

Enhancing Hospital Surge Capacity for Mass Casualty Events

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TWO DAYS AFTER THE 2008 PRESIDENTIAL ELECTION, the Government Accountability Office identified 13 “urgent issues” President-elect Obama and the 111th Congress should address during the transition period and first year of the new administration. One of the issues, preparing for large-scale health emergencies, is particularly relevant to the US health care system. The Government Accountability Office posted on its Web site the following statement:

Many states have used the [US Department of Health and Human Services] hospital preparedness funds in their efforts to improve the surge capacity of the nation's health care systems . . . Federal agencies, however, continue to face challenges in working with one another and with state and local governments, private organizations, and international partners to [among other things] . . . marshal the resources required for an effective public health response, such as developing health system surge capacity to handle large numbers of casualties.¹

Prior to September 11, 2001, hospital surge capacity received little attention. Since then, substantial resources have been devoted to the problem. Between 2002 and 2008, the federal government spent more than \$8 billion on hospital and public health preparedness.² The most attention has been focused on preparing for bioterrorist attacks and pandemic influenza, events expected to generate a progressive surge of patients over days to weeks.^{2,3} In contrast, preparedness for sudden mass casualty events, such as large-scale terrorist bombings, has received little attention.^{4,5} Because casualties of sudden mass casualty events often have complex injuries, they place unique demands on hospitals.⁵

Disturbing signs show that surge capacity has diminished since September 11, 2001, despite assurances from governmental and nongovernmental officials that hospitals can quickly ramp up capacity in response to a mass casualty event.^{3,6} In 2006, the Institute of Medicine released a 3-volume report on the future of emergency care in the US health system.⁶⁻⁸ Numerous problems were identified, including extensive emergency department (ED) crowding, widespread boarding of admitted patients in ED hallways, frequent episodes of ambulance diversion, and declining numbers of subspecialists willing to take ED or trauma call. All of these problems have eroded hospital surge capacity.^{3,6,7}

In spring 2008, the House Committee on Oversight and Government Reform conducted a point-in-time survey of level I trauma centers in 7 US cities considered at high risk of terrorist attack.⁹ On the date of the survey, responding hospitals were so overcrowded with patients, it is unlikely that they could handle an incident of the scale of the Madrid train bombings, which produced 2000 casualties in a matter of minutes.^{6,9}

Because it is difficult to prepare for a sudden mass casualty event, it may be instructive to consider how another country meets this challenge. Hospitals in Israel resemble US hospitals in technical sophistication, staffing, and occupancy. But unlike US hospitals, they are constantly prepared to accept a sudden surge of casualties. To maintain this degree of readiness without compromising day-to-day operations, Israel's Ministry of Health has developed a practical doctrine for enhancing system surge capacity, based on the following principles:

1. Nationally coordinate resources. To ensure that any large-scale challenge is met from a national point of view, planning and coordination are handled by Israel's National Supreme Health Authority. This body of government, which is chaired by the Director General of the Ministry of Health and includes the Surgeon General of the Israel Defense Forces and the Director General of the country's largest Sick Fund, defines and enforces the nation's health policies for disasters and mass casualty events. No office in the US government has comparable statutory and enforcement authority, but the US Department of Health and Human Services' Office of the Assistant Secretary for Preparedness and Response is broadly responsible for strengthening the nation's medical preparedness. Because Israel has no military hospitals, the nation's general hospitals treat both civilian and military casualties. To ensure that sufficient equipment and supplies are immediately at hand, stockpiles are prepositioned at each hospital and some national distribution centers.

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2. Establish goals. The first priority is to determine the number of patients each hospital must be prepared to receive and treat during the initial hours of a mass casualty event. This estimate gives planners an explicit goal. The Ministry of Health decreed that every general hospital must be capable of handling a surge of casualties equal to 20% of its usual bed capacity.¹⁰

3. Prepare standard operating procedures. All hospitals have standard operating procedures and checklists for various mass casualty events. They are based on a national doctrine written by the Ministry of Health. The standard operating procedures call for immediate reinforcement of personnel using internal and external call-up systems. Each hospital appoints leaders who are responsible for preparing the staff to manage various mass casualty events.

4. Constantly monitor surge capacity. Using a standard format, hospitals file a daily report with the Ministry of Health. It lists inpatient and intensive care unit occupancy rates by specialty, the hospital's overall bed capacity, and the number of patients receiving ventilator support out of the intensive care unit.

5. Design expandable facilities. Many hospitals are designed to quickly expand capacity in the event of a mass casualty event. For example, some have installed oxygen and power lines along interior corridors and other spaces not ordinarily used for patient care.

6. Avoid ED crowding. Standard practice is to preserve access to emergency care by promptly moving admitted patients from the ED, regardless of hospital occupancy. If an ED patient requires admission but no inpatient bed is available, the patient is usually placed in a temporary space on the wards until a bed is secured.

7. Promptly clear EDs to accommodate incoming casualties. Emergency medical services (EMS) operations are coordinated by national and regional command and control centers. These centers are linked to every hospital in Israel by radio, backed up by dedicated land lines that can be activated in the event of a communications failure. When a mass casualty event occurs, the command and control center notifies the hospitals closest to the event to prepare to receive casualties. Emergency department patients who need admission are promptly moved to inpatient units, and those who are stable enough to be discharged go home. Typically, an ED can be largely cleared of patients within 15 minutes.

8. Reinforce medical workforce. Nonemergency physicians and other health care personnel report to a staging area next to the ED. Once there, they are deployed to various tasks by the hospital's designated mass casualty event manager.

9. Designate an adjoining site to treat patients with minor injuries. Patients with minor injuries and those who are psychologically traumatized invariably self-evacuate to the closest hospital. To expeditiously manage these cases, most hospitals open a temporary walk-in clinic in close proximity to the ED.

10. Distribute severely injured casualties among several hospitals. To prevent the nearest trauma center from being overwhelmed, EMS teams usually transport casualties to several nearby hospitals. The ranking EMS supervisor on scene prioritizes casualties for transport, and the EMS command and control center distributes them based on type and severity of injuries.¹¹ If the scale of the event or its remote location requires secondary evacuation of casualties, the Home Front Command coordinates this process.

11. Assign an EMS liaison to each receiving hospital. At the outset of the mass casualty event, EMS sends a liaison to each hospital that will receive casualties. This individual keeps the hospital's leadership informed of the approximate number, type, and anticipated arrival of casualties and updates the EMS command and control center regarding the hospital's capacity to accept additional patients. This procedure facilitates the distribution of casualties.

12. Designate a triage hospital. If the number of casualties overwhelms the resources of the closest hospital, it stops functioning as an admitting hospital and converts to a triage hospital. When this change occurs, the staff shift from providing definitive care to stabilizing patients for transfer to more distant facilities.¹²

13. Frequently conduct rigorous, full-scale drills. Every hospital is required to annually conduct a full-scale mass casualty event exercise. The Ministry of Health determines the scope, type (conventional, chemical, or biological), and timing of all exercises.¹³ Approximately half of these exercises involve conventional scenarios, such as a bombing or structural collapse; the other half addresses a wider range of threats, including weapons of mass destruction (WMD). To ensure that each drill is rigorously assessed, evaluators are drawn from a different hospital. After each drill, the Ministry of Health conducts an after-action review with personnel from both hospitals. In addition to staging annual drills, hospitals frequently conduct table-top simulations.

14. Continually maintain surge capacity. These principles herein, characteristic of Israeli hospitals, are widely endorsed by disaster medicine authorities but are inconsistently applied in the United States. This difference may be in part due to cultural and economic barriers. In contrast to Israel, the large and diverse US health care system hinders adoption of standard approaches to the management of a mass casualty event. Every Israeli has health insurance; therefore, hospitals have no incentive to favor elective admissions over emergency cases. In the United States, differing levels of reimbursement for emergency vs elective admissions are thought to contribute to ED crowding.^{3,6} Israel's Ministry of Health mandates that every general hospital maintain sufficient surge capacity, and it has the legal authority to verify compliance. In the United States, hospital preparedness is primarily voluntary.

Both nations embrace disaster preparedness, but differ in emphasis. Since the anthrax attacks of 2001, the United States has primarily focused its efforts on WMD, particularly bio-

terrorism. Other threats have received less attention.^{5,6,14} Israel's doctrine for mass casualty event preparedness and response emphasizes preparedness for conventional terrorism and natural disasters, particularly earthquakes. Preparedness for WMD is layered atop this basic approach.

Hospital operations differ as well. In many US hospitals, admitted patients are held in the ED until a vacant bed is unavailable. This practice contributes to ED crowding and ambulance diversions.^{3,6} Israeli hospitals strive to keep their EDs open and accessible. As a result, ambulance diversions are rare.

In US hospitals, information sharing is hindered by competitive concerns.⁶ Some communities have established local health information exchanges, but most have not.¹⁵ The US government operates national emergency operations centers at the Centers for Disease Control and Prevention, the Department of Homeland Security, and the Department of Health and Human Services, but none of them monitor levels of hospital surge capacity or EMS diversion. In Israel, hospitals freely share information with each other and the Ministry of Health. Differing levels of concern about preparedness may partially explain observed differences in approach. Israel has long embraced a culture of preparedness. In such a small country (population 7.2 million), mass casualty events—whether caused by terrorism or a natural disaster—are shared events. As a result, everyone is ready to do his or her part.

Israel's experience in preparedness and response shows that it is possible to maintain surge capacity for sudden mass casualty events without compromising a hospital's daily operations. Certain practices, such as promptly transferring emergency admissions to inpatient units, improve efficiency and promote patient safety.⁶ Measures like these may work equally well in the United States.

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