

Call Center Success Stories

The U.S. Poison Control system is a strong current example of an effective and extensive use of a call center. The system is made up of 61 centers across the country, accessed by a toll-free number anywhere in the country (1-800-222-1222). The system receives 2.4 million contacts per year related to potentially toxic exposures. Seventy-five percent of those calls do not end up requiring a visit to a healthcare facility. In other words, 1.8 million patients are diverted from the hospital system because they were able to get the information they needed with a single phone call. Predictably, when the system is not used, healthcare costs rise. Lewis Goldfrank, chair of the Department of Emergency Medicine at New York University, said that within 2 years of the closure of the poison control system in Louisiana due to budgetary reasons, statistics showed they were spending as much as six to seven times what the

system cost, due to the increased number of emergency room visits and ambulance calls.

A study of the Denver Health Nurse line described by Colorado's Bogdan found that a majority of callers trust the information they are given by the nurses, with 70 percent of them following the advice they were given. "We are directing people to the right resource, and they are taking that message to heart," said Bogdan, "and even when they disagree with our recommendation and do whatever they want to do, they generally will choose a lower level of care." In other words, even if they ignore the nurse, they often do so by simply choosing not to go to a healthcare facility because they have a more informed opinion of their condition. A full 40 percent of callers were able to manage their illness at home, reducing the impact on the healthcare system.

Other examples include an older Kaiser Permanente study described by Steven Phillips, associate director, Specialized Information Services, National Library of Medicine. In the study, health plan subscribers were asked to call an 800 number to receive guidance before visiting the ED (Stirewalt et al., 1982). "When they analyzed what happened, roughly 70–75 percent of the people [who] called and got information required no further care," explained Phillips. "Approximately 15 percent were able to delay it to a subsequent day, and the rest didn't need emergency care."

Bilateral Communications

Information from a call center can go both ways. Not only do patients get information and guidance on how to treat their conditions, but they also give information to the center about the types of illnesses present in the community and their severity. Since 2003, HELP in Colorado has received more than 175,000 calls as part of responses to smallpox vaccinations, West Nile virus, influenza, hepatitis, salmonella, and now H1N1 outbreaks. Using non-clinical staff, the center provides information to the public to allow them to make decisions for themselves. But importantly, information is collected by HELP and fed back to public health agencies to show what is happening in the community and what concerns the community. This information can help the public health system make decisions on conducting outbreak investigations or providing additional support. "It has also led the public to actually call the help line to tell us things, and so now we're a sentinel event detection sys-

tem," Denver Health's Bogdan noted. "We have sometimes been the first to know about TB [tuberculosis] cases and hantavirus cases in Colorado, well before our state health department knows, and they love that—that we can actually give them that early warning."

Additionally, call centers can be parts of mass-risk communication and community-care strategies. Mass media are obviously critical in a mass-casualty or pandemic situation, but there's no substitute for two-way communication. At an effective call center, people can ask questions and have their concerns addressed by a trusted entity.

Operational, Staffing, and Funding Issues

Unfortunately, workshop participants noted, call centers are in crisis across the country. At the time of the workshop, California was threatening to close all of its poison control centers due to budgetary constraints. Other states such as Michigan, Arizona, and Washington were facing similar problems. Even in Colorado, where the HELP program has enjoyed such success, at the time of the workshop there was a concern that it would need to close after August—though the state would still want the capabilities to be there if needed during an emergency.

This raises a critical question: How can a system be maintained for emergencies when the staff and infrastructure are not supported with funding for day-to-day operations? If the resources are to be available for emergencies, Bogdan explained, "We really need to think about how we use these resources, and how we maintain them so they're there when we really, really need them."

Bogdan recommended a long-term goal of creating a more coordinated and structured care system that involves call centers. He pointed out that nearly all nurse lines are now independent. The American Association of Poison Control Centers is a rare example of national coordination, but one worthy of consideration for broader implementation. Still, the funding issue remains.

Leveraging Technology

Call centers are not the end of the road in patient communications. Websites, hospital blogs, Twitter, social networks, interactive voice recognition (IVR) technology, and text messaging may all have a place in patient communication during mass-casualty and pandemic events.

Workshop participants discussed using technologies such as these for interactive self-assessment tools. "We should have … interactive self-assessment tools, customized for symptoms, customized for comorbidity, interactive things," Kellerman said. "We've got the technology." He went on to warn: "If we don't do it, somebody will, and God knows what they're going to put up there." An example of an interactive tool is the Strategy for Off-Site Rapid Triage (SORT™) tool developed at Emory University. Since the workshop, HHS, Microsoft, and other organizations have modified and developed it into a decision tool that can be used to help individuals if they are worried they have flu symptoms that could warrant immediate medical attention.

Other workshop participants brought up social networks, blogs, and chat rooms. "One nurse at a call line can talk to one patient at a time," said the CDC's Koonin. She and others at the workshop discussed the use of technology as a way to augment the traditional modes of communication. "It's that kind of imaginative thinking that we really ought to embark upon now," she suggested.

CREATING SITUATIONAL AWARENESS: A SYSTEMS APPROACH

Even with all the resources available, alternate facilities established, legal authority in place, and an infrastructure ready to take patients, the ability to surge effectively could be limited by the knowledge of the many stakeholders involved in the response.

"Situational awareness" is a term that simply means understanding the current situation. It is the ability to look at a huge variety of data, determine what is relevant, synthesize the data, and act on it. In a mass-casualty event or public health emergency, situational awareness is the ability to collect the correct information, analyze it, and project what will come next, so the appropriate actions can be taken. Eric Toner, senior associate with the Center for Biosecurity at the University of Pittsburgh Medical Center, summed it up this way: "To achieve situational aware-

ness, we have to get that right information to the right person who's prepared to receive it, who can analyze it and do something with it."

Joseph Barbera from the George Washington University Institute for Crisis, Disaster and Risk Management agreed with this core definition. "I think if we look at it like that, it helps us better frame data-acquisition systems and other things, where we don't have them trying to overreach and generate an automatic trigger," he said. The goal is not automation, but informing human decision making.

Perhaps most importantly, situational awareness drives policy decisions. This was never more apparent than in the first phase of the H1N1 pandemic in the spring of 2009. "Decisions regarding school closures, personal protective equipment (PPE) guidance, and antiviral use are all dependent on knowing key characteristics of the epidemic in real time," said Toner. The better the information, the better the situational awareness, the better the decisions that are able to be made.

Different participants and different mass-casualty scenarios have different information needs. A plane crash in the middle of Manhattan will put different information demands on policy makers, and have different potential sources of information than a pandemic incident. Even within the same incident, different personnel at different levels of response will have very different information needs. The HHS Secretary has different data needs during a pandemic than the EMT transporting flu patients, the emergency room physician receiving the patient, the incident commander of the hospital where the patient is admitted, or the patients themselves.

At the top of the demand chain, there is a real need for nearly real-time surveillance systems because policy decisions and medical interventions are and should be always moving toward crisis mitigation, rather than crisis response. For example, in past pandemic situations, characteristics such as the severity of the illness, basic epidemiology of the disease, the transmission characteristics, and the degree to which the disease had already spread through the community were studied retrospectively by epidemiologists. The modern healthcare system seeks to stop an outbreak in real time—quarantining populations, limiting travel, and tracking disease vectors as they emerge. This work requires that information is either available or at worst can be estimated in real time. "In order to do this," Toner said, "we have to be able to identify those who have died of the disease, those who are seriously ill, and those who have mild disease." This requires medical sophistication—rapid diagnostic testing, for example—but it also requires near real-time surveillance systems. "We

have to have the ability to quickly reach down to the bedside to get clinical information about the patients who are sick," he asserted.

The National Need

Various projects have tackled the problem of situational awareness in mass-casualty events and public health emergencies. In 2005, DHS and FEMA funded meetings with a wide variety of federal agencies, such as the DoD, VA, and HHS, along with state, local, and private industry representatives, to begin work on the National Mass-Patient and Evacuee Movement, Regulating and Tracking System. The purpose was to begin to examine the necessary data for a tracking system that needs to supply different information to different users. Paul Biddinger, chair of the Massachusetts Medical Society Committee on Preparedness, highlighted some of the key areas:

- The public needs to know where their loved ones are—reunification after an event is a huge concern and a huge job. After Hurricane Katrina it took 9 months for the last child to be repatriated to its family.
- Emergency operations centers need to know the location of the event and what is available to respond so the need for outside assistance can be determined.
- Public health departments and relief organizations such as the Red Cross need to know how many people are in shelters and what their needs are so that appropriate supplies can be delivered.

Over the next 3 years, the experts hammered out the key characteristics that should be included in a system that needs to serve many purposes for many people. In their report, released in 2008, they developed some key recommendations for a national tracking system (AHRQ, 2009):

- The system should be built on existing systems as much as possible—no need to scrap what is already out there.
- The system should be activated, rather than always running.
- Health status information as well as location should be tracked.

- Tracking should occur at touch points—entry into a shelter, transfer points, etc.
- Minimum data elements should include unique identifiers: name, gender, date of birth, comment on health status.
- The system should be accessible to public and emergency responders and planners, with access tightly controlled.

Information to improve situational awareness is available through many systems, but the problem is that most of them were developed as stand-alone systems. The next critical step toward better situational awareness is to move toward integrated systems.

"We need to harness health information technology to improve digital linkages between hospitals and healthcare systems, public healthcare systems," suggested University of Pittsburgh's Toner. "The Hospital Preparedness Program, the CDC, and CMS should continue to promote these linkages" as well as the development of regional healthcare coalitions.

Early Successes

Although no national information system is currently in place for responding to all types of emergencies, there are examples of smaller scale projects that have achieved many goals envisioned in the national tracking system.

Alabama's Medicaid Electronic Health Record

Carl Taylor, director of the Center for Strategic Health Innovation and assistant dean at the University of South Alabama College of Medicine, targeted a key feature for incorporation in any integrated system: an electronic, patient-centered health record. Currently, the state of Alabama has electronic health records for all 700,000 of its Medicaid patients. "If you get a patient from our state, please call me," said Taylor. His point was simple: As part of the Alabama system, he has all of a patient's doctors, diagnoses, and drug needs available at the click of a button. More importantly, he can use the electronic patient-centered health records to look at patient population dynamics before a disaster occurs. "Want to know where your frail population is? Want to know where your

chronic population is? Want to know what their needs are?" he asked. "Want to know actually how to keep surge capacity from happening by forward-deploying resources instead of sending out explanations of benefits? How about sending out explanations of preparedness to some of these patients?"

Including this type of information in a single situational awareness system opens up all kinds of possibilities and enables all sorts of decisions to be made during an event, from easing the evacuation process to stocking a medical needs shelter.

Alabama Incident Management System

The Alabama Incident Management System, or AIMS, is a tool currently used by the hospitals, nursing homes, medical needs shelters, and all EMS agencies in the state, with approximately 1,000 users overall. The system tracks a broad range of data—supply levels, staffing, resources, and utilities—self-reported by each participant in the system. Although the service is performing its function, Taylor shared, it does have gaps. In particular, by design it does not look back or ahead, and it does not look at information outside of the healthcare system.

There were additional needs that are not part of AIMS that play an important role in attaining full situational awareness. For example, there is a need to have data from outside the hospital setting, including from community health centers and primary care facilities. Systems also need to be established that can be predictive and answer questions such as: Where are we in the event? How many more patients are we going to be getting? What should we be worried about? Situational awareness tools simply do not look forward very easily.

"We need to radically focus more on the decision-support systems and tools at that ground level," said Taylor, "to give healthcare providers a lot more confidence in making those decisions."

Boston's Partnership for Effective Emergency Response (PEER)

Boston's PEER system has the advantage of enrolling public health facilities, hospitals, health centers, EMS, and long-term care facilities in the Health and Homeland Alert Network in order to increase notification of mass-casualty incidents and integrate all the major components of

the health system that will be responding to an incident. To facilitate communication during an incident, the facilities use software named WebEOC to share information and receive updates.

The PEER system has been used several times with success during ice storms, the Boston Marathon, and the H1N1 outbreak. Its two strongest points are that it provides notification about an incident and a system to share information. For example, "the PEER system was used following a trolley crash in Boston and immediately people knew how many patients there were, where they were being triaged, what kinds of injuries they had," recalled Paul Biddinger, director of operations and director of disaster medicine at the Massachusetts General Hospital Department of Emergency Medicine.

However, Biddinger also described the complexities associated with trying to expand PEER to the surrounding jurisdictions. Obtaining information supplied by a broader group was a challenge. "As soon as you ask people: tell me how many ventilators you have, tell me how many beds you have, tell me how many nurses you have and you're not the public health authority, people say, well, why are you asking? Are you going to take them? Do you want them? And we nudge up every time we try to get better in our situational awareness, we nudge up against command and control," Biddinger said. However, control of information is control of the response, so it is important to establish strategies and systems that link situational awareness with the appropriate control authorities in the response so that people feel comfortable sharing the information and acting as a regional unit.

Seattle Healthcare Coalition

Cynthia Dold, hospital emergency preparedness administrator for King County in Washington, shared some of the Seattle Healthcare Coalition's efforts to create an integrated system for situational awareness. The project includes hospitals, home health providers, nursing homes, and dialysis providers—the whole gamut of healthcare providers, all sharing information about resources, staffing, clinical data, and infrastructural impacts in a variety of ways. Data are collected from sources as broad as conference calls, WATrac (Incident Management Software), healthcare status forms, public call centers/nurse lines, clinical data (provider reporting, systems, surveys), field operations (EMS, etc.), and media reports. The Healthcare Coalition uses the data to help facilities make

policy decisions, inform operational objectives, and provide clinical guidance. The information is also used in press releases and other public messaging.

During the spring of 2009, the Healthcare Coalition was activated for the H1N1 outbreak. Briefings were provided and information shared through the chat rooms available in the WATrac system. Although the system worked well, some gaps and challenges remain. Dold shared the following "to do" list in the wake of the spring outbreak:

- Create user-friendly tools to process data more rapidly;
- Improve systems for clinician communication and coordination;
- Create a transparent framework for prioritization that is in step with resource conservation strategies;
- Define and standardize capacity for all sectors;
- Create tools that translate guidance into implementation; and
- Identify sustainable funding.

The Hippocrates Project—New Jersey's Integrated Situational Awareness System

The Hippocrates project in New Jersey is a web-based Information Technology project that connects and integrates stand-alone Health Information Technology systems in support of analysis and assessment, resource management, and information brokerage across multiple agencies. New Jersey is proposing use of their existing software as a basis for a national health information technology high level architecture, a long-time goal of HHS. This proposed effort will initially focus on three data elements: HavBED (a national system that reports bed capacity), hospital diversion status, and incident-management/information brokerage. However, in order for this project to translate into a national effort, there is a need for national data standards, commented David Gruber, New Jersey Department of Health and Senior-Services Senior Assistant Commissioner for the Division of Health Infrastructure Preparedness and Emergency Response, the Office of Emergency Medical Services and the Division of Public Health and Environmental Laboratories. Once these standards are set, individually developed products meeting these standards will be able to plug into a national system through the existing Hippocrates high level architecture.

"Everybody will tell us they have resource management databases, and I agree with that, and there are plenty of them out there," said Gruber. "But what we don't see is the integration of the external influences with the needs—with resources and resource databases and processes."

The goal of the Hippocrates project—and the broader national effort—is to provide infrastructure that can integrate these different systems. Hippocrates not only brings together data from disparate systems, but it allows different users to view the data at different levels, giving each user the data they need to make the best decisions possible, given the information at hand—which is exactly the goal for situational awareness systems.

AT-RISK POPULATIONS: BEHAVIORAL HEALTH EFFECTS AND MEDICAL NEEDS

Public health emergencies and pandemics are not equal opportunity offenders. The very young, the very old, the chronically ill, and the mentally ill all are more vulnerable. Special planning considerations need to be made for how to treat these patients in any emergency. Pre-existing vulnerability puts tremendous additional pressure not only on the medical system, but also on those already charged with caregiving before an incident occurs. Substantial time was dedicated at the workshop for discussion of various vulnerable populations, what makes them special, and what issues need to be addressed.

Children

Children and youth make up approximately a quarter of the U.S. population. They are in daycare facilities and schools for much of their waking life, which increases their risk of contracting an infectious disease. As summarized by Arthur Cooper, director of Pediatric Surgical Services and the Regional Trauma Center at the Harlem Hospital Center, in the medical view, children are not small adults. They are more vulnerable to toxic exposures because of their metabolism and developing bodies. They require more food and water per pound than adults, which comes into play when planning for sheltering. And perhaps obviously, they are children. This means they need more supervision, reassurance, and help than adults, and are unable to care for either themselves or oth-

ers. They may not be able to report symptoms or exposure reliably, may not be able to self-identify, and cannot legally consent to care.

Workshop participants stressed that all of these factors complicate the caring for children and need to be planned for specifically in any emergency preparedness plan. This extra planning is made more important when we consider that, paradoxically, children are both vulnerable and healthier, as a population, than other groups in the nation. A smaller slice of the healthcare pie goes to children than other segments of the population. This leads to fewer resources, and less ability to surge.

Children have many unique needs in a disaster—from reunification with families to special decontamination facilities that can handle family groups and non-walkers. But considerations also need to be made for the people who take care of the children. Parents' concerns for their children and the stress of taking care of severely ill or injured children weigh heavily on caretakers. "Post-traumatic stress disorder [PTSD] … is not limited to families, but also to the caretakers," asserted Joseph Wright, director of Pediatric Medicine and vice president for Patient Care Services at Children's National Medical Center. "It is an important issue to keep in mind when taking care of children and families."

Workshop participants expressed a general concern that some elements of disaster preparedness have not been adequately tested and evaluated for children. Wright suggested that the Pediatric Emergency Care Applied Research Network (PECARN), a federally funded research network, is a resource where these issues can be addressed. PECARN is working on a new set of performance measures for the Emergency Medical Services for Children Program. "We are proposing that there be a new performance measure on state preparedness for children and disasters, and this might be an opportunity to really get engagement of multidisciplinary folks," said Wright. "This is a working document right now and I think an opportunity to engage."

H1N1 and Children

To provide a concrete example during the workshop, Richard Hatchett, director of medical preparedness policy for the National Security Staff at the White House, presented an update on the H1N1 influenza and its incidence in children. The CDC numbers as of early June 2009 showed H1N1 to predominately affect younger age groups, with about two-thirds of infected people being under age 24. Of the 27 deaths that

had been reported in the United States as of June 5, six occurred in the 5- to 24-year age group.

Hatchett noted that school closures across the nation peaked around May 5, with 700 schools closed, affecting 450,000 students.[2] New York City was hit especially hard, with seven deaths occurring in the city and a number of schools closing for up to a week, as of the beginning of June.

There were lessons to be learned from New York City's H1N1 outbreak. First, schools will be highly affected during pandemics, and not just because of the possible increase in risk of passing contagions. During the H1N1 outbreak, there were high rates of absenteeism in many schools, with about a third of NYC schools experiencing 20 percent higher absenteeism than usual for that time of year.

Not all students who stayed home were sick, leading workshop participants to ask: What do we do about the "worried well"? The NYC Department of Health and Mental Hygiene estimated that two-thirds of the absenteeism was due to parents keeping their children home as a result of parental anxiety. Unless we can develop ways to ensure that our schools are safe environments for our children, Hatchett suggested, this is probably going to be a significant factor going forward.

Hatchett noted that the response to the H1N1 virus changed as information was gathered. The CDC "did strike a cautious pose initially in terms of their recommendations relating to non-pharmaceutical interventions and the initial recommendations about school closure," said Hatchett. "And they changed course very quickly. I think that they are to be credited for taking a look at the situation and, as they got a better handle on it, shifting gears toward a more calibrated approach to the virus that you were actually facing."

The challenge, of course, is keeping children in school while preventing the spread of disease.

The New York Approach

New York City has taken the approach of looking at the pediatric chain of survival for evaluating care options: prevention, access to care, life support, and specialized care. As Cooper, who is also a professor of surgery at Columbia University, stated, "If any of these links in the

[2]These statistics were up to date at the time of the workshop, but are not current to the publication date.

chain is broken, children cannot be expected to receive the care that is necessary."

In New York City, prevention is supported through risk communication. Access to care is supported by the creation of a triage plan. As far as the links of life support and specialized care, New York City has established which hospitals have pediatric facilities, either as tier-1 facilities (children's hospitals with a pediatric intensive care unit [PICU]) or as tier-2 facilities (general hospitals that have pediatric inpatient units, but no PICUs). For medical surge, NYC is focused on increasing the human capabilities of hospitals without PICUs to be able to care for children who are sicker than usual, but with an emphasis on transferring children to specialized children's hospitals as quickly as possible. Although this plan is sound in principle, it makes many assumptions—especially that interfacility transportation will be available in the midst of a crisis.

Older Adults

Although there is little disagreement that older adults are at risk, there is not a broad consensus about the definition of "older adults." Older adults can be defined as over 80, over 65, or even over 50. Each group has different specific characteristics and needs, and needs increase as the population ages. Charlotte Yeh, chief medical officer of AARP Services Incorporated, shared some characteristics of the over-65 Medicare population with the workshop:

- More than 80 percent of all Medicare beneficiaries have at least one chronic illness, with 20 percent of them having four or more;
- 42 percent of women 65 and older have arthritis;
- Roughly 50 percent of men and 33 percent of women have hearing difficulties;
- 20 percent of all men and women have visual impairment or visual difficulty;
- 42 percent of the 65-and-older population is compromised in activities of daily living (trouble with handling the telephone, shopping, managing money, cleaning the house, etc.);
- 20 percent of men 65 and older and 40 percent of women 65 and older live alone; and

- The population is growing older. Estimates show that by 2030, the United States may have nearly 20 million people aged 80 and older—and the over-100 population is also growing. In 2008, nearly 100,000 people turned 100. By 2050, that number may reach 1 million.

Complicating these factors, many older adults are reluctant to request public assistance because they are afraid of being institutionalized or put into facilities. Because they value their independence even more than their health in some cases, Yeh said, "They are often invisible to relief workers."

The consequences of these characteristics were seen in the aftermath of Hurricane Katrina. Of the approximately 1,300 people who died in New Orleans, 71 percent were 60 or older. Forty-seven percent were older than 75. Most people who died did so in their own homes and communities. Even those who did survive had long-term health effects. "There are tremendous ramifications for displacement and deterioration in their health and their vulnerability because of the change in environment," Yeh commented.

Unique Challenges

For many older adults, chronic illnesses mean a reliance on multiple medications. About half of people aged 65 and older take three or more prescription medications a month. This has huge ramifications when thinking about care after a mass-casualty event. Not only will medications be needed to treat whatever illnesses and injuries arise from the event itself, but the prescription and medication system needs to be in place so that patients can continue to get their routine medications as well. Additionally, people with chronic illnesses have a higher risk of developing pneumonia even before the effects of a pandemic or toxic exposure have occurred.

Chronic illnesses also frequently require medical appliances that need electricity and supplies, from oxygen pumps to home dialysis machines. An electrical outage due to an emergency can mean these patients may need medical sheltering before the general public. Raymond Swienton, codirector of the Section of Emergency Medical Services, Homeland Security and Disaster Medicine at University of Texas Southwestern Medical Center, explained, "The reality of most special

needs patients are they are simply at home, living day to day in a very fragile, self-designed medical community." That self-designed medical community—their home—can become nonfunctional in an instant with the simple removal of electricity or a failure in the supply chain.

The older population faces challenges simply in moving physically through the system. The higher incidence of arthritis in the population causes complication boarding public transportation to get to alternate care facilities, and those sites need to be accessible to those who use a wheelchair, walker, or cane.

Even communication can be a challenge. Hearing difficulties complicate verbal announcements and information. Visual impairment complicates written communications, and a lower level of "health literacy" in some older populations can make communicating written health information and even collecting accurate patient data more difficult. Yeh cited a recent example in which a third of the 75-and-older population could not circle and identify when their next appointment was on a hospital appointment form. "In fact only about 4 or 5 percent of those 75 and older are even thought to have any proficiency in healthcare literacy," Yeh explained.

There is one encouraging statistic in communicating with older adults—they're relatively easy to target as a population. People over 65 spend, on average, 50 percent of their leisure time watching television. They are also among the fastest growing populations on the Internet—in fact, women age 55 and older are the most rapidly growing segment on Facebook and other social networking sites.

Some states are making it easier to locate vulnerable groups of older adults. Florida is required to have a special needs registry that lists every resident who needs assistance with activities of daily living. This enables the state to find people who will need extra help in the event of a hurricane or other emergency.

Treatment needs of the older population may overlap with those of the pediatric population. Some older people may be disoriented and unable to remember all of their medical needs, and they may need more help with self-care because they are confused. However, how the system deals with these issues can be problematic. "Under CMS, if we want to pay you for nursing home services, you have to meet certain levels of criteria," Yeh noted. "Well, what if it is a pandemic? You do not have those kinds of facilities in your ordinary shelters. You might want to put them in facilities like nursing homes. How do the nursing homes actually get paid when essentially these individuals do not quite need that skilled

level of nursing care, but they need it during a disaster or a surge response?"

Many workshop participants emphasized that tackling the issue of Medicare funding in mass-casualty events is an important area for future work to improve emergency preparedness and response.

The Chronically Ill

The chronically ill have many of the same needs as older adults. They can have multiple medications, require oxygen or other medical support systems, and have complex care plans. The chronically ill can be too fragile to move safely without significant planning and specialized transportation. During an emergency evacuation, this can be impossible.

Workshop participants shared numerous anecdotes from Hurricane Katrina about nursing homes that were not evacuated in time. The natural reaction is always "Why? Why didn't they evacuate, why didn't they leave sooner?"

Swienton related a conversation with one administrator who explained that he had been told that between 1 and 10 percent of the patients he needed to evacuate would not survive emergency evacuation. He had to weigh that with the risk of riding out a storm. While perhaps a shocking illustration, the question remains valid. "What is the answer?" asked Swienton. "What can a healthcare community do to move these people effectively?" There are no metrics available to make this kind of a decision, and the evaluations are necessarily situational.

Psychological Impact

When talking about behavioral health, there are a number of things to consider that impact medical surge. Behavioral science suggests that people respond in counterproductive and counterintuitive ways when confronted with an emergency: sheltering in place when they should evacuate, and evacuating or migrating when they should shelter in place. People tend to go where they feel safe. "You may not have people come to the emergency room. You may have them plant tents around the hospital," said Robert Ursano, chair of the Department of Psychiatry at the Uniformed Services University and director of the Center for the Study of Traumatic Stress.

Alternatively, people may migrate out of the area, as seen after Hurricane Katrina. "New Orleans was not the disaster zone," Ursano said. The disaster zone "was, in fact, the entire nation." When people migrate in response to a disaster such as an epidemic, they carry the disease with them, spreading the event and the breadth of the required medical surge.

The injured or ill are not the only ones who seek care in a mass-casualty event; those who *believe* they are ill, injured, or exposed may also seek care. The 1995 sarin-gas attack in Tokyo's subway system killed 11 people, but more than 5,000 sought care. In 1987 in Brazil, a radiological hazard contaminated 249 people and caused 4 deaths, but caused approximately 110,000 to seek screening (International Atomic Energy Agency, 1998). "You must deal with the question of those who are distressed, and not only those who are actually exposed," cautioned Ursano.

Behavioral responses also can contribute to casualties. During the SCUD missile attacks in Israel in 1991, 1,059 people went to emergency rooms. Twenty-two percent were direct casualties of the attacks, and the remaining 78 percent were behavioral stress casualties: About half were suffering from anxiety, some had auto-injected themselves with countermeasures without being exposed to a biological agent, and seven people died due to incorrect use of gas masks.

A disaster has very real psychological effects on victims, survivors, and relief workers, including healthcare providers. "The mental health burden of illness doubles in the face of disasters," said Ursano, citing research done after Hurricane Katrina. A wide range of behavioral responses occur after disasters, including PTSD, increased use of alcohol and cigarettes, delirium/organic brain syndrome/psychosis, mourning/traumatic complex grief, depression, sleep disturbances, increased family violence and conflict, overdedication to the group, helplessness and guilt, identification with the victim, and unexplained somatic symptoms.

Because responses to mass-casualty events can be long lasting, special needs must be met to sustain alternative care facilities and home care. Support needs to be available to caregivers and first responders. "Even those that take care of others need sleep, rest, connectedness, and hope," said Ursano. "The question is how to address our first responders' needs … in times of medical surge."

FATALITY MANAGEMENT STRATEGIES

The practical repercussions of large numbers of dead can be difficult to grasp, but workshop discussions highlighted the need for coordinated and integrated planning. Lisa LaDue, deputy director of the National Mass Fatalities Institute, put it this way: "If we think about the continuum of care, beginning from the very beginning with prevention and treatment and all of the steps that are included with medical care to the very end of that continuum—death—that is really not such a far-reaching idea."

Workshop participants emphasized that fatality management is really about the living—they are the people who are left behind to deal with the tragedy and grief and need resources and support.

Family Assistance Centers

Family assistance centers came into the national spotlight after the 1996 mid-air explosion of TWA Flight 800 off the coast of Long Island, New York. Out of this tragedy came the Family Assistance Act of 1996, which set standards for dealing with mass-casualty and mass-fatality incidents in aviation. Over the next 5 years, 3,600 people died in large-scale aviation incidents, including the events of 9/11. In each case, family assistance centers were set up to assist people affected by the events. An estimated 10 to 100 people seek services from a family assistance center for every one casualty or fatality in these situations.

A family assistance center is not a one-size-fits-all entity. By its very nature, it is reactive—the scope and location of the incident dictates what types of services and staffing levels are needed and where they can be provided. They have the capacity to provide a large variety of services, including spiritual care, grief support, information hotlines, childcare/play space, and food and drinks. Given the breadth of services provided by family assistance centers, planning is critical, but must be flexible, scalable, and reactive; not set in stone.

For example, during the hours after the planes hit the Twin Towers, the family assistance center in New York changed drastically—switching locations, growing, and expanding as the extent of the devastation unfolded. By the time it moved into its final home on Pier 94, it had grown to include computer systems, a childcare area, a café, and an area for ante-mortem data collection, in addition to areas for other services.

Virginia Mewborn, assistant commissioner of Training and Exercises for the Office of Emergency Management in NYC and former senior director of Emergency Services at the American Red Cross in Greater New York, shared a few lessons she learned from managing family assistance centers. First, she recommended that planners set aside their preconceptions: People in crises do not behave rationally. Second, people grieve in their native language, so having translators available is critical. Workshop participants mentioned that faith-based and other area community groups are a great resource for native speakers. Having these groups involved in planning for mass-casualty events means having the connections in place when they are needed most.

Most importantly, Mewborn stressed that what people need in any disaster is information. "People want to know what is happening," she said. "One of the things we learned quickly was that you brief the families first and then you brief everyone else."

Staffing

The work being done in a family assistance center is carried out in a difficult environment, so the staffing must be appropriate. "You need to make sure that the people that you are going to put out there, dealing with immense grief, are able to handle it," explained Mewborn. Staffing a family assistance center is not the same as staffing a call center; it is important to have trained mental health professionals who work not only with the families, but also with the other staff and volunteers at the center.

Volunteers and staff need to be trained before they are put to work, said Jack Herrmann, senior advisor for Public Health Preparedness of the National Association of County and City Health Officials. "Dealing with the mental health and spiritual care issues around family assistance are not easy 'just-in-time' training issues," he said. "Many of the folks who are working in these fields are working in environments that do not really test their skills." Dealing with the stress of grieving and worried families isn't part of most volunteers' day-to-day experiences.

Family assistance centers work well for discrete events such as airline incidents and building collapses, but in a pandemic environment they become problematic. Because of the need for social distancing in a pandemic, it may not be possible to have a physical family assistance center, though many of the services it would otherwise provide are still

needed. The challenge is to figure out how to use virtual means to get services to those who need them. Several workshop participants highlighted this as work yet to be done.

Duties and Jurisdiction of Medical Examiners

In a mass-fatality event, medical examiners and coroners play pivotal roles that cannot be transferred to federal entities or expanded to untrained personnel. For example, the issuing of death certificates is simply not a federal capability or transferable authority. Even in the bombing of the Federal Building in Oklahoma, only the local medical examiner had the jurisdiction to issue death certificates.

Medical examiners are involved in the recovery and processing of decedents in a dignified and respectful manner. The medical examiner ultimately determines the cause and manner of death—even during pandemics and natural disasters. During and after Hurricane Katrina, not all of the deaths were a result of the hurricane, and some needed to be investigated by the police. More recently, the NYC medical examiner investigated every death during the H1N1 event, playing a vital role, in conjunction with CDC pathologists, in determining the virulence of the virus.

Medical examiners are also responsible for the accurate and efficient identification of victims. They interact with surviving family members, providing them with information and support—often working through family assistance centers. The medical examiner is also responsible for the rapid return of the decedents' remains to their legal next of kin.

To carry out these responsibilities in a mass-fatality environment, surge support needs to be in place. Two critical needs are the ability to develop a victim manifest in an efficient manner and to communicate with the public quickly after a mass-fatality incident. Frank DePaolo, director of the Special Operation Division at the Office of the Chief Medical Examiner for the City of New York, said only two places in the world have systems in place to directly support this capability—NYC, with its Unified Victim Identification System (UVIS), and the United Kingdom, with a casualty call system that has been in place since World War II. New York's web-based UVIS system is currently being made available to other agencies throughout the United States.

One of the main challenges discussed by attendees was the fact that many medical examiners' and coroners' offices have severely limited

resources. They are challenged to operate efficiently on a day-to-day basis, and are last on the list when it comes to funding within their local jurisdictions. DePaolo explained that when policy makers need to decide whether to fund services that save lives versus services that serve the dead, it is understandable why the funding is directed toward saving as many lives as possible. "It leads to significant problems when we face mass-fatality incidents. It also results in a heavy reliance on federal resources." DePaolo continued, "You will notice when you look at mass-fatality disaster plans … their plans says the following: Call DMORT." The problem is that DMORT—the Disaster Mortuary Operational Response Team, covered later in this section—is a limited resource that may not be available during a catastrophic event.

Complicating the funding problem is that there are limited grant opportunities in the field, and, quite often, funds are not available until a community is actually faced with a mass-fatality event.

Case Study: New York City

To reduce the burden of fatality surge in a mass-fatality incident in NYC, the medical examiners have become the buffer between the healthcare industry and the funeral industry. The medical examiners arrange for the recovery, transport, storage, tracking, and processing of fatalities to avoid competing for scarce resources. The NYC medical examiner works in concert with the Office of Emergency Management to provide logistics to each healthcare facility in NYC. All decedents during a catastrophic event are processed and managed by the NYC medical examiner for the hospitals, and NYC has information technology and tracking systems in place to do this. DePaolo said, "All of this is in place in New York City, and this is part of the system that we are making available to the rest of the country."

After 9/11, NYC was the recipient of funds for emergency preparedness. One project that was funded by Homeland Security was the development of the UVIS. It is a comprehensive disaster management system that addresses everything from setting up call centers to managing family assistance centers. It also can manage both ante-mortem and post-mortem reporting needs. It deals with both the living and the dead and has been used in the H1N1 outbreak to track flu patients.

Federal Resources for Fatality Management

Although most fatality management will necessarily be handled by local resources, the federal government does have resources available to support local efforts. These entities will always be in a supporting role—never a leading one—and, in a widespread emergency, may not always be available.

Department of Defense

The U.S. Northern Command (USNORTHCOM) provides command and control of the DoD's homeland defense efforts, and is the DoD lead for any major disasters in the United States and certain portions of the Virgin Islands, Canada, and Mexico. Mortuary Affairs consists of approximately 400 mortuary personnel who are trained primarily to work in military operational theaters. Currently 60 percent of DoD resources are deployed in either Iraq or Afghanistan. The DoD does not have the capacity to take a primary role in responding to a domestic incident, according to Michael Luke, mortuary affairs officer from NORAD USNORTHCOM and joint logistics planner for the Logistics and Engineering Directorate.

Disaster Mortuary Operational Response Team

DMORT is the Federal National Mortuary Affairs Support system, and is made up of 10 teams distributed within the FEMA regions. The team members are pulled from within each region and primarily are people actively engaged in the funeral industry. While theoretically they are available to be deployed in a crisis, the regional nature of the teams means that personnel may already be involved in relief efforts before DMORT is even called.

Beyond just staffing, DMORT is actually a portable morgue system where human remains are brought and processed. However, DMORT is not designed to actually recover human remains. "There is still a recovery gap," stated Luke, and a need "to go to the community to find those kinds of people that are willing to help in this type of recovery that most people do not want to deal with."

Private-Sector Resources

In the United States, post-mortem care is largely the province of the private sector. Once someone has died and their cause of death has been determined, they move out of the healthcare system and into the realm of funeral directors. This private industry deals not only with burial or cremation arrangements, but in many cases also provides grief counseling and support for families.

"There is a wealth of experience and capabilities in the private sector that can be used to supplement and work with you to deal with mass fatalities in your local area," said John Fitch, senior vice president for advocacy for the National Funeral Directors Association in Washington, DC.

Because most funeral homes are small, locally based, family-run businesses, they have ties to the community. "Many of our funeral directors have ethnic or diverse families that they serve and they have learned languages or have people on their staffs that can liaison with these communities," Fitch noted. "They reach out—and we have encouraged them to reach out—to their religious leaders and ethnic community leaders in their service area."

Of particular importance is communicating that traditional funeral customs may be impossible in the midst of a mass-fatality situation. Workshop participants believed that the funeral industry was in a good position to have these conversations, due to their relationships with community and faith-based groups in their day-to-day work. Additionally, their daily contact with local medical examiners for routine matters, such as obtaining death certificates and arranging transportation, put them in a good position to be effective during a surge event.

If there is a gap, it is in connecting the private funeral industry with emergency preparedness planning, Fitch commented. This gap can sometimes be seen in discussions about what to do with decedents in a mass-fatality event such as a pandemic. There can be an assumption that crematories will be able to handle the surge; however, Fitch cautioned that this simply isn't the case. "Crematories need to take time to do the cremation," he explained. "They need to stand down to collect the ashes. They need time for repairs. They are not going to be operating 24/7 to handle this sort of thing."

In addition, Fitch noted, "The one area that gets lost in all of this planning process is that funeral homes, cemeteries, crematories, and morgues and their suppliers should be included in any kind of priority for

logistical or workforce support." These facilities need to be functioning and well supplied, especially if a quarantine situation arises. The industry has worked with the CDC to ensure that funeral service personnel are in tier 2 for vaccinations, so operations can continue as needed. However, concerns remained about maintaining normal operations during a pandemic, especially in rural areas with fewer resources.

Future Needs

Workshop participants noted the United States has no comprehensive fatality management strategy and only limited resources available. The federal resources—particularly DMORT—are limited. Because of this, participants agreed that it is important to plan within communities, and that there are informational needs that have not even been considered. "What if we have to inform people of how to care for their deceased loved ones who are going to be home with them for the next 5 days?" asked LaDue of the National Mass Fatalities Institute. "Do we have a pamphlet in the back of a drawer that provides that kind of guidance?"

Another issue raised during the discussion was the concept of a crisis standard of care for palliative care during a mass-fatality incident. "We need to take a look at what kinds of [palliative] care will be provided in a tremendous surge-capacity situation," LaDue said. This issue was addressed in the recent IOM report that highlighted the need to integrate palliative care in crisis-standards-of-care plans (IOM, 2009a). Along the same lines, Fitch suggested that plans need to be in place for "the suspension of certain rules and regulations that may inhibit the ability of funeral directors and others to perform their function with regard to taking care of the families and the dead."

The challenge is to balance the medical need to process a large number of dead with caring for the dead and their families respectfully. Just as this remains a thorny problem in crisis standards of care for the living, it remains an issue in dealing with the deceased.

Finally, workshop participants noted that fatality management is not addressed in most federal frameworks or local response plans. Few, if any communities have conducted drills on how local authorities would handle large numbers of bodies and the emotional needs of survivors.

"Was there a fatality management component built into the single incident action plan?" DePaolo asked, rhetorically. "We understand why that's not the case: because there is no mention in the NRF [National Re-

sponse Framework] and there is no mention in NIMS [National Incident Management System]. I believe that if we could do one thing … if we can get some language into those two documents, we can make a significant difference throughout this country."

DePaolo also recommended that collaboration among hospitals, healthcare facilities, and medical examiners/coroners be required in mass-fatality initiatives. He pointed out that many medical examiners and coroners have worked closely with hospitals already, taking advantage of Hospital Preparedness Program grant initiatives.

RAMPING DOWN AND RECOVERY FROM A MASS-CASUALTY INCIDENT

What Does It Mean to Recover?

When the initial surge is over, the work is only half done. As we have seen with Hurricane Katrina and elsewhere, getting a community back on its feet after a disaster can be a monumental task, one that requires the same degree of commitment and focus as the surge response itself.

Workshop participants agreed that a significant amount of work remained to be done in evaluating how to recover from medical surges, starting from the very top. "Part of the challenge in developing recovery plans is in defining what we mean by 'recovery,'" explained Roslyne Schulman, senior associate director for Policy Development at the American Hospital Association. "A simplistic definition might be the return of a community to a stable state after a disaster."

Studies have shown that, while recovery efforts share much in common with disaster response, leveraging similar resources and requiring similar levels of commitment, the purpose of recovery and the challenges it poses can be quite different. The new, different purpose and challenges cause different stresses and a need for a different type of planning.

"Disaster response is focused on immediate needs to protect human life and physical infrastructure from the immediate effects of a disaster," explained Schulman. "Recovery, on the other hand, is much broader in scope. The goal of recovery is to ensure the economic sustainability of a community and the long-term physical and mental well-being of its citizens, to rebuild and repair the physical infrastructure, and to implement mitigation activities to reduce the impact of future disasters."

To do this, certain basic services must be in place, including healthcare services. Such services are critical to broader community-disaster recovery. Without these services, long-term economic stability and vitality of a community will not exist.

Planning to Recover—Lessons Learned from Hurricane Recovery Efforts

The key to recovery starts during emergency preparedness planning, even before an event occurs. Workshop participants agreed there are no quick fixes; lots of hard work, time, and money are needed to return a community, or even a single facility, to normal operations after a major event. Workshop participants cautioned that the immediate recovery period is not the time to recreate a new healthcare delivery system. John Matessino, president and chief executive officer (CEO) of the Louisiana Hospital Association, cautioned administrators to "get back to normal, or at least what some sense of normal is first" before tackling that kind of task.

Many Southern states have been hit with large hurricanes in the past 5 years. Hurricanes Frances, Jeanne, Katrina, and Ike all inflicted large-scale damage and deaths in the United States and other countries. Workshop participants from area healthcare systems shared lessons they learned as they worked to rebuild their communities.

Scope of Recovery

The scope of emergency preparedness and recovery planning can be quite large, and as with the initial disaster response, it is important to think outside of the hospital when defining what essential non-hospital services can be restored quickly. If outpatient dialysis facilities, pharmacies, or urgent care clinics are damaged or overrun in an incident, the patients will turn to the hospital to pick up the slack. Beyond healthcare services, vendors and contractors such as laundry services have a huge impact on a facility's ability to conduct business. If the laundry service your facility uses is unable to deliver clean linens and uniforms, what will you do? All of these services need to be restored as part of recovery efforts.

Hospitals and healthcare systems cannot rely solely on FEMA or other federal sources for recovery funding. It is important to make sure that facilities are covered with their own adequate insurance policies—especially for investor-owned hospitals that may be ineligible for some of the federal programs. "We make it a point annually to remind our hospitals in our state to go back, check your business interruption insurance, make sure it covers the kind of things that you have to deal with," Louisiana Hospital Association's Matessino said.

Some irony can be associated with business interruption insurance. Hospitals that closed due to flooding after Hurricane Katrina were able to take advantage of their business interruption insurance to return to normal operations. Hospitals that stayed open, even though patients were unable to get to them because of floodwaters, were not, even though they were not treating patients.

Facilities and Supplies

Workshop participants shared some of their planning strategies, such as having contingency contracts with vendors and suppliers—both local and distant—which are precertified with insurance companies or FEMA contractors. These arrangements can speed up recovery efforts, allowing services to be provided by multiple vendors outside the immediate area if they are not available locally. Additionally, with prenegotiated and preapproved contracts, vendors can begin work as soon as a disaster passes. "If you're hit heavily by a storm, it's likely that a lot of the people you generally rely upon locally or within your region are likely to be out of business or unavailable," said Mark Robitaille, president and CEO of the Florida Martin Memorial Health Systems. After the hurricanes in 2004, "We were able to bring contractors in, literally, within hours of these storms leaving, both locally and out of the area."

The key to these rapid recovery efforts—or at least the key to getting these efforts funded or reimbursed—is documentation. In addition to paperwork, videos that document conditions before, during, and after the event are all important when it comes to making insurance claims. Matessino suggested that facilities "prepare and start to document everything that you spend from the very, very beginning to make sure that any kind of aid that you need from FEMA or federal sources is there." Furthermore, in order to get reimbursed by FEMA for person-hours related

to disasters, specialized payroll and documentation systems need to be in place, preferably before the event occurs.

As far as supplies, Robitaille's organization has created a policy of keeping 30 days' worth of supplies such as fuel, food, and water on hand. This provides a buffer in case there is a mismatch between what supplies can be delivered and what is truly needed in a crisis.

Emergency Departments

After an incident, the status of the healthcare system outside of the hospital itself will continue to affect hospital operations. Private-practice physicians or community health centers may not be open for business, or may have limited hours as they recover from the event themselves. People in the community may have lost their jobs—and their health insurance—due to damage. This can lead to the local hospital emergency department becoming the primary care site for a large population—an expensive way of distributing primary care—if the ED is even open. History has also shown that it is not always possible to keep the emergency department doors open during a disaster. Therefore, hospitals need to also develop plans for community members/patients presenting to the hospital ED while the hospital is actively evacuating.

In 2008, after Hurricane Ike, the University of Texas Medical Branch (UTMB) closed its ED because its facilities were unable to handle trauma due to damage to its pharmacy, blood bank, sterile processing areas, and operating rooms. Directly after the hurricane, Disaster Medical Assistance Teams (DMATs) from HHS helped out with a program of treat-and-transfer of any patients who arrived needing medical care—because patients still showed up regardless of what the hospital said it could do for them. After DMAT left, the hospital continued the program for a few months, but the area hospitals became saturated and less tolerant of receiving patients. Finally, after trying to care for patients the best they could, they resorted to calling 911 to have the patients taken to other hospitals for care.

This put the hospital, which was simply doing the best it could, in the position of violating EMTALA (Emergency Medical Treatment and Active Labor Act). "There has to be a way in which hospitals are given some kind of guidance on what they can possibly render in a recovery state," said Karen Sexton, Executive Vice President and Chief Executive Officer for the UTMB Health System.

Staff Considerations

One of the hardest challenges to manage in shifting from response to recovery is the role of staff. Some entities have taken the approach of defining what each employee's role is during an emergency—who are the first responders and who are responsible for keeping operations going while others respond. Critically, some roles may change once a declared disaster is officially over. In the Department of State Health Services in Texas, each employee's job description details his or her role in a disaster. In Florida, the Martin Memorial Health Systems employs storm teams, with one team staying onsite at facilities for the duration of the event, and the second team relieving them after the storm. Even more important is to develop programs that support personal and family preparedness. The healthcare workers should all have a plan for how their families will respond to an incident, such as those promoted by the Red Cross, address evacuation, emergency planning, supply kits, and communications.

Staff also require personal support during and after an incident. They need to know that they and their families are safe and supported. For example, they will be more likely to report for work if a childcare plan is in place and lasts through recovery efforts. "We mobilize our daycare facilities immediately," said Robitaille of Martin Memorial Health Systems. "We have a very comprehensive associate-assistance program to facilitate their ability to get back to normal—whether it's housing, food, shelter, or childcare," he explained. "We found that has been extremely valuable in being able to help our associates, but to also make sure they're available to be able to come back and perform their duties."

Repatriation

Just as good discharge planning begins when the patient is admitted, planning for repatriation occurs before a disaster begins. "Getting people back home in many ways is more difficult than getting them out of harm's way," said David Lakey, commissioner of the Texas Department of State Health Services. He noted that after a disaster standards of care return to normal, and what was appropriate during the emergency is no longer appropriate—which changes the resources you use. "Individuals that were evacuated by buses or by airplane may now need to be sent back home by ambulances."

Patient-tracking needs after a disaster are similar to those during one—names, addresses, and shelter identification are all important. But when it comes to thinking about getting people home, it is important to understand their medical needs and the type of environment to which they will return. Essential infrastructure such as electricity and sanitation services need to be in place before evacuees can be returned to the community. After the 2008 Galveston Hurricane, officials used the media to inform the public that, until such basic services were available, they could not return. Once the basics were up and running, the public health infrastructure and basic medical infrastructure had to be back in place before the general public could return. Beyond that, "Additional infrastructure … had to be up in place before medical special needs individuals could safely return," said Lakey. For example, if a person is on dialysis, it is important that they are not returned to the community until the local outpatient dialysis center is open and ready for patients.

Depending on a disaster's scale and scope, repatriation will always be a local, intrastate, and possible interstate or national issue that correlates to the dynamics of the population evacuated. Factors include destination(s); acuity; evacuee type (general, special-needs; hospital, etc.), infrastructure status, ground transportation including EMS units, coordination and communication, and others. Because of this, Lakey suggested unifying transportation standards-of-care and electronic tracking into cohesive, national standards. He noted, "We need a unified tracking system instead of a collection of systems. We need to consider how some of the federal assets might be used in this repatriation process."

Repatriation is an essential part of recovering from a mass-casualty incident, but it is complicated by the fact that recovery of communities is less predictable than the recovery of a single individual or a single hospital. Moving patients and other evacuees out-of-state, adds to the complications for repatriation. It is a long-term process that can drain organizational resources as care is provided for evacuees for extended periods of time. Workshop participants noted that this broad, long-term resource drain is an area that needs further research, discussion, and funding.

FINANCING SURGE CAPACITY AND PREPAREDNESS

A continued theme throughout the workshop was that current financing strategies have not and will not be able to support efforts to plan,

prepare, and respond to catastrophic health incidents. For example, one gap discussed in detail was the need to appropriately finance training. As William Smith, senior director for emergency preparedness at University of Pittsburgh Medical Center, said, "We have lots of stuff, but we don't have the money to pay people to learn how to use it properly and how to deploy it properly." The need to fund training exists at all levels of medical surge, from front-line emergency workers, clinic staff, nurses, and physicians to non-medical staff who will be called on in a crisis.

The old adage "form follows finance" was brought up many times throughout the workshop, and participants noted that the existing finance system is not helping. "Everything we do about how we finance and engineer healthcare delivery in the United States is designed to thwart preparedness," suggested Emory University's Kellerman. To set the stage for discussions, workshop participants examined the various ways health care is paid for in the United States and how each can contribute to emergency preparedness planning and medical surge.

Centers for Medicare & Medicaid Services

Medicare can represent 30 percent or more of an average physician's revenues. Hospital revenue is often even more heavily dependent on Medicare, with as much as 50 percent of operating revenue coming from inpatient and outpatient services to Medicare patients. Because of this, the continued flow of Medicare payments during a mass-casualty incident is financially critical for healthcare systems.

One of CMS's roles is to ensure the continuity of healthcare services to its beneficiaries by paying for services rendered to individual patients. "We assist when there is a disaster, in trying to ensure that our payments flow more easily," said Marc Hartstein, deputy director of the CMS Hospital and Ambulatory Policy Group. CMS has created an emergency preparedness website that is updated with various resources such as links and answers to payment and billing policy questions.

During an emergency, CMS has some limited flexibility in the rules that can be waived. If a public health emergency has been declared, an 1135 waiver can be made. An 1135 waiver allows CMS to waive some rules and regulations—but not all of them.[3] Hartstein explained, "Most of

[3]Of note, since the workshop took place President Obama declared a public health emergency (October 24, 2009), which among other things provided HHS Secretary Kathleen Sebelius the authority to permit CMS to waive a number of its requirements.

the rules and regulations that we'll waive will be related to things like conditions or participation, certification requirements, requirements that physicians and other healthcare professionals hold licenses in states where they provide services, sanctions under the Emergency Medical Treatment and Labor Act—[those] would be some examples—and sanctions and penalties arising from noncompliance with certain HIPAA [Health Insurance Portability and Accountability Act] privacy regulations."

But some things cannot be waived. "One of the things that we can't wave is payment regulations," Hartstein said. This means that rules about fee-for-service payments or about transferring patients between acute care facilities cannot be abridged. This issue was particularly important in Arkansas when patients were evacuated from Louisiana after Hurricane Katrina. CMS worked with the Arkansas hospitals to help them understand how the transfer policy regulations work in those situations—what to do when the patients were there for a length of time that caused them to go into "outlier" status.

In short, the rules and regulations of CMS remain functionally intact from a payment perspective regardless of the crises. The 1135 waivers serve primarily to ensure that patients receive care, not to provide additional, alternative, or streamlined funding for healthcare providers.

Private Insurance Plans

Although there is no insurance code that physicians can use to bill for disaster-training activities, the private insurance companies do play a part in preparing and responding to catastrophic incidents.

The most important factor for the healthcare system is that insurance companies are up and running and paying for services. Private insurers, just like Medicare and Medicaid, need to be prepared for the payment issues that arise from mass-casualty events, especially when patients may be seeking treatment at facilities that are not part of their insurer's network. "We have asked our plans to look at rules that actually need to be waived," said Diana Dennett of America's Health Insurance Plans. "For example: cost sharing, out of network, those kinds of rules." Straightening out problems can become quite complicated, especially when a disaster is focused in a certain geographical area and waivers are requested for people in those areas, but not in others. For example, during Hurricane Katrina waiver requests were coming in based on what parish (Louisi-

ana's equivalent of a county) people lived in, but the insurance plans don't organize their members that way. Dennett noted that thinking about regional approaches would reduce these types of complications.

Ultimately, it is in insurance plans' best interest that their members be prepared for emergencies, and some use existing nurse hotlines to supply their members with access to medical information or advice without requiring an office visit during a crisis. It makes good business sense from the insurers' point of view to reduce the need for office visits if a member can be safely and effectively treated at home. If they need to enter the healthcare system, private insurers need to know where their patients are, so patient tracking is important to them as well. Unfortunately, large-scale funding of preparedness programs by private insurance companies is absent.

Funding EMS Surge—A Gap in Planning?

"In the fee-for-service world, you really don't fund surge, you fund what exists," said Kurt Krumperman, clinical assistant professor at the Department of Emergency Health Services at the University of Maryland–Baltimore County. In the EMS world, that means a fee-for-service model that is tied to transports with no money for readiness costs. Funding is based on day-to-day patient care needs, and even then it may not be adequate. A Government Accountability Office report on Medicare funding showed that on average, Medicare pays 6 percent below the average cost of service for EMS (GAO, 2007). In urban areas, Krumperman explained, there may not be adequate resources to meet response time standards of 8 minutes or less for 90 percent of calls received.

Workshop participants noted that local EMS surge ability currently comes through local or regional mutual-aid relationships. Nationally, there are two systems for mutual aid in a disaster—the Emergency Management Assistance Compact and the FEMA ambulance contract. Under EMAC, states provide mutual aid to other states using resources drawn from their local communities. With FEMA ambulance contracts, the agency contracts directly with EMS companies to provide resources to an affected community.

Both systems have their problems. "There are a lot of issues that relate to the EMAC response," Krumperman said. "It has to do with the lack of set rates, the issue of low bid, lack of consistent standards, delays in payments or no payments, different rate structure between the FEMA

ambulance contract and what EMAC reimbursement is, not being able to backfill overtime on EMAC responses, and also, finally, who assumes the risk?"

Despite the problems mentioned above, the nation has demonstrated the ability to field a large national response after Hurricane Katrina and other hurricanes. Still, Krumperman asked, what kind of capacity is expected for a community to have at a local level if federal response is not available?

Funding Alternatives

"The point has been made before—the IOM report on EMS made it—that the funding for training and for equipment related to disaster response from the first responder grant program, it's only been 4 percent for EMS and it's been that way since the inception of the program," explained Krumperman.

This makes funding anything not immediately put to use on the street—spare capacity—problematic. Biologue's Runge proposed a shift away from straightforward payments for capacity to a plan-driven, requirement-defined system that pays for capabilities instead.

"The bigger issue is how do we get the people, how do we provide enough people on the ground to provide that surge that we want?" asked Krumperman. "If we don't figure that out, the equipment's just going to sit there." The solution is to create spare personnel capacity within the EMS system, and fund it through community-based funding, rather than on a pure fee-for-service basis.

Krumperman outlined an example of how such a system might work. He suggested starting by calculating the costs to provide basic emergency medical services to the community—ambulance, first response, and medical communications—all of the components that the community wants to include. The community can then determine what amount of surge capacity the community wants above that, realizing that those resources would be idle on a day-to-day basis specifically so they could be available when needed. EMS would then be funded to maintain those capabilities.

The question becomes: How should those capabilities be used for the public good? What activities can those providers offer given their skills as EMS responders? "Is it in public health? Is it in immunizations?" asked Krumperman. "EMS providers play a lot of different healthcare

roles in disasters, and perhaps they could be done on a regular basis in a community" to prepare ahead of time.

Instead of funding on a fee-for-service basis, Krumperman suggested funding on a per-capita basis, a monthly fee that all insurers pay into—including Medicare and Medicaid. At the time of the workshop, the draft bill on healthcare reform from the Senate Committee on Health, Education, Labor, and Pensions committee contained a component relating to a pilot project for regional EMS systems that dealt with, among other concerns, surge and the development of adequate surge funding.

Looking Ahead

Throughout the workshop, participants noted that the way we fund medical surge capacity and emergency preparedness in this country does not work. There is no sustained funding to plan for or prepare for medical disasters, and it is only after a disaster has occurred that money is available through the Stafford Act. As Runge asked rhetorically, "Where's the Stafford Act for predisaster?" Where does the money come from to do the planning, run the simulations, or train and drill providers on how to handle disasters that may be looming ahead?

It doesn't come from fee-for-service funding; it is only marginally addressed by grants, and possibly not all that well. The Maryland Institute for Emergency Medical Services System's Bass said, "As a state EMS director, my personal experience is that federal efforts to drive planning and response through grants are overly prescriptive and too compartmentalized, hampering state and local efforts to address the complex issues and unique needs of state-level planning and coordination, and in the end are counterproductive."

Any discussion of the "how" in financing preparedness quickly devolves to a discussion of "who," and while opinions varied, workshop participants agreed national leadership was needed. "One of the few good reasons to have a federal government is to provide for the common defense," suggested Runge. "There is a pre-event phase that has to enter into this common defense ethic. It is a shared responsibility" that flows from the federal government to the state level and down into each community.

In this line, William Smith, senior director of emergency preparedness at the University of Pittsburgh Medical Center, joined other workshop participants in suggesting that going forward, federal funding

should emphasize regional capabilities. "My idea for future funding is to emphasize regional planning," said Smith. "Maybe even mandate that in terms of the utilization of the money, so it's most effective for the populations served, not necessarily for the individual institutions."

CONCLUSIONS

The IOM's workshops exist to bring together a diverse set of viewpoints to tackle major problems—in the case of this workshop, the issue of medical surge planning. This program certainly did that, bringing together nearly 100 people from 21 states, representing many segments of the health system, from doctors to public health officials to service members, EMS directors, morticians, and more.

Workshop discussions highlighted that the HHP program should consider the following in the development of their grant guidance: (1) planning must be regional, (2) funding must be identified and sustained for pre-disaster as well as post-disaster, and (3) unique needs and constraints of the private healthcare system must be identified and acknowledged.

This unique gathering served a unique purpose: Perhaps the single most important lesson drawn from the workshop was that, in order for surge planning to work, each of these parties must work with the others, efficiently and according to plans. It goes far beyond the hospital, but includes coordination among all components of the health system.

The picture that emerged of a successful medical surge was a planning and response system that goes beyond just hospital and that has the following features: politicians who rapidly issue disaster proclamations, and legal teams who work immediately on credentialing and authorizations; contingency staffing plans that snap into place, and hospital triage teams that are ready to function; activation of contingency plans throughout the health system including alternate care facilities that are staffed, and funeral directors that have local-language translators on hand, ready to help; hospital daycare facilities that are activated, payers who keep the necessary funds flowing, EMS who are ready, and an engaged public. It is a web of support, and failures at any one point lead to lost lives and lost opportunity.

But the nature of disaster response extends beyond individual responsibilities, and indeed, beyond individual jurisdictions. One message that was hammered home throughout the workshop was that disasters do

not strike inside the political lines drawn on a map. There is a need to think regionally, and to figure out how to leverage all of the healthcare resources in a community for the good of the whole community. As Gerry Parker, principle deputy secretary at ASPR said during the workshop's closing remarks, "Regionalization is a theme that is really starting to resonate, and we need to think about what that really means … how we can break down those barriers to regional planning, and how we can find those incentives that will enable regional planning in a more meaningful, constructive way."

Discussions at the workshop presented numerous examples of what has worked—and what has not—in various communities around the nation during various disaster events. But participants clearly saw the need for clear and concise definitions, standards, and metrics in order to facilitate further advances. To do this, more solid, evidence-based research needs to be done in the field of emergency preparedness. Additional research should be quantitative, not just qualitative, in nature, according to participants, to make it possible to start putting hard numbers on what has been traditionally a soft science.

A key theme from the workshop was the need to involve the public in some of these difficult issues. Communication and education before an event occurs will go a long way in helping the population understand what will need to be done. Just as school children are taught "stay low and go" they also need to understand the basic steps of protecting themselves in an emergency or pandemic situation.

Another key to emergency preparedness and meeting medical surge demand is the staff that are in the trenches, doing the work. Are they adequately trained and drilled? Do they know the procedures? Are there enough staff to do what needs to be done? If not, how can you get more? This lack of staff and training for staff was mentioned in every session of the workshop. Participants also emphasized that it is important to have support in place for the caregivers and healthcare providers that are responding during an event. Even caregivers need food, sleep, and emotional support.

One issue that was seen as missing from the workshop's discussions was the fact that in many places, healthcare workforces are downsizing and hospitals are closing. Sally Phillips from HHS said, "We've got layoffs going on all over the place, even hospitals doing layoffs. And in that light, though, we still have a responsibility when the balloon goes up to provide that care, somehow."

Finally, there are huge financing challenges, both in terms of the amount of money available for preparedness and how those funds are made available. As HHS's Parker said, "Grants are necessary and we do need to do a better job, particularly with the lessons we have learned, so we can more intelligently target our grant programs in the future."

But he cautioned that grants alone aren't sufficient for preparing the nation for mass-casualty events. Many workshop participants believe that preparedness is fundamentally a national security issue, and suggested that funding can come from that arena. As the University of Pittsburgh Medical Center's Toner said, "We always find ways to pay for national security projects. We have to find a way to pay for this."

Inova Health Systems' Hanfling put preparedness efforts in perspective. "The dual luxuries that we have, right now before us, of time and available resources: They should be taken advantage of, because once we hit scarcity and fear, we're not going to be able to innovate. Now is the time for innovation."

Through the HPP program and other federal funding mechanisms, the health system can continue to make the progress necessary to reach these difficult, but important, goals.

A

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B

Agenda

June 10, 2009

Keck Center, Room 100
500 Fifth Street, NW
Washington, DC 20001

Background:
The mission of HHS's Hospital Preparedness Program is to enhance the ability of hospitals and healthcare systems to prepare for and respond to bioterrorism and other public health emergencies. The United States constantly faces the real possibility of catastrophic public health incidents that could involve thousands, or tens of thousands, of patients. Therefore it is critically important for health systems to identify, plan, and prepare for the possibility of a mass-casualty incident. To help address these needs, the Institute of Medicine's Forum on Medical and Public Health for Catastrophic Events is organizing a workshop around the topic of "medical surge capacity" that will help inform future guidance developed by HHS's Healthcare Preparedness Program.

Audience:
Policy makers from federal agencies and state and local public health departments. Providers from the healthcare community, including relevant medical disciplines, nursing, emergency medical services (EMS). Healthcare and hospital administrators.

Objectives:
The workshop will feature invited presentations and discussions focused on the following topics, including specific discussion of the role of the Hospital Preparedness Programs (HPP) in facilitating each of these efforts, specifically through guidance developed by the HPP.

- Definitions of medical surge that are applicable to local, state, territorial, tribal governments, and federal government entities;
- The capability and tools available to local, state, territorial, tribal, and federal government entities to assess the current status of preparedness to conduct medical surge operations;
  - Identify metrics that can be used to improve performance and preparedness for a mass-casualty incident; and
- Strategies to facilitate public- and private-sector work to improve surge capability for victims and the distressed, including new or modified guidance and legal and funding mechanisms.

For each area, current capabilities, perceived gaps, future opportunities and innovative options should be identified and discussed.

Note: Continental breakfast will be available at 7:30 a.m.

8:00 a.m. Welcome, Introductions, and Workshop Objectives

LEWIS GOLDFRANK, *Forum Chair*
Professor and Chair
Department of Emergency Medicine
New York University School of Medicine

8:05 a.m. Charge to Workshop Speakers and Participants

GERALD PARKER
Principal Deputy Assistant Secretary
Office of the Assistant Secretary for Preparedness and Response
Department of Health and Human Services

8:15 a.m. ASPR Healthcare Preparedness Programs: Current Objectives and Future Priorities

KEVIN YESKEY
Deputy Assistant Secretary
Office of Preparedness and Emergency Operations
Office of the Assistant Secretary for Preparedness and Response
Department of Health and Human Services

8:30 a.m. Public Health Emergencies: HHS Legal Authorities for Responding to a Mass-Casualty Event

SUSAN SHERMAN
Senior Attorney
Office of the General Counsel, HHS

SESSION I: DEFINITIONS OF MEDICAL AND PUBLIC HEALTH SURGE CAPACITY

Session Objective: Identify and discuss different definitions of medical surge capacity within a construction of an all-hazards approach. Discuss the merits of identifying a commonly accepted terminology. Examine gaps in the currently used definitions.

8:45 a.m. Session Objectives and Introduction

JEFFREY RUNGE, *Session Chair*
President
Biologue, Inc.

8:55 a.m. Surge Capacity Continuum: Conventional, Contingency, and Crisis

JOHN HICK
Associate Medical Director for EMS and Medical Director of Emergency Preparedness
Hennepin County Medical Center, MN

9:10 a.m. Hospital Surge Capacity for Mass Casualty Events—Israeli Perspective

KOBI PELEG
Director
Israeli National Center for Trauma and Emergency Medicine Research

9:25 a.m. Public Health Perspective on Surge Capacity

DANIEL SOSIN
Acting Director
Coordinating Office for Terrorism Preparedness and Emergency Response, CDC

9:40 a.m. Medical and Public Health Surge Capacity: Emergency Management Perspective

ROBERT BASS
Executive Director
Maryland Institute for Emergency Medical Services System

9:55 a.m. Discussion with attendees

- What are the advantages of developing a consensus definition of surge capacity?
- How can a consensus definition of medical surge capacity be established?
- Is it possible to develop a uniform definition of surge capacity within an all-hazards approach?
- What components of a definition are necessary to allow for "surge capacity" to be measured?
- How can the HPP assist in the development of a commonly accepted definition of surge capacity?

10:40 a.m. BREAK

SESSION II: LOCAL STRATEGIES: CREATING AN INTEGRATED APPROACH TO AN ALTERNATE CARE SYSTEM

Session Objective: Recognizing that urban and rural communities would utilize resources and assets in different ways, discuss some common guiding principles that will guide the use of resources and assets. Identify and discuss strategies to leverage and integrate local and community resources to develop an effective alternate care system.

10:55 a.m. Session Objectives and Introduction

DAN HANFLING, *Session co-Chair*
Director
Emergency Management and Disaster Medicine
Inova Health System

DEBORAH LEVY, *Session co-Chair*
Chief, Healthcare Preparedness Activity
Division of Healthcare Quality Promotion, CDC

11:05 a.m. Panel Discussion: Opportunities to Leverage Local Components: Strategies and Guiding Principles

Leveraging Federal Resources to Bring Together Stakeholder and Develop an Integrated Response

RICHARD SERINO
Chief
Boston EMS

Developing a Healthcare Coalition Approach to Coordinating Surge Resources

ZACHARY CORRIGAN
Executive Director
Northern Virginia Hospital Alliance

Role of Emergency Health Operations Centers: Managing System Capacity

FREDERICK (SKIP) BURKLE
Senior Fellow, Harvard Humanitarian Initiative
Harvard School of Public Health

Role of the 9-1-1 and EMS System

LESLEE STEIN-SPENCER
Manager of Quality Improvement, Chicago Fire Department
Program Advisor, National Association of State EMS Officials

Licensing and Interstate Credentialing: Ensuring Staff Availability and Capability

JAMES HODGE
Executive Director
Center for Law and the Public's Health
Johns Hopkins University

11:45 a.m. Discussion with Attendees

- What are some common guiding principles that will guide the use of resources and assets?
- How can local components of the healthcare and public health sector resources be better leveraged, e.g., private providers, EMS, call centers, urgent care facilities?

DAN HANFLING, *Session co-Chair*
Director
Emergency Management and Disaster Medicine
Inova Health System

DEBORAH LEVY, *Session co-Chair*
Chief, Healthcare Preparedness Activity
Division of Healthcare Quality Promotion, CDC

12:45 p.m. LUNCH

SESSION III: ALTERNATE CARE SYSTEM: STRATIFICATION OF CARE

Session Objective: Discuss benefits of establishing effective alternate care facilities. How can alternate care sites be effectively used? How should alternate care sites be established so that they meet the goal of saving as many lives as possible given the limited resources? How to ensure coordination with the entire healthcare system? How should alternate care facilities be integrated into the emergency medical services system?

1:30 p.m. Session Objectives and Introduction

DAN HANFLING, *Session co-Chair*
Director
Emergency Management and Disaster Medicine
Inova Health System

DEBORAH LEVY, *Session co-Chair*
Chief, Healthcare Preparedness Activity
Division of Healthcare Quality Promotion, CDC

1:40 p.m. Panel Discussion: Effective Alternate Care Facilities: Opportunities to Integrate into Current Plans

Hospital Surge Capacity for Mass-Casualty Events

ARTHUR KELLERMANN
Professor of Emergency Medicine and Associate Dean of Health Policy
Emory University

Utilizing Call Center Capabilities

GREGORY BOGDAN
Research Director and Medical Toxicology Coordinator
Rocky Mountain Poison & Drug Center at Denver Health

Alternate Care Capabilities

LEWIS RUBINSON
Assistant Professor of Medicine
Division of Pulmonary and Critical Care Medicine
University of Washington

Community Mitigation: In-Home Care and Role of the Family

LISA KOONIN
Senior Advisor
Influenza Coordination Unit
Centers for Disease Control and Prevention

2:20 p.m. Discussion with Attendees

- What are the characteristics of an appropriate alternate care site?
- What are the most appropriate uses of alternate care sites?
- How can alternate care facilities be established to ensure they meet the goal of saving as many lives as possible given the limited resources?
- How can the HPP and other federal programs facilitate the increased capacity of the emergency medical services and healthcare system

DAN HANFLING, *Session co-Chair*
Director
Emergency Management and Disaster Medicine
Inova Health System

DEBORAH LEVY, *Session co-Chair*
Chief, Healthcare Preparedness Activity
Division of Healthcare Quality Promotion, CDC

3:15 p.m. BREAK

SESSION IV: CREATING SITUATIONAL AWARENESS: A SYSTEMS APPROACH

Session Objective: Examine strategies to establish an integrated systems approach for improving situational awareness for medical surge capacity. Identify current capabilities, perceived gaps, future opportunities and innovative options that could improve coordination between sectors with in a community. Identify reporting mechanisms that could be developed to ensure a community is adequately prepared.

3:30 p.m. Session Objectives and Introduction

ERIC TONER, *Session Chair*
Senior Associate
Center for Biosecurity, UPMC

3:40 p.m. Panel Discussion: Integrative Strategies and Operational Implications

Data Needs for Situational Awareness in a Mass-Casualty Disaster: Optimal and Minimal Data and Technology Requirements

PAUL BIDDINGER
Chairman
Massachusetts Medical Society Committee on Preparedness

Harnessing Electronic Health Records for Situational Awareness

DAVID GRUBER
Assistant Commissioner
Division of Health Infrastructure Preparedness and Emergency Response
New Jersey Department of Health and Senior Services

Developing a System to Improve Situational Awareness

CYNTHIA DOLD
Healthcare Coalition Program Manager
Seattle and King County

Information Systems for Just-in-Time Training: How would it work?

CARL TAYLOR
Assistant Dean
University of South Alabama College of Medicine
Director
Center for Strategic Health Innovation

4:20 p.m. Discussion with Attendees

- What is the optimal set of data needed for situational awareness in a mass-casualty disaster?
  - What is the optimal technology needed to enable it?
  - What is the minimal set of data and technology needed?
- How can electronic health records be harnessed for situational awareness?
- What role would syndromic surveillance systems play in situational awareness in mass-casualty disasters?
- Information systems for just-in-time training—how would it work?

ERIC TONER, *Session Chair*
Senior Associate
Center for Biosecurity, UPMC

SESSION V: OPPORTUNITIES TO MOVE FORWARD

Session Objective: Review the discussions that took place during the day and identify promising avenues by which the HPP and other federal programs can improve the surge capacity of our nation's healthcare system.

5:00 p.m. Panel Discussion: Recap of Promising Ideas from Day 1

GAMUNU WIJETUNGE
NHTSA/Office of Emergency Medical Services
U.S. DOT

DAVID MARCOZZI
Homeland Security Council
The White House

MARGARET VANAMRINGE
Vice President
Public Policy and Government Relations
The Joint Commission

LEWIS GOLDFRANK
Professor and Chair
Department of Emergency Medicine
New York University School of Medicine

JACK HERRMANN
Senior Advisor
Public Health Preparedness
NACCHO

5:20 p.m. Discussion with Attendees

- What new ideas have surfaced in this workshop that should be explored further?
- What action steps are required to integrate these strategies into the current guidance and funding opportunities, including the HPP program?
- What resources and further infrastructure investments will be necessary in the short- and long-term?

6:00 p.m. ADJOURN

June 11, 2009

Keck Center, Room 100
500 Fifth Street, NW
Washington, DC 20001

Note: Continental breakfast will be available at 8:00 a.m.

8:30 a.m. Welcome

LEWIS GOLDFRANK, *Forum Chair*
Professor and Chair
Department of Emergency Medicine
New York University School of Medicine

SESSION VI: VULNERABLE POPULATIONS: BEHAVIORAL HEALTH EFFECTS AND MEDICAL NEEDS FOR AT-RISK POPULATIONS

Session Objective: Discuss current capabilities, perceived gaps, future opportunities and innovative options to ensure appropriate care can be provided to individuals with medical needs. Identify strategies that could be modeled and tested to improve care to individuals with medical needs.

8:35 a.m. Session Objectives and Introduction

ARTHUR COOPER, *Session Chair*
Professor of Surgery
Columbia University Medical Center

8:45 a.m. Panel Discussion: Enhancing the Health Care System's Capacity to Care for those with Special Medical Needs

H1N1: Special Considerations for Children and Youth

RICHARD HATCHETT
Homeland Security Council
The White House

Developing Care Strategies and Capacity for the Psychologically Impacted and the Distressed

ROBERT URSANO
Professor of Psychiatry and Neuroscience
Chairman of the Department of Psychiatry
Uniformed Services University of the Health Sciences

Enhancing the Health Care System's Capacity for the Young

JOSEPH WRIGHT
Professor of Pediatrics (Vice Chair), Emergency Medicine and Health Policy
George Washington University/Children's National Medical Center
Washington, DC

Enhancing the Health Care System's Capacity for the Elderly

CHARLOTTE YEH
Chief Medical Officer
AARP Services Incorporated
Washington, DC

Enhancing the Health Care System's Capacity for the Chronically Ill

RAY SWIENTON
Associate Professor, Division of Emergency Medicine
University of Texas Southwestern Medical Center

9:25 a.m. Discussion with Attendees

- What are the current capabilities and perceived gaps in providing care to individuals with medical needs?
- What future opportunities and innovative options could ensure appropriate care can be provided to individuals with medical needs?

- What strategies that could be modeled and tested to improve care to individuals with medical needs?

ARTHUR COOPER, *Session Chair*
Professor of Surgery
Columbia University Medical Center

10:05 a.m. BREAK

SESSION VII: FATALITY MANAGEMENT STRATEGIES

Session Objective: Examine potential fatality management strategies. Identify the goals of managing fatalities during a mass-casualty incident. Discuss the resources necessary for ensuring adequate fatality management.

10:15 a.m. Session Objectives and Introduction

JACK HERRMANN, S*ession co-chair*
Senior Advisor
Public Health Preparedness
National Association of County and City Health Officials

LISA LADUE, S*ession co-chair*
Deputy Director
National Mass Fatalities Institute
Cedar Rapids, Iowa

10:25 a.m. Panel Discussion: Mass Fatality Strategies: Gaps and Opportunities

Domestic Mass Fatality Response: Lessons from the DoD

MICHAEL LUKE
Joint Mortuary Affairs Officer
United States NORTHCOM

Family Assistance Centers

VIRGINIA MEWBORN
Assistant Commissioner of Training and Exercises
Office of Emergency Management, New York City

Responding to Mass Casualty Incidents: Medical Examiners

FRANK DEPAOLO
Director of Special Operations Division
Office of Chief Medical Examiner
New York City

Private Sector Opportunities and Challenges

JOHN FITCH
Senior Vice President, Advocacy
National Funeral Directors Association

11:10 a.m. Discussion with Attendees

- What strategies can be used to ensure appropriate planning for fatality management during a mass-casualty incident?
- What are the resources necessary for ensuring adequate fatality management?

JACK HERRMANN, S*ession co-chair*
Senior Advisor
Public Health Preparedness
National Association of County and City Health Officials

LISA LADUE, S*ession co-chair*
Deputy Director
National Mass Fatalities Institute
Cedar Rapids, Iowa

11:45 a.m. LUNCH

SESSION VIII: RAMPING DOWN: WHEN IS IT APPROPRIATE AND HOW CAN ONE BEST TRANSITION AFTER A MASS-CASUALTY INCIDENT?

Session Objective: Discuss what are realistic assumptions about care in the short-term (not immediately following) following a mass-casualty incident. Based on these assumptions, discuss potential criteria and guidelines that may be used to assist stakeholders in transitioning from a surge environment back to a "new normal" level of "steady state" care.

12:30 p.m. Session Objectives and Introduction

ROSLYNE SCHULMAN, *Session Chair*
Senior Associate Director
American Hospital Association

12:40 p.m. Panel Discussion: Ensuring Operational Sustainability

Demobilization and Return to Former Operations

MARK ROBITAILLE
President and CEO
Martin Memorial Medical Center, Florida

Reassessment of Needs

KAREN SEXTON
Interim Executive Vice President and Chief Executive Officer
University of Texas Medical Branch Health System

Rebuilding of the Health Care System

JOHN MATESSINO
President and CEO
Louisiana Hospital Association

Repatriation

DAVID LAKEY
Commissioner
Texas Department of State Health Services

1:20 p.m. Discussion with Attendees

- When is it appropriate to begin to transition back to "steady state" care?
  - What are the triggers and how can they be recognized?
- What tools and guidelines are necessary for stakeholders?
- What should stakeholders be doing now to plan for rebuilding their healthcare system following a large-scale incident?
- How should a reassessment of need be accomplished?

ROSLYNE SCHULMAN, *Session Chair*
Senior Associate Director
American Hospital Association

SESSION IX: FINANCING SURGE CAPACITY AND PREPAREDNESS

Session Objective: Based on workshop discussions, identify funding mechanisms that could be utilized to ensure effective and efficient medical surge capacity preparedness and response. Identify barriers for establishing preparedness and response. Examine potential changes in reimbursement policy to assist the healthcare system during and immediately following a catastrophic event.

2:10 p.m. Session Objectives and Introduction

WILLIAM SMITH, *Session Chair*
Senior Director
Emergency Preparedness
University of Pittsburgh Medical Center

2:20 p.m. Panel discussion

MARC HARTSTEIN
Deputy Director
Hospital and Ambulatory Policy Group
Center for Medicare Management
Centers for Medicare and Medicaid Services

KURT KRUMPERMAN
Clinical Assistant Professor
Emergency Health Services Department
University of Maryland, Baltimore County

DIANA DENNETT
Counsel
AHIP

JEFFREY RUNGE
President
Biologue, Inc.

3:20 p.m. Discussion with Attendees

- What resources are required to implement the changes necessary to ensure that the most efficient and effective frameworks are in place?
- What economic barriers are preventing effective preparedness and response for a mass-casualty incident?
- How should federal resources be integrated into local and state planning?
- What changes can be made to the current reimbursement mechanisms to improve the stability of effected healthcare systems, e.g., modified filing deadlines and interim payments, recognizing alternate care sites, flexibility in coding, etc.?

WILLIAM SMITH, *Session Chair*
Senior Director
Emergency Preparedness
University of Pittsburgh Medical Center

SESSION X: GENERAL DISCUSSION WITH WORKSHOP PARTICIPANTS AND ATTENDEES

Session Objective: Discuss what opportunities and constraints exist to improve medical surge capacity to a mass- casualty incident. Review opportunities and challenges identified during the workshop. Identify and discuss the most promising near-term opportunities for improving standards-of-care protocols at local, state, and regional jurisdictions.

4:00 p.m. Panel Discussion: Synopsis of Workshop Discussions

DAN HANFLING
Director
Emergency Management and Disaster Medicine
Inova Health System

ERIC TONER
Senior Associate
Center for Biosecurity, UPMC

MARGARET MCMAHON
Senior Clinical Editor—*Journal of Emergency Nursing*
Emergency Nurses Association

DAVID LAKEY
Commissioner
Texas Department of State Health Services

4:20 p.m. Discussion with Attendees

- What new ideas have surfaced in this workshop that should be explored further?
- What action steps are required to integrate these strategies into the current public health system?
- What resources and further infrastructure investments will be necessary in the short- and long-term?

4:45 p.m. Closing Remarks: The Path Forward

GERALD PARKER
Principal Deputy Assistant Secretary
Office of the Assistant Secretary for Preparedness and Response
Department of Health and Human Services

5:00 p.m. ADJOURN

C

Registered Attendees

Terri Adams-Fuller
Assistant Professor
Sociology and Anthropology
Howard University

Gloria Addo-Ayensu
Director of Health
Health Department
Fairfax County

Diaa Ahmed

Brad Austin
Captain (Select), U.S. Public Health Service, Senior Program Officer
Office of the Surgeon General
U.S. Department of Health and Human Services (HHS)

Sid Baccam
IEM in support of BARDA Modeling

Joseph Barbera
Codirector
Engineering Management
GWU Institute for Crisis, Disaster, and Risk Management

Donna Barbisch
President
Global Deterrence Alternatives, LLC

Tali Bar-Shalom
Program Examiner, Public Health Branch
Office of Management and Budget

Jamil Bayram
Assistant Professor in Emergency Medicine
Emergency Medicine
Rush University Medical Center

Dan Bochicchio
Colonel
J-3/Domestic Operations
National Guard Bureau

Douglas Boenning
Medical Officer
HHS
Office of Science and Data Policy

Robert Bozzo

Deeanna Burleson

Duane Caneva
Director, Medical Preparedness Policy
White House Homeland Security Council

Ellen Carlin

Cullen Case, Jr.
NMDP/RITN

Mary Chaffee
Disaster Research Coordinator
National Library of Medicine

Melissa Cheung
Research Project Manager
Department of Public Health
Weill Cornell Medical College

Susan Coller-Monarez
Policy Analyst
Office of the Assistant Secretary for Preparedness and Response (ASPR/HHS)

Brooke Courtney
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Stephen Cunnion
Medical Director
National Security Health Policy Center
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Sergio De Cosmo
Research Associate and Ph.D. Student
ICDRM-Engineering Management and Systems Engineering
The George Washington University

Randall Dell
Chief
Response Operations
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Mary Lee Dichtel

Thuy Doan
ASPR/HHS

Aram Dobalian
Research Health Scientist
Center for Healthcare Provider Behavior
VA Greater Los Angeles

Edward Dolan
Director, Preparedness Policy
Homeland Security Council

Donald Donahue
Senior Fellow and Executive Director
Potomac Institute for Policy Studies
National Security Health Policy Center

Melissa Dunkerson
Emergency Preparedness Director
Emergency Preparedness Program
Howard County Health Department

Natasha Lee Efrat
Research Analyst
Altarum Institute

Ross Faith
Secretariat
NSTC Subcommittee on Disaster Reduction

Frank Fiedrich
GWU Institute for Crisis, Disaster, and Risk Management

Sarah Field
ASPR/HHS

Andrew Flacks
ASPR Liaison to Veterans Health Administration

Gina Flores
Policy Advisor to the Assistant Secretary
The Office of Health Affairs
Department of Homeland Security

Brian Flynn
Associate Director
Center for the Study of Traumatic Stress
Uniformed Services University

Andrew Garrett
Director, Planning and Response
Mailman School of Public Health
Columbia University, National Center Disaster Preparedness

Harry Gedney
Park Ranger
National Mall and Memorial Parks
National Park Service

David Gencarelli
Consultant
Gencarelli Group

Jeffrey Geppert
Research Leader
Centers for Public Health Research and Evaluation
Battelle Memorial Institute

Robert Gifford
Executive Officer
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Surge Medical Response Capability: What Is It? How Do We Get It? How Do We Know When We Have It?

The following is a white paper prepared for the June 10–11, 2009, workshop on medical surge capacity, hosted by the Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events. All opinions expressed in this paper are those of the author and not necessarily of the Institute of Medicine.

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The nation's track record in planning for, funding, and achieving even minimally adequate disaster surge response capabilities within the medical community is woefully deficient. This paper offers eight transformational requirements the country should embrace in order to develop essential capabilities. By embracing these requirements, public leaders and the medical community can together begin to forge a new science of medical surge. That new science of surge must be focused relentlessly on one question: What works?

For as long as there have been hospitals, there has been a need to plan for a surge in patient volumes. Whether caused by flu season, a natural disaster, or a terrorist attack, there is frequently a mismatch between demand and resource supply. Daily surge capacity has been dwindling as emergency department volumes increase, and the facilities to handle the patients, at best, is stable. By any measure—ambulance diversion, wait times, or patient boarding—crowding of emergency departments is worse than ever and there are significant delays in patients

receiving timely service when urgent or emergency care is required.[1] Hospitals and healthcare systems have squeezed out all of their excess capacity for the purposes of efficiency and reduction of overhead. The way health care is financed has catalyzed these efficiencies so that cost-shifting to compensate for overhead to address non-income–producing services is virtually eliminated.

Hospitals manage "daily surge" in several ways; the predominant one is shared by every other industry with ebbs and flows in demand—increased wait times for service. A relatively steady state is therefore created, with predictable consequences. What is yet unmanaged is the unpredictable surge of patients that arises from infrequent, geographically scattered events, known as "disasters with medical consequences." The issues dealing with large-scale catastrophic events are what seem unmanageable. Are the daily skills and accidents of the management of daily surge scalable for natural disasters or intentional catastrophic events? Clearly, the answer is "no." This is not to say that the same capabilities needed to address daily surge are not applicable to disasters—they are. But it is the set of additional requirements to manage this rare circumstance that groups of experts gather and produce recommendations for catastrophic events. Due to the rarity of the events and the lack of a mechanism to gather data in real-time, this expertise is usually based on experience rather than the more normal evidence-based approaches to medical decision making.

The difficulty of designing a national strategy for medical surge capacity in disasters, much less the operational and tactical planning, is in evidence by the failure to produce such a strategy irrespective of the numbers of papers in the literature on the subject over this decade. Responsibility for developing such a strategy has been shunted off to states, the private sector, hospitals, think tanks, and professional associations. But it is difficult to ignore that one of the reasons for the formation of a federal government in the first place was to provide for the common defense. Medical response is an essential element of the common defense, and is therefore a responsibility of the federal government that must not be abrogated. Like the super majority of our critical infrastructures and key resources (CI/KR), the nation's medical infrastructure is not owned or controlled by the government. Like much of the U.S. homeland security enterprise, the federal government has responsibility, but no control. Therefore, the way the federal government has asserted itself to achieve the goal of a common defense is through planning, controlling funding,

setting standards, and collaborating with private CI/KR owners on common goals, like continuity of operations (COOP) assurance.

Medical response should be no different, and the government has acknowledged this through its efforts to date. The lead federal agencies for this effort have been the Department of Health and Human Services (HHS), the Department of Homeland Security (DHS), and to a lesser extent, the Department of Defense and the Veterans Administration. The latter two are different in that their facilities *are* controlled by the federal government and they have distinct populations to serve. But they are also part of the nation's distributed health infrastructure, and their facilities are as likely to be involved in any large-scale disaster. HHS and DHS have had a somewhat different approach to the health critical infrastructure. For DHS, the focus has been on hardening and protecting and brick-and-mortar infrastructure and with COOP issues. HHS has tended to think more in terms of systems, including people and consumable resources like medicines and supplies, and is much more apt to talk about surge capability in terms of "public health." Both agencies work together through the DHS Health Sector Coordinating Council and Government Coordinating Council, for which HHS is the "lead sector-specific agency."

Still, the issues around medical surge capacity cannot be managed by the federal government in a vacuum. The federal government is wholly dependent on the commitment and investment of the owners and deliverers of health care in the private sector and state and local governments. There is virtually no hope of achieving the necessary level of commitment, much less investment, without the process of planning, standards setting, and taxpayer investments to fulfill the requirements that emerge. The responsibility therefore falls to the taxpayers to provide for the common defense, with the federal government as its agent.

Requirement #1: HHS must take responsibility for seeking out all owners of the healthcare infrastructure necessary for catastrophic incident response, assessing the need for investment and achieving ongoing funding outside of periodic grant programs.

REFOCUSING THE CORE TERMINOLOGY OF SURGE CAPACITY

The fact that there is not a common nomenclature and definition is vexing and indicative of a lack of planning. Kelen and McCarthy have

pointed out that it is not excess capacity we seek, but rather a capability termed "surge response capability," as a function of available resources and resource demand.[2] The most attractive feature of this nomenclature is that no one, including the government or the private medical sector, can afford to pay for unused capacity, but nearly everyone should agree that the nation should possess the capability to respond to a surge in healthcare demand in the wake of a disaster.

Any doubt about the political will to have this capability is belied by the criticism over the alleged slowness and incompleteness of the medical response to Hurricane Katrina, in spite of the heroic work done by thousands of volunteers and private-sector contributors in caring for people whose tenuous infrastructure was wiped out. America usually gets what it pays for, and so for it hasn't paid for medical surge response capability. However, it is a better argument than advocating for "capacity" that will either go unused or be sucked up by everyday surge and overcrowding. From here on, "surge medical response capability" it is. (Even the acronym SMRC has a confident ring to it.)

There is considerable attention being paid to definitions around *levels* of surge capability. Some experts advocate the terms "daily surge" and "disaster surge."[3] Others use the capacity levels "conventional," "contingency," and "crisis" as subsets of overall surge capacity.[4] These definitions have operational significance and must be linked to planning and exercises in order to be meaningful. At some point, decisions will be made about definitions and operational triggers based on the merits, and the usage of the terms will be driven from the top down. Management of a disaster is no time for democracy. If you want to fly a commercial airliner anywhere in the world, you communicate with air traffic control in English. Medical personnel who want or need to participate in the management of a disaster without running into one another had better agree to use a common language. HHS needs to settle on a set of names and definitions and require it for every official document generated for medical surge response capability.

Conformity of nomenclature and terminology is not a foreign concept. If seasoned experts can agree on one issue, it is that the nomenclature of the National Incident Management System (NIMS) be adhered to for the sake of communications with a unified incident command. The December 2008 version of NIMS, written in readable English, explains the principles and language of disaster management.[5] Training courses are available online[6] and should be expanded to include training specifically for medical personnel. The Hospital Incident Command System

developed by the California Emergency Medical Services Authority provides NIMS-compliant incident command guidelines for hospitals,[7] but training and exercising must be expanded. Healthcare professionals must understand the interdependencies that exist between medical response and other emergency support functions (e.g., mass care, housing, security, communications) in the National Response Framework.[8]

Requirement #2: HHS must prescribe common nomenclature and definitions for surge medical response capability and use those terms in its publications and the appropriate annexes to NIMS.

Requirement #3: DHS and HHS must create NIMS training specific for physicians, nurses, and other hospital personnel and administration to support their integration into a unified incident command structure.

PLANNING AND EXERCISES

Whether it is performance on the battlefield or in a disaster, "planning and preparation equals performance." The Department of Homeland Security, as part of its national preparedness program, uses 15 planning scenarios. Although even high-level, interagency strategic plans have yet to be released by DHS, certain of the scenarios have been studied to the point where estimates of population risk and exposure have been quantified. While the details of the canonical scenarios on which they are based is classified, the "population risk assessments" performed by DHS drive the requirements for countermeasure acquisition, procurement, and stockpiling. Those numbers are not classified and provide a scale of what healthcare systems should be thinking about when trying to understand their requirement for surge medical response capabilities.

To use the biological event scenarios as an example, a release of *Bacillus anthracis* spores using conventional agricultural technology in a densely populated city with 8 million people may result in exposure of over 2 million, approximately a quarter million of whom would contract pulmonary anthrax without post-exposure prophylaxis. For the *Yersinia pestis* scenario, it's a million people ill with pneumonic plague. For botulinum toxin, the range is many thousands.

We have more direct experience with explosive devices on which to base planning scenarios. The March 11 bombings in Madrid sent 312 people to hospitals with the entire range of blast injuries.[9] The destina-

tion hospitals followed the usual historical pattern, in that people were taken to the closest hospital, not the "closest appropriate hospital" touted in trauma triage schemes.

All of this points out the importance of scenario-based planning and gaming out the requirements. Is a community hospital that is not a trauma center ready to take care of a large share of 312 people with diffuse orthopedic injuries, many of whom would have severe blood loss, be deafened and blinded, or have overpressure injuries to the lung? A community or a particular hospital may make the decision NOT to prepare, but that decision should be a conscious one, made in concert with emergency planners and political leadership. As the Madrid and London experiences taught us, if your hospital is closest, the patients are coming whether you want them or not.

The Agency for Healthcare Research and Quality has published a Hospital Surge Model that helps healthcare professionals and administrators use population risk scenarios to estimate the personnel and equipment requirements for two biological scenarios, as well as several chemical releases and radio-nuclear attacks.[10] The use of the model remains dependent on understanding the nature of the agent and the likely proportions of the local population that would be affected, which is not something usually known to hospital planners. Although it is a very useful planning tool to make requirements more granular, the Hospital Surge Model should be linked to other models developed by the federal government to characterize biological events and validated for smaller population centers.

All personnel involved in medical response to disasters must have planning and exercising built into their job descriptions, and hospitals must do it as part of regular operations. As Burstein said, it is a myth that health professionals are smart enough to hear it once and be able to perform.[11] He also takes the position that it is indeed possible to achieve the necessary degree of preparedness. That is not easily accomplished, however, given the few tools we have to accomplish training and exercising for these scenarios. The value of an annual or biannual tabletop exercise is questionable. Work is being done, however, by the national laboratories and some elements within DHS to create web-based computer gaming for training and exercising. The healthcare community needs to be able to tailor such tools to their particular plans, assuming that such plans exist.

Every healthcare institution that expects to be a player in the surge medical response capability should have a designated Chief Preparedness

Officer (CPO) who is not just the most junior administrator who drew the short straw to add to his or her "other duties as assigned." This person should be driver of the planning, training, equipping, and exercising that is necessary to deliver in times of emergency. The CPO should be the point of contact with law enforcement, emergency management, public health, and any other entity with a responsibility under the emergency response plan. The CPO should be fully funded and for large institutions be a full-time job.

Requirement #4: DHS must issue federal interagency strategic plans for those planning scenarios with high-volume medical consequences, specifically anthrax, plague, food-borne illness, explosive devices, and earthquakes.

Requirement #5: DHS and HHS must develop and distribute a template for operational planning for healthcare facilities around the scenarios with high-volume medical consequences, specifically anthrax, plague, food-borne illness, explosive devices, and earthquakes.

Requirement #6: DHS and HHS should fund a web-based solution to training and exercising for healthcare professionals to acquire and maintain proficiency in implementation of surge medical response.

STANDARDS

Just as there is no agreement on definitions and nomenclature, there is no standard for what constitutes an adequate state of preparedness in the healthcare sector. Even if standards did exist, compliance with the standards may be very difficult given the absence of or the distributed nature of the necessary capacity data, no mandated reporting requirements of capacity, and few real-time resource tracking tools. Healthcare system preparedness standards would also need to be individualized to different types of medical facilities, recognizing differences in the size and density of a hospital's catchment area, space capacity, and the differences in the threats to their locales (e.g., terrorist risk levels, geological faults, hurricane risks).

At a conference on "the science of surge" sponsored by the journal *Academic Emergency Medicine*, participants could reach consensus only on research and enabling tools that were lacking and certain quantitative metrics.[12] The participants did express concern for a one-size-fits-all ap-

proach to standards and metrics and noted that a surge capacity metric may have to be imposed on the system by a professional or governmental authority. The American College of Emergency Physicians has made a worthy attempt at defining best practices for hospital preparedness by producing an operational document with critical emergency department capabilities.[13] Yet, any specific best practices to ensure a surge capability are lacking.

Just because standards and metrics are elusive does not suggest that they are impossible to identify and achieve. Other CI/KR sectors are much further along in defining standards for certain capabilities, such as pipeline restoration, continuity of operations in the financial sector, and chemical security, the latter in order to comply with a recent set of federal regulations. The healthcare industry, physicians in particular, have traditionally been hesitant to embrace standards set by external bodies. One should not confuse the "standard of medical care," which is determined locally, with standards and metrics for system preparedness, which should be derived through an iterative, evidence-based process.

The disadvantages of a centralized set of standards and metrics can be mitigated. Rather than apply the same quantifiable standards to every healthcare entity, preparedness standards can be derived using modeling for determining the requirements for quantifiable metrics, making the standard, in fact, a mathematical function rather than a linear relationship based on any single attribute. Both DHS and HHS support robust modeling entities that are used to predict various planning elements, including disease prevalence, effects of terrorist attacks on the infrastructure, and the necessary resource requirements to mitigate those conditions. Any preparedness standard that is promulgated can include a template model for communities to use in determining their surge requirements and therefore the appropriate standard. Specific requirements must be based on the best possible evidence, as intuitive thinking from everyday experience often leads to mistaken assumptions.[14]

There are distinct advantages to having standards to which the healthcare sector should aspire. First and foremost, achieving appropriate standards increases the chances of actually being prepared when the time comes. There are system advantages as well. Planning aimed at achieving standards will drive more concrete requirements, which in turn leads to more exacting and efficient use of funding. Healthcare systems can better compete with other sectors for homeland security grant funding when specific requirements are known. The HHS Hospital Preparedness Program would finally have targets to meet, rather than the more random

spending that has occurred thus far. The Metropolitan Medical Response System, funded by DHS, would also have community-specific benchmarks to achieve in cross-sector collaboration. It also enables a much easier sell to congressional appropriators who need assurance that the taxpayers' expenditures are achieving results.

Finally, there is public law that can indirectly confer liability protection to entities that meet certain standards. Title IX of the "9/11 Act" of 2007 provides for a mechanism for standards setting, certification, and accreditation for private-sector critical infrastructure owners.[15] Once there is a DHS-recognized standard developed for the industry, plaintiffs would bear the burden to show that the standard itself is inadequate, and if unable to do so, the defense simply needs to show that it met industry standards, evidenced in the certification or accreditation. Although this has not yet been applied to capabilities standards or to healthcare systems, the provision exists and should be employed. This would be very important for institutions that would incur liability for an inability to provide care for vast numbers of patients in a disaster, even if they had made significant provision for surge management. Congress has thereby determined that the doctrine of reasonableness applies to infrastructure owners who may not be able to fulfill their normal duties in the face of unreasonable demand. It is through the standards process that the owners access that protection.

Requirement #7: DHS and HHS, as the sector-specific lead agencies for the healthcare sector, must implement a process to achieve voluntary preparedness standards for healthcare institutions in accordance with Title IX of the 9/11 Act (2007).

COSTS AND PAYMENT

Improving the status quo in medical preparedness, including provision for reasonable surge medical response capability, will require significant investment. Who is responsible for that investment? As discussed above, creating this capability is providing for the common defense, an inherent responsibility of the federal government. What would constitute a sufficient incentive to the owners of the healthcare critical infrastructure to invest in preparedness? Clearly, the owners will perform a cost/benefit analysis to drive those investment decisions, and absent real, sizable incentives, the tendency to roll the dice that "it won't

happen here" or "we'll just make do" will overwhelm the desire to be prepared.

Using the number of 4,900 hospitals with emergency services, what level of grant funding would be necessary to achieve a state of medical readiness for all the possible scenarios? Even if the average initial investment is a modest $1 million, it would exceed the entire homeland security grant funding (approximately $4 billion) and the HHS Hospital Preparedness Program (about $400 million). Clearly, the federal government cannot grant its way to success.

Since this is an inherent responsibility of the federal government, funding the requirements that arise from scenario-based planning and the setting of standards must have a source outside of the grant programs. The federal government could simply say that meeting standards is a requirement and attempt to pass on the added costs to the customers of the healthcare system. However, with its other hand, the federal government has squeezed the opportunity to cost-shift out of its reimbursement policies. According to a Government Accountability Office report, approximately 40 percent of the 119 million annual emergency department visits (in 2006) were paid for by federally supported programs. Hence, the federal government owns the responsibility for deciding that is or is not going to fund medical preparedness, including surge medical response capabilities. Abrogating that responsibility and dumping it onto providers who cannot cost-shift is not an option.

Pushing the responsibility down to taxpayers at the community level is another option, but in the end, the taxpayers in the highest risk urban areas will bear the brunt of the cost, which leads back to the argument about the common defense. Moreover, mounting a defense against the consequences of terrorist attacks is the responsibility of the entire nation, not only those in communities at highest risk. No community is immune, no matter how removed or bucolic, as the citizens of Shanksville, Pennsylvania, would attest.

If the federal government is to fund the investments in surge medical response, how can it ensure that its investments are well spent and will, in fact, result in a better state of preparedness? The answer to this lies in the specificity of the requirements that come out of the planning process or that are necessary to meet national standards. But if grants are not the answer, then where will the money come from?

In 2006, the Centers for Medicare & Medicaid Services (CMS) was posed the following question by DHS: Would CMS consider certification and accreditation of a hospital to standards of preparedness as an indica-

tor of quality of care? If so, CMS could enhance those institutions' reimbursement formulas by an amount necessary to incentivize such an investment. CMS has not answered the question, presumably because of the multiple policy implications of its answer. For example:

- Is additional investment necessary to raise the level of hospital preparedness? If so, where would the money come from under the current mandate to cut costs?
- Is it the federal government's responsibility, or the providers?
- Would Medicare or Medicaid beneficiaries directly benefit from a hospital's improved state of readiness? Put another way, could there be hospitals providing better service to CMS beneficiaries at a less prepared hospital than they receive at one that meets standards for surge medical response?

In any case, some existing mechanism for ongoing investment must be found to accomplish this goal. It can't be cost-shifted onto the customers of the system, grants will not be adequate unless billions more are appropriated, and local governments may not be able to afford to supplement their healthcare institutions to that degree to counter what, in the case of terrorism, is an attack on our nation.

Requirement #8: The Secretaries of HHS and DHS must issue a requirement for the federal government to invest in achieving an adequate standard of surge medical response capability, and the Administration must propose the necessary funding mechanisms as part of the President's next budget.

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Alternate Care Systems: Stratification of Care

The following is a white paper prepared for the June 10–11, 2009, workshop on medical surge capacity, hosted by the Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events. All opinions expressed in this paper are those of the author and not necessarily of the Institute of Medicine.

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Catastrophic disaster, resultant from natural events or terrorist consequence, may rapidly lead to an overwhelming requirement for healthcare service delivery. Communities across the nation must be prepared to manage such a surge in demand for patient care services, and might be faced with the prospect of having to implement an "alternate care system" that incorporates a stratification of care ranging from home health service delivery to hospitalized care.

The last decade of planning for catastrophic disaster response in the United States has led to the development of a number of surge response capabilities supported by the federal government, particularly the Department of Health and Human Services, and the Department of Homeland Security. These efforts have mostly been focused in the provision of necessary staffing, supplies, equipment, and pharmaceuticals that might be required to support a large-scale disaster response, particularly one in

which available local and state resources have been depleted, or are in short supply.

However, it has become increasingly clear that much more planning at the local and state levels is required in order to implement a meaningful response to the expected surge in demand for healthcare services that will arise in times of crisis or catastrophe. The Centers for Disease Control and Prevention has adopted such an approach to surge capacity planning, emphasizing the importance of coordinating public health and healthcare-related planning for pandemic influenza under the umbrella of a community Alternate Care System (ACS), composed of select community partners who are essential to delivering care in the setting of a surge response to disaster. The components of an ACS are built around the stratification of care model, with an important emphasis on developing consensus-based, community-wide agreement on the use of triage algorithms, particularly those that relate to the ethical and legal implications of allocating scarce resources in a disaster event. Such a comprehensive system of development emphasizes the inclusion of many groups heretofore not significantly or consistently involved in the planning process for a community's response to overwhelming surge in demand for care.

IMPLEMENTING A MODEL OF STRATIFIED CARE IN A DISASTER

Increasing attention is being given to the need to broaden surge capacity planning to include the full spectrum of patient care delivery capabilities in a disaster-impacted community. Much of this work started with a focus on alternate care facility planning for extension of hospital-like services in an unregulated, non-healthcare setting. Examples of this include the establishment of federal medical shelters during the responses to the multiple Florida hurricanes in the summer of 2004, Hurricanes Katrina and Rita in 2005, and Hurricanes Gustav and Ike in 2008.

The initial concepts for such planning came from work conducted for the U.S. Army Soldier Biological Chemical Command (SBCCOM) in the late 1990s. These efforts focused on a combination of out-of-hospital capabilities divided between Neighborhood Emergency Help Centers (NEHCs) and Acute Care Centers (ACCs).[1,2] The NEHC is intended to function as a community care station that provides a combination of functions including victim triage, and serves as a distribution point for medical countermeasures. The ACC, similar to the FMS concept, serves

as an out-of-hospital medical treatment facility for patients requiring a lower acuity level of care than that provided in a hospital critical care setting, but who are not well enough to be managed at home. Additional work in this arena has continued to focus on the spectrum of care delivery options, broadening the focus to a stratification of care model, which was elucidated in the *Mass Medical Care with Scarce Medical Resources: A Community Planning Guide* publication in 2007.[3] Pandemic influenza planning has galvanized many communities to adopt such an approach to surge capacity planning, largely based on this theoretical framework.[4] So, while some excellent work has commenced, particularly with regard to healthcare facility surge and designation of an out-of-hospital approach to patient care delivery, more work remains to be done.

The components of a stratified model of healthcare delivery, implemented in order to meet a surge in demand for healthcare service delivery in a disaster event, can be subdivided into the four broad categories below.

Delivery of Hospital and Healthcare Facility Services

The foundation of any community's healthcare surge planning must be based on solid, fundamental healthcare service delivery at the hospital. Recognizing the importance of maintaining essential medical services, the hospital surge plan is the basis on which patients in the community will continue to receive as high a level of hospitalized care as possible under disaster conditions.

Community-Based Triage

To limit the burden on the hospitals, out-patient medical settings, and the private medical community, community-based triage capabilities that provide easy access to information and evaluation of the population at risk will be important. A network of "virtual" and "onsite" community-based triage stations could be implemented across any given community in order to assess the health needs of the population, determine level of appropriate medical care to be delivered, and issue relevant health information that will inform the public's decisions regarding healthcare needs. Examples of such "virtual" capabilities include Internet- and phone-

based triage programs to identify "at risk" patients in need of additional care or more thorough evaluation.

In addition, onsite locations to provide "Main Street" triage need to be incorporated into a comprehensive alternate care system. These may be composed of existing ambulatory care sites (large-group practices, urgent care centers) or may be expanded to include pharmacies, schools, or other sites that could be used in such a triage function. Such an approach, focusing on a basic initial triage and evaluation of patients, leads to discrete disposition decisions built into the assessment algorithm (return to home for self-care; report to designated ambulatory care network facility–outpatient site; report to the hospital for evaluation, stabilization, and treatment).

Alternate Care Facility Services

An out-of-hospital healthcare delivery option is a very important component of the community alternate care system, and will serve as both a means of decompressing an overburdened, filled-to-capacity hospital and a destination for patients who receive initial screening and evaluation via a community triage option—virtual or onsite—and are deemed too sick to return home, but not sick enough to warrant the full-scale inpatient level of services provided at the hospital.

The level of services to be provided at such a facility should be relatively simple and straightforward, but such decisions have to be established by consensus agreement with participation of the local medical community. The rate-limiting step for level of services provided, and total number of beds developed, will largely be governed by availability of staffing. Staffing models will need to include a combination of resources, including hospital staff, Medical Reserve Corp staff, public school registered nurses, and staff from a select number of urgent care facilities in the community. Implementation of an out-of-hospital solution to surge capacity also requires resolution of legal and financial impediments currently limiting such efforts.

Home Health Care

The ability to care for oneself or one's family in the home setting will be a foundational component of any response to a large-scale disaster, particularly when access to the healthcare system may be compromised or capacity for additional care delivery simply unavailable. Based on basic triage criteria, many patients seeking evaluation and treatment during a disaster event may be stable enough to return home. The anthrax attacks of October 2001, the novel H1N1 influenza outbreak beginning in April 2009, and numerous other infectious disease emergencies have demonstrated that disease in the community, even mild in virulence and limited in morbidity, will spark tremendous fear and promote the visit of both the "worried well" (individuals who are concerned about their potential exposure to disease) and the "worried sick" (patients who seek evaluation and reassurance). Self-care guidelines and a communication strategy for those patients deemed stable enough for home care will need to be developed, along with a follow-up plan for further evaluation if clinical conditions deteriorate.

In addition, catastrophic disaster may result in overwhelming numbers of patients who may be too ill to receive prolonged hospital-based care. Based on implementation of strategies to guide the delivery of care in the context of a scarcity of critical resources, such patients may also require home care, with an emphasis on receipt of palliative care. Of fundamental importance is to instill confidence in the community that these are not patients who have been abandoned by the medical system. Expansion of home health services will be vital to the success of these efforts.

MOVING MEDICAL SURGE CAPACITY PLANNING BEYOND THE HOSPITAL

The implementation of surge capacity strategies has mostly focused on how to get more patients into the hospital. These efforts have revolved around a graded approach that take into account a variety of potential strategies that can be used to expand capacity over discrete time frames. Based on supply and demand definitions of healthcare facility surge capacity management, research efforts examining the creation of additional care capacity in the hospital have been conducted**,** particularly focused on strategies meant to expedite early patient discharge.[5] A

number of steps can also be taken to supplement the delivery of care to an increased volume of high-acuity patients. Space to deliver care, clinical staffing availability, and the judicious use of selected supplies will all contribute to the surge response implemented.

Similar efforts, matched to a supply and demand formula for surge capacity development, need to be expanded to these community-based efforts. One framework that readily lends itself to such work may be a concept currently proposed to further categorize healthcare facility surge response along a continuum of required actions. Conventional, contingency, and crisis surge capacity strategies, along with corresponding conventional, contingency, or crisis standards of care, may be one such way to mark the triggers required to implement a community-based approach to surge response.[6]

Delineating such levels may allow for response planning based on the recognition that not all disaster events will require the same degree of response, thus suggesting a scaled approach to surge capacity implementation in the hospital and surrounding community. For example, a number of decisions can be made to support conventional care that are outside the normal operations of daily patient care delivery, such as doubling up beds in single-patient rooms and canceling elective procedures, that have minimal impact on patient outcomes. Likewise, ensuring continuation of basic services in the outpatient setting should be managed with little difficulty. In the middle of this spectrum of care, delivery contingency solutions may be implemented in the hospital setting, including the expanded use of clinical areas, such as post-anesthesia care units to provide continuous critical care. At the community level, shifting to a contingency approach may include the use of certain physician practices as streamlined triage centers and the transition of 911 call centers to include basic triage information about the need for further evaluation and diagnostic assessment. At the far end of this spectrum, the delivery of crisis care might involve the placement of patients in hallway or other non-conventional treatment settings and the opening of alternate care facilities. It might lead to an expanded use of community-based triage resources, and might include provisions to deliver palliative care in the home setting.

This same framework also works well for emergency medical services (EMS) use. Conventional response uses all available ground transport units, although transport destinations may involve the closest hospital rather than hospital of preference, for example. Contingency response implies that the triage of 911 calls will be based solely on

medical priority, suggesting that pending calls that are not perceived as life threatening will not be responded to after exceeding the threshold of a certain call volume. Under crisis surge response, even 911 calls that are potential or apparent life threats will likely not be responded to under existing time line guidelines. EMS responders may be given wide discretion for leaving patients at the scene, or limiting the selection of those transported to the hospital based on community consensus-driven guidelines derived under planning efforts focused on the implementation of crisis standards of care.

A deliberate framework for planning for such patients must be developed and prepared before an event begins. Such efforts must include clearly delineated plans for the step-wise expansion of healthcare service delivery that maximizes available resources within the hospital, and creates capability outside of the traditional hospital setting in a way that provides the highest level of service care delivery sustained over as long a period of time as possible.

POTENTIAL AREAS OF FUTURE FUNDING PRIORITIES

Commitment to planning, increased costs for additional materiel stockpiling, training and staffing, existing regulatory, legal, and financial impediments, and the overarching complexity of coordinating such operations are but some of the barriers to getting this accomplished.

How can healthcare facility surge capacity planning be linked to daily operations?

Hospitals are straining to manage the existing caseload of patients on a daily basis, let alone under the stresses of a disaster response. Provide incentives for grant funding tied to reduction of overcrowding and limitation of emergency department diversion hours during daily operations. Success in this arena would demonstrate commitment to "fixing" some of the inefficiencies in patient flow, and might be indicative of improved efficiencies in the response to large numbers of patients in a disaster.

How can community-based triage be incorporated into surge capacity planning?

Promote integration of traditional first responder community, the private physician community, the private sector, and emergency management into the planning process via grant funding. Fire stations, urgent care centers, private doctors' offices, and even pharmacies can play the important role of providing medical triage in the community. However, to do so, grant funding must extend to support such efforts, and emergency management will play an important role in convening the parties under the auspices of governmental authority, particularly in the context of a declared public health emergency.

What mechanism needs to be implemented in order to coordinate the stratification of care in the community? How will the decisions for patient triage, management, and information be integrated across the community?

This is likely the most complicated aspect of the creation of a stratification-of-care model of response in disaster. The importance of coordinated incident management at the jurisdictional level, or more importantly, at the regional level, cannot be overstated. The developing role of regional hospital coordination centers, those that coordinate the complex tasks of health operations, must be incentivized in the federal grant process. There is also a deep need to take advantage of telemedicine and "telehealth" solutions to provide real-time medical surge capability and medical oversight. Developing an expanded information management platform that allows medical information exchange, "just-in-time" training modalities, and direct patient care delivery should be a part of future grant funding opportunities.

How can the stratification of care model be supported by existing capabilities within the Department of Veterans Affairs and Department of Defense (Northcomm)?

With more than 150 Veterans Affairs Medical Centers (VAMCs) and approximately 70 Department of Defense medical treatment facilities (MTFs) on military installations across the United States, there is a

critical healthcare infrastructure that has largely been "off limits" to civilian surge response planning. Contrary to conventional wisdom suggesting that these facilities would not be available to respond to disaster in the community, most VAMCs and MTFs would likely play a central role in such a response. However, current restrictions regarding the grant funding process restrict closer coordination in planning with the private healthcare community. It is important to identify the manner by which such coordination, including access to available resources, could be maximized if surge capacity strategies need to be implemented.

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F

Creating Situational Awareness: A Systems Approach

The following is a white paper prepared for the June 10–11, 2009, workshop on medical surge capacity, hosted by the Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events. All opinions expressed in this paper are those of the author and not necessarily of the Institute of Medicine.

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WHAT IS SITUATIONAL AWARENESS?

Put simply, situational awareness means understanding what is going on around you. But there is more to this statement than first meets the eye. Understanding is more than information gathering. It implies gathering the right information (all that is needed, but not too much), being able to analyze it, and making projections based on the analysis. In the best of all worlds, it also means being able to do something with the information (i.e., it is useful information).

The first references to the term come from the U.S. Air Force, after the Korean War, and relate to the understanding of the enemy that a fighter pilot needs in an aerial dogfight. The pilot needs to know not only where the enemy plane is, but what its next move will be. This involves gathering information, analyzing it, and making projections based on that analysis. This was described by Col. John Boyd as the "observe-orient-decide-act loop," or OODA loop, also called the Boyd cycle. To win a

dogfight, the pilot must "get inside" the opponent's loop; losing one's own situational awareness was called being "out of the loop."[1]

The term is still used extensively in aviation, and it encompasses the idea of understanding the entire environment of the aircraft, both inside the cockpit and out—what the instruments are indicating, what air traffic control is saying, and what is visible through the windshield. The term is also extensively used by the military. According to the *Army Field Manual 1-02* (September 2004), situational awareness is:

> Knowledge and understanding of the current situation which promotes timely, relevant and accurate assessment of friendly, competitive and other operations within the battlespace in order to facilitate decision making. An informational perspective and skill that fosters an ability to determine quickly the context and relevance of events that are unfolding.[2]

Again the emphasis is on *understanding actionable* information.

What does situational awareness mean in the healthcare context? The concept has been applied to the analysis of patient safety and healthcare quality issues.[3] However, the most frequent use of the term in health care relates to emergency management and is often used in reference to computer systems to aggregate data in an emergency operations center, or to collect and transmit disease surveillance data. These systems are useful tools, and may even be essential tools, but they do not in and of themselves provide situational awareness. To achieve situational awareness, the right information (without a lot of noise) is needed at the right time, and the right person is prepared to receive it, is capable of analyzing it, and is then able to do something useful with it.

This raises a number of issues, the most fundamental of which is what information is actually needed in a disaster? What information really makes a difference? In fact, the information needed probably varies with the type of event, and different actors involved in emergency response need different information. For example, the physician in the emergency department needs different information than the state's Director of Emergency Management or the Secretary of Health and Human Services (HHS).

THE CURRENT STATE OF THE ART OF HEALTHCARE SITUATIONAL AWARENESS

The following are some of the existing systems and programs that relate to healthcare situational awareness. It is not a comprehensive list, but it illustrates the diversity of types of systems. For the most part, these systems were designed as stand-alone systems and are not integrated.

Disease Detection and Surveillance

- BioWatch (the United States government system to detect certain bioterrorism agents in the air)[4]
- BioSense (the United States government system to gather syndromic surveillance data from hospitals)[5]
- Other state and local syndromic surveillance systems such as RODS,[6] ESSENCE,[7] AEGIS[8]
- The Centers for Disease Control and Prevention's (CDC's) multiple influenza surveillance systems (e.g., ILInet, Emerging Infections Program) [9]
- The World Health Organization's Global Influenza Surveillance Network (GISN)[10]
- Traditional public health disease surveillance, case investigation, and contact tracing
- Laboratory reporting systems

News and Web Trawling

- ProMED (distributes disease reports submitted from around the world)
- Global Public Health Intelligence Network (GPHIN) (mines global news for disease reports)[11]
- Google Flu Trends system[12]

Alerting

Health Alert Network (sends messages from the CDC and state health departments to clinicians)[13]

Bed Tracking

- Many home-grown or off-the-shelf systems within hospitals
- Many systems for reporting bed data to local, state, and federal governments

Patient Tracking

- Many systems to track patients within hospitals
- Many systems to track emergency medical services patients

Incident Command Systems

- Web emergency operations center (EOC) and others

Electronic Health Records

- Within hospitals or clinicians' offices

In addition, there are emergency operations or information fusion centers at the local, state, and federal levels whose purpose is to merge the various streams of information. These include local and state EOCs, the Secretary's Operations Center (SOC) in HHS,[14] the CDC Director's Emergency Operations Center,[15] the CDC's BioPHusion Program,[16] and the National Biosurveillance Integration Center (NBIC) in the Department of Homeland Security.[17] Another center, the National Biosurveillance Integration System (NBIS) created to connect various surveillance streams and agencies.[18]

Although these surveillance efforts undoubtedly provide information flows that did not exist before, it is not clear to what extent they have enabled a more robust understanding of a rapidly unfolding event. How do, or how can, these diverse systems, programs, and centers work together to provide an integrated picture? Can decision makers use these systems effectively to direct action in a crisis? Do these systems provide the necessary information in real-time? It seems overall that there has been much more emphasis placed on systems to detect outbreaks rather than on systems to manage outbreaks. At this point it appears that there is

a lot of technology, but relatively little science. Systems exist without a clear concept of operation.

Several entities have or are currently studying these issues, including:

- The National Biosurveillance Advisory Subcommittee (NBAS) Task Force (mandated by HSPD-21)
- Institute of Medicine, or IOM (mandated by Congress)
- Government Accountability Office, or GAO (mandated by Congress)

SITUATIONAL AWARENESS AND NOVEL H1N1: WHAT DID WE LEARN?

The current novel H1N1 epidemic has provided a real-life test of our situational awareness capabilities. One thing that we certainly learned from this outbreak is that situational awareness is critically important—it drives policy decisions. Decisions regarding school closings, personal protective equipment guidance, and antiviral use are all dependent on knowing key characteristics of the epidemic in real-time. These characteristics include the severity of illness, the basic epidemiology (e.g., R value, serial interval), the transmission characteristics, and the extent of dissemination of the disease in the community. Traditionally, these characteristics have been determined in retrospect after careful epidemiological investigation; however, intervention strategies now in place presume knowledge of these characteristics. Therefore, as we have seen, in a nascent pandemic that arrived in the United States without warning, this information must be estimated in real-time if interventions are to be attempted. The same would be true for other contagious diseases, such as Severe Acute Respiratory Syndrome. To estimate these characteristics, one must be able to identify those who have died, those who are seriously ill, and those with mild disease. This requires a capability for rapid and reliable diagnostic testing, near real-time disease surveillance, and the ability to quickly reach down to the bedside to get clinical information.

In the current outbreak, we found that that there was inadequate capacity for accurate rapid diagnostic testing. Rapid antigen tests were unreliable (insensitive and non-specific). While polymerase chain reaction (PCR) was useful ("untypable influenza A" had very high predictive

value), PCR is not available in many clinical labs. Moreover, laboratories had difficulty keeping up with the volume of tests.

We also learned that systems for syndromic surveillance did not seem to provide an adequate picture of the scope of the outbreak quickly enough. The CDC's ILInet data on outpatient visits to sentinel physician offices has traditionally been reported weekly—not timely enough to inform intervention decisions that must be made in a matter of days. Anecdotally, local syndromic surveillance systems either did not show a spike of ILI or showed a "false" spike—worried well and well people seeking testing. Reportedly, BioSense data corroborated the ILInet data, but whether the data provided further useful information is not yet clear.

One unexpected finding is that apparently a large outbreak of clinically mild disease can fly under the surveillance radar because most surveillance systems are designed to look for people sick enough to seek medical care. Some systems collect data on other surge indicators such as the volume of purchase of over-the-counter medication, but it is not known if these systems have been useful in the current outbreak. The Google Flu Trends system that tracks influenza-related Internet searches revealed only a minimal spike. Why do we care about people not sick enough to see a doctor? Because that information is needed to understand the severity and epidemiology of the outbreak and this understanding drives important policy decisions.

One innovative and apparently successful attempt to quickly assess a localized outbreak was the use of Survey Monkey at St. Francis School in Queens, New York. Students and staff were queried by e-mail about influenza-like symptoms. This afforded a very quick determination of the rough scope of the outbreak.[19]

There was also a need to quickly get clinical information about hospitalized patients—both to understand the severity of the disease and to guide treatment. This seems to have been a particular problem with the cases in Mexico. Key questions to which answers were needed early on include: What were the reasons for hospital admissions? What are the causes of death? Are there particular risk factors for serious illness? What treatments seem to have been effective and what did not? The data collection methodology for this information seems straightforward, at least in the early stages of an outbreak: a simple telephone call to the physician caring for the patient. A process for collating the data, analyzing it, and feeding it back to clinicians quickly is also needed. Real-time clinical trials may also be needed in an outbreak of an unknown disease.

Although it has not yet been a major issue in the current epidemic, states and the federal government need a process to know what is going on at the ground level in hospitals and other healthcare facilities. They need this information to know how best to deploy their limited resources and to identify critical choke points that they may be able to alleviate. This raises the question of what the key data elements are that indicate a hospital or healthcare system is under severe stress. In other words, what are the vital signs for the healthcare system? How can that data be obtained easily and in near real-time? One approach may be to use existing and developing healthcare coalitions to "take the pulse" of their member organizations and report information to the state and federal governments.

There is also a need to collect healthcare facility data to feed into a cycle of continuous improvement. Understanding how hospitals and other facilities performed during this crisis should lead to refinements of the Hospital Preparedness Program and other preparedness programs.

GOING FORWARD: RECOMMENDED SHORT-TERM GOALS

Over the next several months, before the anticipated next wave of the pandemic begins in the fall, it is important to improve the government's ability to quickly acquire key information needed to manage the response to the epidemic. This includes:

- Assessing the number of mild flu cases so that the severity of the epidemic can be estimated. This can be accomplished by expanding or enhancing existing influenza surveillance systems and by using existing tools like Survey Monkey to do very quick cohort studies.
- Accessing information on hospitalized patients. This can be accomplished by enhancing existing hospital influenza surveillance systems and assigning clinicians to do very rapid telephone investigations of hospitalized cases.
- Identifying "vital signs" for hospitals and healthcare systems and figuring out how to access them.

RECOMMENDED LONG-TERM GOALS

A more integrated approach to federal biosurveillance programs is needed that is based on clearly defined missions, goals, and priorities. This approach should include a scientific analysis of what information is needed to manage various health emergencies, interoperability among various surveillance systems, and a process for continuous improvement of the systems through rigorous evaluation of events and exercises.

The federal and state governments should harness the momentum toward universal health information technology to improve digital linkages between public health and hospitals so as to improve public health access to key clinical data.

The federal government should invest in increasing the surge capacity of clinical and public health laboratories and in the development and dissemination of rapid diagnostic tests.

The hospital Preparedness Program (HPP) should continue to promote the development of healthcare coalitions for a variety of reasons, one of which is to provide a mechanism to collect critical information from hospitals and other healthcare facilities. The HPP, along with the Centers for Medicare & Medicaid Services and the CDC, should continue to promote digital linkages between hospitals and health departments.

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Vulnerable Populations in Disasters: Health Effects and Needs

The following is a white paper prepared for the June 10–11, 2009, workshop on medical surge capacity, hosted by the Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events. All opinions expressed in this paper are those of the author and not necessarily of the Institute of Medicine.

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INTRODUCTION

Surge *capacity* is simply, if not easily, measured in terms of numbers of facilities and equipment, such as beds, ventilators, imaging units, and operating suites that could be pressed into service should a sudden and overwhelming need arise. Surge *capability*, on the other hand, is measured in terms of the numbers of staff and resources truly available to provide the services for which these facilities and equipment are required. Estimates vary according to the type of hazard being encountered, such that as few as 50 percent of staff state they would report to work in large-scale bioevents, but in truth, no reliable estimates of local or national surge *capability* currently exist. For no population group is this gap between expectation and realization more acute and critical than for vulnerable populations with special health care needs—the very young, the very old, the disabled, and the dispossessed, as was amply demonstrated in the aftermath of Hurricane Katrina.

Unfortunately, little has been published in the scientific literature to date regarding the needs of such populations, despite the fact that special populations appear to account for the majority of patients "stranded" in areas of limited health care resources, particularly following natural disasters.[1] At the same time, the effective surge capacity of emergency departments in the United States has fallen sharply during the past 15 years, perhaps by as much as one-third, when one takes into account both the increase in annual visits to emergency departments and the decrease in the number of emergency departments.[2] The Health Resources and Services Administration set targets for surge capacity in the nation's hospitals at 500 cases per 1 million population for large-scale bioevents and 50 cases per 1 million population for blast and radiation injury.[3] However, it is unclear whether these targets, extrapolated largely from the Israeli experience, are truly applicable to the far larger American healthcare system—a system not used to managing major disasters and manifestly lacking the military training and experience of the Israeli population—let alone the American healthcare system as used by American children.[4-6]

ON-THE-GROUND SUCCESSES: STATE OF THE ART

Outside assistance following a major disaster cannot be expected to arrive before 24 hours, and may arrive as late as 96 hours, even though the peak demand for emergency services can be expected to occur within the first 24 hours—84 to 90 percent for conditions manageable on an ambulatory basis.[7] The majority of hospitals in densely populated urban environments appear to have well-established incident command systems; protocols for hospital lockdown, early discharge, and cancellation of elective operations; designated victim overflow areas; predisaster "preferred" vendor agreements; emergency medical services–compatible communications systems; a minimum of 3 days' worth of supplies on hand; and daycare for children of staff. However, mutual aid agreements with law enforcement, other hospitals, and long-term care facilities are generally lacking, while few hospitals have fully engaged in community-wide disaster planning or have involved other agencies in their disaster training. Moreover, less than one-third of such hospitals may have reliable surge capacity in excess of 20 beds or access to 6 or more ventilators, while less than one-half may have access to pharmaceutical stockpiles.[8]

This is especially troubling when one considers the fact that pandemic modeling based on the Toronto experience with severe acute respiratory syndrome indicates that the increase in hospital admissions associated with even a mild pandemic may well exceed the reduction in hospitalizations resulting from early discharge and cancellation of elective operations.[9] Even more problematic is the fact that fewer than one quarter of all nursing homes may have specific pandemic response plans.[10] In addition, the initial drafts of the National Pandemic Influenza Preparedness Plan provided little in the way of explicit guidance addressing the special needs of infants, children, or elders.[11] Fortunately, the response of the Centers for Disease Control and Prevention to the ongoing 2009 H1N1 pandemic has been far more encouraging, as indicated by the presence of frequently updated treatment guidance on its public website, although specific guidance with respect to surge capability has been far less robust.[12]

IDENTIFIED SHORT-TERM GOALS: THE LOW-HANGING FRUIT

What is clear from the foregoing is that while special needs populations can be expected to consume the majority of resources in the event of a major regional disaster, there are no shortcuts to effective community disaster planning. When local health resources are rendered scarce or dysfunctional after a disaster, chronic conditions become acute, especially among racially and ethnically diverse segments of the most vulnerable groups of victims—children, elders, the infirm, and the impoverished.[13,14] Unfortunately, efforts to enhance health system surge capacity increasingly proceed side by side with efforts to curtail healthcare expenses, making community-wide planning processes that invoke infrequently used social capital increasingly crucial.[15,16] The effects of such mismatch between health needs and resources after a major disaster can be truly devastating, as shown by the well-chronicled events that followed in the wake of Hurricane Katrina.[17,18]

Still, helpful guidance to aid in community planning for the healthcare needs of special populations following major disasters is available. Several general and specific strategies have been proposed not only for the population as a whole, but also for children and elders, in particular.[19-24] For children, these involve recognition of the need for pediatric expertise in local disaster planning, age-linked strategies for pediatric

decontamination, minimized parent–child separation, development of comprehensive pediatric resources to assist non-pediatric hospitals in preparing for a large influx of pediatric patients following major disasters, careful matching of pediatric population density and pediatric medical resources, and development of alternate care strategies in case of—and in advance of—disasters with overwhelming pediatric need.[20-23] For seniors, these involve education of the elderly for preparedness and response, recognition of the value of existing community resources in planning and preparedness, assistance to community-based agencies in developing disaster continuity capabilities, incorporation of the needs of the elderly into the overall emergency management system, and consideration of recovery needs.[24]

LONG-TERM GOALS: A STAR IS FALLING, FASTEN YOUR SEAT BELT!

The only acceptable long-term goal is for every community in the nation to have in place specific plans for its special needs populations in the event of major disasters as part of the comprehensive disaster plans that are vital to community disaster management. This will only happen through concerted effort on the part of all public and private entities concerned with the health and well-being of the community as a whole—including its corporate leaders, who depend on a healthy population for the continuity of businesses. While the approaches noted above provide useful information about what has succeeded in the recent past, it is interesting to cite the uncanny parallels between disaster planning efforts and time-tested injury prevention strategies first advocated by William Haddon, founding administrator of the National Highway Traffic Safety Administration, known universally within the public health sector as the Haddon Factor-Phase Matrix.[25] This approach to injury prevention and control relies on identification of factors that impact on the *host*, *agent*, and *environment*, *before*, *during*, and *after* the traumatic event, and seeks to modify these factors through individually crafted strategies involving *education*, *engineering*, *enforcement*, and *economics*, to reduce the burden of preventable injury—strategies such as widespread adoption and insistence on use of seat belts and shoulder harnesses that have substantially reduced the unacceptably high burden of highway traffic fatalities in the United States since this approach was first proposed in the early 1970s, and that are most successful when applied by comprehensive in-

jury prevention and control systems that link the public health system with the trauma care system in partnership.[26]

Emergency managers, of course, have adopted a nomenclature that is unique to disaster management. However, it follows a pattern that will be readily recognized by experts in trauma care and injury control: *preparation* is analogous to *primary* injury prevention, which seeks to *avoid* injuries before they occur, chiefly through targeted educational programs; *mitigation* is analogous to *secondary* injury prevention, which seeks to *attenuate* injuries as they occur, mainly through system or product engineering strategies; *response* is analogous to *tertiary* injury prevention, which seeks to *ameliorate* the effects of injury through timely application of sustentative, followed by definitive, prehospital and in-hospital emergency medical care; *recovery* is analogous to what might be called *quaternary* injury prevention, which seeks to (re)*activate* local public health and healthcare systems to effectively manage intercurrent or recurrent injuries and illnesses using surviving or restored community-based resources. While it has become fashionable for many disaster experts to ask why it seems we are incapable of learning from the mistakes made in past disaster events, the answer lies in the very nature of the disaster event—the word "disaster" itself being derived from the Latin words for "evil" and "star"—for falling stars are seldom seen, and even when seen, vanish from view almost immediately. The fact, however, is this: while the exact date, time, and place of the next disaster is unknown to us—just as the exact date, time, and place of the next motor vehicle crash was unknown to William Haddon—the lessons learned from previous disasters, when applied through systematic effects on the host, agent, and environment, before, during, and after disaster events, can be invaluable in assisting us to prepare for future disasters.

WHAT WILL IT TAKE TO GET THERE? RESEARCH NEEDS

Injury prevention and trauma care did not improve in the United States until population- based surveillance systems and detailed trauma registries were in place to reliably document both the scope of traumatic injury and best practices for trauma care. The same is likely to be true for disaster and emergency management. A comprehensive nationwide disaster registry that recorded not only the nature of the disaster event, but in very simple terms the types of illnesses and injuries encountered and

their final outcomes, will be essential to accurate identification of the host, agent, and environmental factors—before, during, and after the disaster event—that have greatest impact on ultimate survival and functional outcome. Without such real-time data, it becomes nearly impossible to reconstruct the past, even through review of detailed after-action reports, because of the limitations of human memory and its tendency to ignore information it cannot recognize.

Without such a structured system, reliable information on the fate of special populations during disasters will continue to be hard to come by. One clear-cut example exists in the methods that have been used to estimate true case fatality rates in the adult population following Hurricane Katrina: review of death notices from local newspaper obituaries.[27] However, due to the potential underreporting of such death notices among children, it has been difficult to adopt the same methodology for children.[28] In the opinion of the author, therefore, only minimal datapoints, collected in real time as part of a nationwide disaster registry, are likely to solve the problem, and thus should become a key requirement of the Hospital Preparedness Program of the Office of the Assistant Secretary for Preparedness and Response of the Department of Health and Human Services.

CONCLUSIONS

It is often said that a society is judged by how it cares for its most vulnerable. The widespread media coverage that followed Hurricane Katrina showed the United States that its disaster response was sorely lacking in its capabilities to care for its young, its old, its disabled, and its dispossessed. Recent anecdotal reports following Hurricane Ike indicate that much progress has been made during the intervening years. This is good news, but much still remains to be done for these segments of the American population.

That said, there will likely never be sufficient facilities, resources, or expert personnel to care for all of America's vulnerable populations when a disaster strikes. What America can do, however, is to ask those with expertise in the care of vulnerable populations to teach others how to stabilize such patients until surge resources can be made available, either locally or through mobilization of distant assets. Such social capital is available in every community across the nation, and it is the duty of every citizen with the intellectual or material means to help fellow citi-

zens in distress to do so in the event of a disaster. "We the People of the United States" established our Constitution, among other purposes, to "insure domestic Tranquility" and "promote the general Welfare," and it is therefore incumbent on us to embrace these duties in disasters, as on all other days.

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Fatalities Management Strategies

The following is a white paper prepared for the June 10–11, 2009, workshop on medical surge capacity, hosted by the Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events. All opinions expressed in this paper are those of the author and not necessarily of the Institute of Medicine.

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STATE-OF-THE-ART SUCCESSES IN MASS FATALITIES MANAGEMENT

There have been many defining moments in U.S. history where the challenges of responding to mass fatality incidents have been clearly realized. The bombing of the Edward P. Murrah Federal Building in Oklahoma City, the terrorist attacks in New York City and on the Pentagon on September 11, 2001, and Hurricanes Katrina and Rita along the southwest Gulf Coast were such moments that painted a bleak landscape of the

impact that mass fatality disasters bring on U.S. cities large and small. The recent H1N1 outbreak, with its 1918 predecessor, the Great Pandemic Influenza, created a 21st century reminder of the potential catastrophic impact an influenza pandemic could have on the nation and across the world. These pivotal events, and the anticipation of what may come, require emergency managers, public health preparedness planners, and elected officials to assess what has been accomplished in our national efforts to plan for and respond to mass fatality incidents and to prioritize the development of a comprehensive and coordinated approach to address such incidents in the future.

This country's modern-day efforts to address and respond to the potential impact of mass fatality incidents began in the 1980s, when a committee was formed within the National Funeral Director's Association to address disaster situations and, more specifically, incidents involving simultaneous multiple deaths. A multifaceted nonprofit organization was eventually formed by this committee to support the concept of a national-level response protocol for all related professions. Led by Tom Shepherdson, the Disaster Mortuary Operational Response Team (DMORT) gained federal recognition in 1992 and became incorporated into the federal disaster response system within the National Disaster Medical System. This initiative resulted in the formation of 10 DMORTs representing each federal region of the country. Two specialty teams—the Weapons of Mass Destruction Team and the Family Assistance Core Team—were added later.

While the early years of mass fatalities planning and response focused essentially on the identification and release of decedents, this focus has greatly broadened in light of our country's experience with such events. The Department of Homeland Security's Target Capabilities List (2007) defines fatalities management as "…the capacity to effectively perform scene documentation, the complete collection and recovery of the dead, victim's personal effects and items of evidence; decontamination of remains and personal effects (if required); transportation, storage, documentation, and recovery of forensic and physical evidence; determination of the nature and extent of injury; identification of the fatalities using scientific means; certification of the cause and manner of death; processing and returning of human remains and personal effects of the victims to the legally authorized person(s) (if possible); and interaction with and provision of legal, customary, compassionate, and culturally competent required services to the families of the deceased within the context of the family assistance center." [1] This expanded way of thinking

about mass fatality response sets the stage to consider the complexities of planning for these categorical areas of response.

Many public and private initiatives have been put forth over the past decade or more to improve the ability for state and local communities to respond to mass fatality incidents. Four years after the formation of the DMORTs and following the devastating mid-air explosion of TWA Flight 800 off the coast of Long Island, New York, assistance to families of the deceased took a national spotlight. The National Transportation and Safety Board (NTSB) was tasked in 1996 by the Aviation Disaster Family Assistance Act to coordinate assistance to families of victims involved in major aviation accidents. That Act also required the NTSB to identify a human service organization to assist them in the coordination of the provision of mental health and spiritual care services for families of the victims. The American Red Cross (ARC) was designated as that agency and since that time, both the NTSB and the ARC have worked collaboratively to address the needs of families affected by all types of transportation disasters resulting in mass fatalities. One particular challenge is that operationally, these services should be available in the immediate aftermath of a disaster; yet many local ARC chapters and local emergency managers are unfamiliar with the provisions of this Act.

In 2000, a congressional appropriation, administered by the Centers for Disease Control and Prevention (CDC), created a mechanism to form the National Mass Fatalities Institute (NMFI) located at Kirkwood Community College (KCC) in Cedar Rapids, Iowa. The NMFI's mission focuses primarily on planning and workforce development by providing technical guidance and training at the local and state levels. KCC's Hazardous Materials Training and Research Institute also developed an online library, which lists a variety of documents and other resources pertaining to the field of mass fatalities management.[2] Since the ending of its federal funding period in 2007, the Institute has struggled to maintain its mission and ensure that all communities across the country have mass fatalities plans and a robust and highly trained workforce to respond to mass fatality events. Even so, the Institute continues to identify alternate mechanisms of funding so that it may continue its contribution to the field of mass fatalities planning and response.

A number of workgroups and sentinel documents have also been credited with furthering the field of mass fatalities management. *Providing Relief to Families After a Mass Fatality: Roles of the Medical Examiner's Office and the Family Assistance Center*[3] offers guidance on establishing a Family Assistance Center, providing emotional and spiri-

tual support to families of the victims, and tackles the challenges of antemortem data collection. This document has been an instrumental resource in training local ARC volunteers and other potential responders at the community level.

In June 2005, the National Institute of Justice convened a technical working group to develop *Mass Fatality Incidents: A Guide for Human Forensic Identification*.[4] This guide was one of the first documents to address issues facing medical examiners, coroners, and other forensic professionals involved in the identification of human remains resulting from a mass fatality incident. It notes some of the critical differences between "normal fatality management" operations (i.e., responding to a motor vehicle accident with five fatalities) and those involving incidents with mass fatalities (i.e., terrorist attacks involving hundreds or thousands of deaths).

The release of *The Capstone Document: Mass Fatality Management for Incidents Involving Weapons of Mass Destruction*,[5] also in 2005, provided an important resource to the field in the response to domestic and international acts of terrorism. This document provides a comprehensive review of forensic issues for managing contaminated human remains of known toxic agents. Similar resources were developed by the National Association of Medical Examiners and include *The Medical Examiner/Coroner's Guide for Contaminated Deceased Body Management*,[6] and a document entitled the *Mass Fatality Plan*,[7] which provides technical information and recommendations for Medical Examiners and Coroners on the management of contaminated human remains.

There is also a body of knowledge that has emerged from the international theater. The Pan American Health Organization (PAHO) produced *Management of Dead Bodies After Disasters: A Field Manual for First Responders*[8] in the aftermath of the 2006 Indian Ocean Tsunami. This guide for non-specialists provides guidance on managing the essential aspects of mass fatality incidents, focusing primarily on "management of the dead." It also provides suggestions on how to support families of the victims and communicate with the media and the public. The PAHO also developed a mass fatalities checklist that serves as a template for developing a mass fatalities annex to an overall mass fatality plan.[9]

From a planning and response perspective, public health departments, both state and local, and healthcare facilities share facing considerable challenges in the aftermath of mass fatality incidents. Many are significantly underresourced to address and respond to the complexities

of such events. Two key resources have been developed in the past year to address these critical gap areas. The first is the *Los Angeles County (CA) Mass Fatality Incident Management: Guidance for Hospitals and Other Healthcare Entities*.[10] This guide applies mass fatality management concepts and operations to hospital settings, with particular emphasis on responding to a catastrophic disease outbreak. The second is the *Managing Mass Fatalities Toolkit*,[11] developed by the Santa Clara County (CA) public health department, a National Association of County and City Health Officials–designated public health preparedness Advanced Practice Center. Toolkit materials were developed based on lessons learned from actual events, including the Oklahoma City bombing, 9/11, and Hurricane Katrina, and provide scalable, operational guidance and resources to assist local public health jurisdictions in creating a local mass fatalities plan.

The CDC has also produced numerous public health bulletins available on the Emergency Preparedness and Response section of its website (www.cdc.gov). Information for both the public and clinical audiences include topics such as traumatic stress and coping after disasters and other mass fatality incidents and technical guidance for medical examiners and coroners in biologic terrorism and response.

Additional attempts have been made to bring together subject matter experts in mass fatalities management to brainstorm and address critical, unanswered questions. A notable example is a 2006 2-day workgroup conference sponsored by the U.S. Northern Command in cooperation with the Department of Health and Human Services (HHS) at the Joint Task Force Civil Support headquarters in Fort Monroe, Virginia. Civilians, government, and military met to address the myriad issues in mass fatality planning and response to an influenza pandemic. A series of White Papers were generated to lay the foundation for a national strategy for pandemic influenza fatality management. HHS also conducted a series of teleconferences with subject matter experts to develop a Concept of Operations (CONOPS) for Fatality Management. Completed in 2007, the purpose of this CONOPS is to identify federal fatality management resources and outline procedures for their engagement during a mass fatality event that overwhelms regional, state, local, territorial, and tribal capacities.

In short, there have been many initiatives undertaken and key resources developed to address the challenges of mass fatalities management. But can these initiatives and resources be defined as "state of the art?" Are we any further along in developing a comprehensive and uni-

fied approach to fatalities management at the local, state, and federal levels? At best, what has been accomplished to date only scratches the surface when considering what it would take to fully and comprehensively address the complex planning challenges and response needs of a large-scale, catastrophic mass fatality incident. Elected officials, emergency planners, public health professionals, and a variety of other disciplines needed to carry out the multitude of tasks and activities following such an event must give priority to developing both short- and long-term approaches to creating a mass fatalities management strategy that can be adopted and implemented at all jurisdictional levels.

SHORT-TERM OPPORTUNITIES

Creating a National Mass Fatalities Strategy

The first short-term goal would be to call for the creation of a National Mass Fatalities Strategy. The call to establish this national priority would be directed to both the Department of Homeland Security (DHS) and HHS and require both organizations to identify agency representatives who would take the lead in coordinating the creation and development of this critical national strategy. Currently, HHS is the lead federal agency for Emergency Support Function 8 (ESF-8), the area within the National Response Framework (NRF) that is currently responsible for mass fatalities management. ESF-8 also includes public health, medical, and mental health services, three very large and complex areas that require robust financial and human resources in order to adequately prepare the nation for its federal obligations and roles in response to disaster. DHS, which is responsible for the National Integration Center and is the "keeper" of the National Incident Management System (NIMS) and NRF documents, would support the creation of a national mass fatalities strategy by clarifying and describing the U.S. government's roles, responsibilities, and authorities in mass fatalities management as described in the NIMS and the NRF.

Recently, a Fatality Management Interagency Steering Committee, convened and facilitated by the HHS Office of the Assistant Secretary for Preparedness and Response, revised the CONOPS for Fatality Management in an effort to create some much-needed structure for the federal government's response to mass fatality events. Although the fate of this most recent document is currently under review, it is imperative that such

a resource be shared with DHS and brought forth to create a framework for future response to mass fatality incidents. Once endorsed, this document can be used as a matrix by the two federal agencies to conduct a comprehensive gap analysis to identify areas for future research, training, and technical assistance and the development of key resources in fatalities management.

Enhancing Workforce Development

One of the glaring gaps identified by many subject matter experts is the lack of a fully functional workforce that is able to respond to a range of mass fatality incidents, especially in rural areas of the country. The Pandemic and All-Hazards Preparedness Act and the Homeland Security Presidential Directive 21, which addresses public health and medical preparedness, calls for the creation of the Federal Education and Training Interagency Group (FETIG). It is still largely unknown how this group—which is proposed to be a coordinating mechanism for public health and medical disaster preparedness and response core curriculums, training, and education across federal agencies, departments, and other stakeholders—will function, but efforts must be made to ensure that one of its roles is to address the workforce and training needs of responders to mass fatality incidents.

Currently, federal and state assets (i.e., the Department of Defense, DMORT, and the National Guard) can and will play important roles in large-scale, mass fatality disaster response and recovery, but local and state planners are largely unfamiliar with these roles and how they will be engaged. Once these roles are clarified, and the gaps in the available workforce identified, developing a nationally recognized training strategy to create a workforce at the state and local levels with the capacity to respond to incidents involving multiple fatalities is imperative. To date, training curriculums lack evidence base and are primarily developed from the anecdotal experiences of planners and responders. In the short term, efforts should be made to generate a comprehensive list of currently available and "reputable" training curriculums, with the goal of creating an "interim training plan or guidance document" for local and state planners to use as a resource to train first responders and others in mass fatalities response. Longer term initiatives to establish training core competencies should be addressed by the FETIG and other invested stakeholders. Enhancing the knowledge and skill levels of a mass fatali-

ties response workforce could also be accomplished through the creation of related drills and exercises that test and reinforce such knowledge and skills. Local, state, and national planners must build on their current exercise scenarios in an effort to continually stretch and examine their response capabilities and capacities and integrate "lessons learned" into future training and exercise opportunities. Finally, opportunity exists to require healthcare facilities funded by the HHS Hospital Preparedness Program (HPP) to have robust training plans for hospital workers who may be called on to respond to such events.

Handling Human Remains

How are we going to handle the dignified recovery, storage, identification, and processing of human remains following mass fatality incidents? How much do we know about how to develop flexible and scalable ways of handling these remains when fatality numbers grow beyond "the hundreds" and surge toward the "tens or hundreds of thousands"? Who has the legal authority and responsibility for handling these remains? A short-term goal could include HHS convening a group of subject matter experts, both domestically and internationally known, to create a plan for the development of modeling and resource management algorithms that can inform future planning to prepare for such catastrophic disasters. Current legal authorities, mostly at the state and local levels, though not entirely, present significant challenges in the recovery, release, and interring of human remains. A comprehensive review of local, state, and federal laws and statutes must be conducted so that revisions and changes in such areas may be considered and proposed.

Enhancing Family Assistance Services

The Aviation Disaster Family Assistance Act of 1996 was a key piece of legislation to address the needs of families in the aftermath of a mass fatalities incident. The Act required the provision of a range of supportive services, including psychological and spiritual, much of which are provided in Family Assistance Centers in the localities where these transportation incidents occur. Often local chapters of the American Red Cross, in collaboration with local public health departments and emergency managers, are responsible for planning and "standing up"

these "mass resource" centers. Because of competing priorities and a lack of understanding of the myriad services required within a Family Assistance Center, many local communities have not fully developed their "family assistance" plans and end up doing so haphazardly when disaster strikes. Greater recognition for the need for pre-planning for family assistance must be given and reinforced through the requirements for federal funding to agencies carrying such responsibility. Guidance needs to be provided to state and local agencies to establish family assistance services for mass fatality incidents that are not related to transportation disasters and are therefore without the mandated assistance of the NTSB and related support agencies.

Another gap area that needs to be addressed in the short run is how to provide support to victims' families during the time it takes to set up a community-based Family Assistance Center. Many communities, particularly hospitals and other healthcare facilities, are exploring ways to fill this gap. Family Reception Centers are typically located in close proximity to a mass fatality scene or in a location, such as a hospital, where the families of victims are likely to congregate. Chaplains, social workers, and other hospital support staff provide the interim information and support until a more comprehensive Family Assistance Center can be opened. However, not all hospitals are prepared to provide such services.

One opportunity to create such infrastructure is through the national Hospital Preparedness Program. Administered by HHS, the HPP provides funding to acute care facilities to aid in disaster planning and response. Such funding should require planning and exercising for how to resource and staff a mass fatalities family reception center. Such a plan should also include the comprehensive training of hospital personnel and community volunteer resources, such as a local medical reserve corps, and address the ways in which a hospital-based center would be integrated into the larger community plan for family assistance services. All transportation hubs (airports, train stations, bus depots, cruise ship ports) across the country should also be involved in the development of these plans and exercises because it is likely that such reception centers can be opened in these facilities to support waiting family members in the event of transportation disasters.

LONG-TERM OPPORTUNITIES

Developing National Policy

Many of the challenges in establishing a comprehensive national mass fatality plan or strategy are a result of the workings and structure of the American government. Lines of federal authority, limited funding opportunities, and outdated policies may present obstacles to putting in place an ambitious and time-efficient plan for advancing the field of mass fatalities management and response. Even so, we have a moral, ethical, and practical obligation to identify and address ways to resolve such governmental barriers. Subject matter experts and other invested stakeholders, convened by public and private entities, must come together with policy makers and elected officials to address key policy areas that can bring due attention and resources to the development of a national mass fatalities management strategy. Policy implications for research, training, workforce development, and establishing performance standards and metrics should be reviewed and recommended.

Securing Adequate Funding

When looking at the broad-based challenges identified in this paper and the potential short- and long-term opportunities to address these challenges, the issue of securing adequate and sustainable funding to carry out these initiatives seems unlikely in this country's current financial climate. This is why it is even more imperative that a group of key stakeholders, to include public health economists, be convened to explore the cost of building a sustainable national mass fatalities strategy that will have quantifiable and efficacious outcomes at the local and state levels. In the interim, current funding opportunities such as those through the HHS Hospital Preparedness Program, the CDC's Public Health Emergency Preparedness grant program and Cities Readiness Initiative program, and the Department of Homeland Security Grant Program should be reviewed to identify ways to include mass fatality planning and exercise initiatives and requirements. These funding streams should also be flexible to allow funding of organizations outside their traditional target audiences. For example, local and state medical examiner agencies are typically exempt from applying for such federal funding because they

are not considered "first responders," but are at the center of any plan for mass fatality management.

Creating a National Research Agenda

Establishing an evidence base for mass fatalities management must be a national priority that is funded and resourced at levels commensurate with other such federal priorities. To date, research priorities for the field are lacking and it is not certain who is accountable for identifying such initiatives. One suggestion would be to task the Fatality Management Interagency Steering Committee and the FETIG with making short- and long-term research recommendations toward the creation of a national research agenda in mass fatalities management.

Identifying Training Core Competencies

As mentioned earlier in this paper, most training curriculums available to date draw on the anecdotal experience of trainers. Lacking is a consensus on what foundational knowledge, skills, and attitudes must be in place for those responding to mass fatality disasters. Developing training core competencies that can inform the education of mass fatality disaster responders is an important first step to strengthening capacity and resiliency at the local, state, and national levels. Again, this may be a role for the newly developed FETIG in collaboration with other public and private stakeholders.

NEXT STEPS

Prioritizing the creation of a national mass fatality management strategy is critical in preparing the country to respond to large-scale natural and human-caused disasters involving multiple, simultaneous deaths. This strategy must include and focus on addressing the complex infrastructure needed to respond to the challenges posed by human remains recovery, the morgue and forensic operations in place to support these recovery efforts, the systems to properly track missing person information and obtain ante-mortem data for decedent identification and release, and the mental health and spiritual assistance services necessary to sup-

port grieving family members. Although this discussion paper identifies some key agencies and organizations, public and private, that might take the lead in initiating some of these recommendations, further efforts must be taken to identify the appropriate lead source to fill the gaps identified in this critically important area.

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Financing Surge Capacity and Preparedness

The following is a white paper prepared for the June 10–11, 2009, workshop on medical surge capacity, hosted by the Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events. All opinions expressed in this paper are those of the author and not necessarily of the Institute of Medicine.

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INTRODUCTION

The fact that hospitals and health systems face numerous financial pressures relating to everyday operations is well documented. The dawn of less advantageous private third-party payor agreements and reductions in federal reimbursements, along with increasing human resource, supply, and technology costs and an aging infrastructure, have created significant hardships. In addition to this economic stress, hospital emergency departments and inpatient facilities are routinely operating at or near 100 percent of capacity on a daily basis. Given all of this, the unilateral investment in surge capacity has been minimal.

In the face of an emergent surge condition, whether occasioned by a sentinel incident such as Hurricane Katrina or a slower growing event such as pandemic influenza, hospitals' already stretched resources are stressed even further. (However, actual evidence from Toronto in 2003

shows that hospital *inpatient* admissions may actually decrease during such an event.[1])

Federal funding for hospitals and public health entities has been provided through the Hospital Preparedness Program and the Centers for Disease Control and Prevention to date. These have served to improve the position of hospitals and other health entities in relation to equipment and supplies. The restrictions in these programs, however, have discouraged investments in other surge-sensitive areas such as infrastructure, alternative care site planning, or staffing.

Another facet of the surge dilemma is the need for care providers to be able to provide adequate documentation and support to third-party payors. The requirement for fiscal responsibility extends to these entities so they can continue their mission in the maintenance of the healthcare system.

The goal of the Institute of Medicine (IOM) Forum on Medical and Public Health Preparedness for Catastrophic Events Financing Surge Capacity and Preparedness section is to "identify funding mechanisms that could be utilized to ensure effective and efficient medical surge capacity preparedness and response."[2]

PROJECTED SURGE IMPACT ISSUES

The effects of an acute or extended surge event on hospitals include numerous factors. Staffing may be compromised for a variety of reasons: ill employees, transit impacts, staff reticence to "bring something home," or a feeling of need to remain home with their families. Supplies (including pharmaceuticals and durable medical equipment) could be negatively affected due to supply chain interruptions, competing demands from all other providers, international transportation interruptions, or raw material shortages. Physical facilities may also be insufficient to support an influx of large numbers of injured or ill persons.

In the wake of Katrina the following access-to-service issues were identified:

- Closure of most acute care hospitals, including Charity Hospital
  - Loss of Level 1 Trauma, mental health beds, other specialty care
  - Open hospitals operating at reduced capacity, but almost full
- Open safety-net clinics decreased from 90 to 19

- Doctors and other health workforce relocated
- Pharmacies closed, including Charity's low-cost pharmacy
- Half of nursing homes closed
- 49 percent of New Orleans residents surveyed reported no usual place of care prior to storm; greater impacts later
- 27 percent were uninsured
- 18 percent reported mental health challenges[3]

An added detrimental effect on the profitability of the institutions, and hence, their ability to remain in operation as a support resource, is also projected. "HHS has advised hospitals in a pandemic to 'Defer elective admissions and procedures until local epidemic wanes,' freeing capacity for influenza patients."[4] Deferring higher profit surgical cases for lower margin flu cases will result in diminished revenues. In addition, issues relating to increased numbers of uninsured patients requiring care would surface. "Using U.S. pandemic planning assumptions and national data on healthcare costs and revenues, a 1918-like pandemic would cause U.S. hospitals to absorb a net loss of $3.9 billion, or an average $784,592 per hospital."[5]

DISCUSSION

The discussion of what key elements must be considered in future funding initiatives should be multipronged:

1. *Funding Use Restrictions*
   Current grant programs used by healthcare facilities to improve surge capacity include significant restrictions on the use of the funds. What is the process by which future grant guidelines should be evaluated in terms of the most efficacious use of these funds to promote true surge capacity enhancements?

2. *Partnerships on Reimbursement Strategies*
   The need for collaborative planning relating to disaster condition workable reimbursement strategies is great. The success of a health plan or other insurer in timely restoration of normal business operations relies on collaboration with "employees, vendors, health care providers, government agencies, and other community organizations."[6] Should public and private stakeholders be able to readily identify the approved courses of action

in designated emergencies so that the payor process continues in an uninterrupted manner?

3. *Regional Initiatives*
   As available monies for preparedness become more restricted, the need for cooperative regional uses of the funds becomes greater. To date, the bulk of preparedness support for hospitals to address surge capacity has been managed primarily at the local institutional or health-system level. Should future grant guidelines mandate the development of coordinated regional projects?

4. *Regulatory Activity*
   The U.S. House of Representatives Committee on Oversight and Government Reform conducted an analysis of U.S. hospital surge capacity compared to the post-bombing experience in Madrid in 2004. The report, titled *Hospital Emergency Surge Capacity: Not Ready for the 'Predictable Surprise*,' stated:

   > *After conducting the "snapshot" survey on March 25 at 4:30 p.m., the Committee staff sent follow-up questionnaires to the hospitals surveyed. Twenty-three of the hospitals responded to the questionnaire. Their responses indicate that the level of emergency care they can provide is likely to be further compromised by three new Medicaid regulations, the first of which takes effect on May 26, 2008. According to these hospitals, the new Medicaid regulations will reduce federal payments to their facilities by $623 million per year. If the states choose to withdraw their matching funds, the hospitals could face a reduction of about $1.2 billion. The hospitals told the Committee that these funding cuts will force them "to significantly reduce services" in the future and that "loss of resources of this magnitude inevitably will lead to curtailing of critical health care safety net services such as emergency, trauma, burn, HIV/AIDS, neonatology, asthma care, diabetes care, and many others.*[7]

What are the regulatory efforts that could assist in improvement of institutions' pre-incident preparation for catastrophic events and ensure viability after the incident?

5. *Recovery Strategies*
   A piece of the emergency surge continuum that has not been addressed adequately in funding strategies to date is the formalization of recovery efforts. Returning the healthcare system to "green" status is vital to the restoration of public health support. Should emphasis on investment in the recovery processes for hospitals and insurers be part of future funding considerations?

6. *Gap Analyses and Measurement*
   The ability to conduct gap analyses of the current versus desired states of surge capacity funding may dictate that some sort of "metrics of preparedness" be developed. What are the best metrics to assess surge success: regulatory compliance, exercise performance, other elements?

CONCLUSION

Today's financial realities are clearly reflected in the healthcare sector. Investment in surge capacity as a "what if" hedge is increasingly weighed as a lesser priority in the face of other difficult decisions impinging on the day-to-day solvency of the institutions. The growing time lapse since the most recent September 11–like event has also promoted an "it can't happen again" attitude. The work of groups like the IOM in formulating policy discussions on fiscally responsible ways to address the issue of surge capacity in health care is vital to the ability of the healthcare system to face future threats, both natural and from humans.

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