

Perspective

What Hospitals Should Do to Prepare for an Influenza Pandemic

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This article offers recommendations on what hospitals should do to prepare for an influenza pandemic and proposes specific actions and priorities for the purpose of making the discussion of hospital pandemic preparedness issues more operationally useful.

THE PURPOSE OF THIS ARTICLE is to offer to American hospital administrators and clinicians specific judgment on what hospitals should do to prepare for an influenza pandemic. These recommendations derive from the authors' analysis of the consequences of a flu pandemic, review of many existing hospital plans, analysis of the federal government's recommendations, and meetings with input and feedback from a number of leaders in health care, public health, and emergency management.¹ Recognizing that any such recommendations must be based on numerous untestable assumptions, any of which can be reasonably challenged, we propose specific actions and priorities for the purpose of making the discussion of hospital pandemic preparedness issues more operationally useful.

BACKGROUND

The Argument for Preparedness

Thirty influenza pandemics have occurred in the past 400 years—three in the past century. There is consensus that the next pandemic is not far off. The threat of an influenza pandemic has caused worldwide concern and stimulated international, national, and local planning and preparedness efforts. Without adequate supplies of an ef-

fective vaccine, most planning has focused on how to contain a pandemic at its source and limit or slow its spread in a community. But these containment measures will likely be of only limited usefulness in an influenza pandemic where disease may be spread by people even before they have symptoms. In the event of a 1918-scale flu pandemic, hospitals would be flooded with sick patients seeking care.

The impact of an influenza pandemic on hospitals is expected to be severe in the best of circumstances. Currently, U.S. hospitals routinely operate at or near full capacity and have limited ability to rapidly increase services. There are shortages of healthcare workers of all kinds. Emergency departments are overcrowded and often have to divert patients to other hospitals. In recent years, there has been a reduction in the overall number of hospitals, hospital beds, and emergency rooms.

During an epidemic, the healthcare work force would be greatly reduced. Healthcare workers would face a high risk of infection because of contact with infected patients, and, in the absence of vaccine, they might fear coming to work lest they bring a lethal infection home to their families. Many would need to stay home to care for sick children or relatives. The provision of medical services to non-flu patients would be adversely affected in most communities.

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TABLE 1. HHS PANDEMIC PLANNING ASSUMPTIONS

| <i>Moderate scenario (1968-like)</i> | <i>Severe scenario (1918-like)</i> |
|--------------------------------------|------------------------------------|
| 90 million sick | 90 million sick |
| 45 million needing medical care | 45 million needing medical care |
| 865,000 hospitalizations | 9.9 million hospitalizations |
| 129,000 needing ICU | 1.5 million needing ICU |
| 65,000 ventilators | 743,000 ventilators |
| 209,000 deaths | 1.9 million deaths |

The U.S. Department of Health and Human Services (HHS) has released two sets of official planning assumptions for pandemic influenza, one based on a mild to moderate pandemic like 1968 or 1957, and one based on a severe pandemic like 1918.² Both sets of assumptions include 90 million Americans becoming infected and 45 million requiring medical care, but they differ by more than tenfold in the number expected to need hospitalization, intensive care, and mechanical ventilation (Table 1).

The Centers for Disease Control and Prevention (CDC) has released FluSurge, a software program used to calculate the impact of a pandemic on hospitals. Using FluSurge 2.0 and inputting variables from the HHS planning assumptions results in projections that indicate that hospitals would be severely stressed in the best case scenario and completely overwhelmed in the case of a severe pandemic (Table 2).

Preparedness Defined

Based on such calculations, it would seem that preparing for a pandemic of even moderate severity is a difficult challenge. For the purpose of this analysis we use the following definition of preparedness:

Every hospital, in collaboration with other hospitals and with public health agencies, will be able to provide appropriate care to flu victims requiring hospitalization while maintaining other essential medical services in the community, both during and after a pandemic.

This definition recognizes that what constitutes “appropriate care” and the criteria for hospital admission may well change during a pandemic.

Existing HHS Guidelines

HHS has issued guidelines and a checklist for hospital planning as part of its *Pandemic Influenza Plan*.² While the hospital checklist is quite comprehensive, it lacks prioritization and specificity in some key areas (e.g., how to calculate inpatient surge demands). To implement all the items on the checklist would be an enormous and very expensive undertaking. The lack of specificity also leaves open the likelihood of various regions, and various hospitals within the same region, preparing for very different contingencies. Without detailed guidelines leading to some degree of uniformity of preparedness efforts, hospital leaders have been reluctant to commit the resources necessary to prepare realistically for a severe pandemic. To address these concerns, we suggest the following priorities and actions.

THE TOP PRIORITIES

Individual hospitals and groups of hospitals involved in regional coordination of pandemic preparedness should initially focus their efforts in the following priority areas:

TABLE 2. FLUSURGE PROJECTION OF AVERAGE IMPACT ON HOSPITALS

| <i>Moderate scenario (1968-like)</i> | <i>Severe scenario (1918-like)</i> |
|--------------------------------------|------------------------------------|
| 19% of non-ICU beds | 191% of non-ICU beds |
| 46% of ICU beds | 461% of ICU beds |
| 20% of ventilators | 198% of ventilators |

Note: Derived using FluSurge 2.0 with national population statistics, 750,000 non-ICU beds, 90,000 ICU beds, 105,000 ventilators, an 8-week duration, a 25% attack rate, and accepting the other default assumptions (1968 based). For a severe pandemic, the assumed number of hospitalizations was changed from 992,000 to 9.9 million to correspond with the HHS planning assumptions.

1. **Comprehensive and realistic planning** based on actual HHS FluSurge projections within each hospital, and collaborative planning among all hospitals in a region;
2. **Limiting the nosocomial spread of the virus** to: (a) protect the healthcare workers and thus maintain a sufficient hospital workforce, (b) prevent the hospital from being a disease amplifier, and (c) protect the non-flu patients from infection, so as to maintain the ability to provide essential non-flu health care.
3. **Maintaining, augmenting, and stretching the hospital workforce;** and
4. **Allocating limited healthcare resources** in a rational, ethical, and organized way to do the greatest good for the greatest number of people.

SPECIFIC ACTIONS

To implement the priority goals above, hospitals should undertake the specific actions described below.

Comprehensive and Realistic Planning

To achieve comprehensive and realistic planning for pandemic influenza, hospitals should:

- Employ a full-time disaster coordinator in each hospital.
- Create a pandemic preparedness committee (or use an existing disaster preparedness committee) that includes representatives of all clinical and support departments as well as senior administration.
- Participate in a regional hospital coordinating group that includes neighboring hospitals, local public health officials, and emergency management personnel. Create mutual aid memoranda of understanding. If your hospital is already a member of a multihospital health system, integrate systemwide planning with local planning with other local hospitals.
- Use the CDC's FluSurge 2.0 and HHS planning assumptions to guide planning for both a moderate and a severe pandemic. Note that the default assumptions in FluSurge are based on a 1968-like pandemic. To model a severe pandemic, FluSurge allows the assumed number of hospitalizations to be modified to correspond to the HHS planning assumptions for a severe pandemic (see Table 2).
- Be able to make 30% of licensed bed capacity available for flu patients on 1 week's notice. About 10–20% of a hospital's bed capacity can be mobilized within a few hours by expediting discharges, using discharge holding areas, converting single rooms to double rooms, and opening closed areas, provided staff is available. Another 10% can be made available within a few days

by the conversion of “flat spaces,” such as lobbies, waiting areas, and classrooms.³

- Collaborate in regional plans to be able to make 200% of licensed bed capacity in the region available for flu patients on 2 weeks' notice. This is the number of beds that would be necessary to accommodate the surge of patients predicted for a severe 1918-like scenario according to FluSurge software and HHS planning assumptions (see Table 2).

Limiting the Nosocomial Spread of the Virus

To limit the nosocomial spread of the virus during an influenza pandemic, hospitals should:

- Limit accidental droplet contamination of the hospital environment by implementing respiratory etiquette and by having everyone entering the facility (staff, patients, and visitors) use simple surgical masks. Assuming that resupply may be difficult during a pandemic, hospitals should stockpile enough masks for 3 weeks.
- Prevent staff involved in direct patient care from getting infected by training healthcare workers on the use of personal protective equipment (PPE) and infection control procedures. Fit-tested N95 respirators should be used in aerosol-generating procedures, in cardiopulmonary resuscitation, and in situations that call for repeated direct contact with patients with influenza or pneumonia, and it is prudent to use them for other direct patient care activities. Shortages of N95 masks should be anticipated, so they should be stockpiled and their use monitored in real time. If no other masks are available, surgical masks, which will provide droplet protection, should be used.³ Powered air purifying respirators (PAPRs) should be available for use in high-risk aerosol-generating procedures.
- Limit the number of staff who are exposed to flu patients by assigning them to a “cohort”—that is, grouping patients by the likelihood that they have flu and assigning staff dedicated to each patient group (Figure 1). Use overtime and long shifts for staff in the flu units to limit the number of staff needed. When possible, use staff who are immune (vaccinated or recovered) in the flu units. Personnel who are infected with influenza but who are on treatment and feel well enough to work could be used in the flu units as well.
- Prevent infected staff from working (except with flu patients) by tracking staff who are sick and testing for flu and keeping a log of staff who have had confirmed flu or have been vaccinated.

The Hospital Workforce

To maintain, augment, and stretch the hospital workforce in the event of an influenza pandemic, hospitals should:

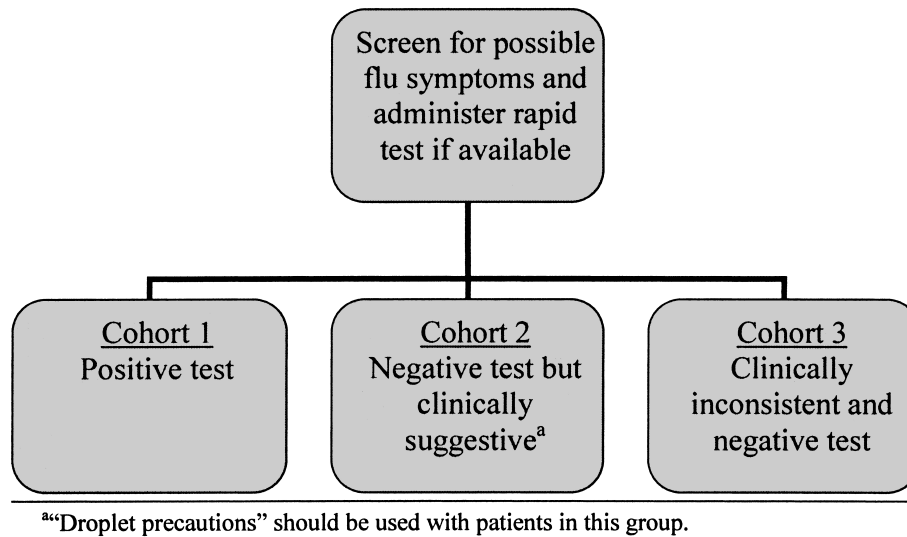


FIGURE 1. SEPARATING PATIENTS INTO COHORTS

- Minimize the duration of illness in staff by making rapid testing (if available and reliable) for influenza available to staff 24/7 and initiating antiviral treatment within 6 hours after onset of symptoms.
- Using screened volunteers, organize in-home childcare for well children of healthcare workers if schools are closed.
- Provide medical daycare for sick family members.
- Allay fear through open, honest, and transparent planning and careful training.
- Shift clinical staff to highest need areas from areas that may be closed or quiet, employing “just in time” education (i.e., training staff “on the job” in new procedures) and “buddy teaming” (pairing staff new to an area with more experienced staff).
- Augment clinical staff with nontraditional personnel, employing “just in time” education and “buddy teaming.” These groups could include medical professionals

- with prior clinical experience (e.g., administrators, researchers, retired clinicians), health professionals in related fields (e.g., dentists, veterinarians, emergency medical technicians), nonclinical hospital personnel, and nonclinical outside personnel. Specific training and operating procedures for each group must be created in advance.
- Coordinate with other hospitals in the region on plans to recruit and use volunteers.

Allocating Limited Resources

Hospitals will need to allocate limited healthcare resources in a rational, ethical, and organized way so as to do the greatest good for the greatest number of people. This can be done by deferring nonemergency care and, if necessary, instituting alternative patient care routines. Hospitals should:

FIGURE 2. ESTIMATE OF THE COST OF HOSPITAL PREPAREDNESS

The average hospital (164 beds) will require an initial infusion of approximately \$1 million for minimal preparedness.

Component costs to achieve minimal preparedness:

| | |
|----------------------------------|--------------------------|
| • Develop specific pandemic plan | \$ 200,000 |
| • Staff education/training | \$ 160,000 |
| • Stockpile minimal PPE | \$ 400,000 |
| • Stockpile basic supplies | \$ 240,000 |
| | <hr/> |
| | \$1,000,000 per hospital |

- Prioritize which services and types of procedures can be deferred, for how long, and with what consequences, and create an alternative plan for patients who will be deferred. Create a process for refining and updating this plan as circumstances change. Create a process to track patients whose services have been deferred.
- Plan for the smooth alteration of patient care routines. In a severe pandemic, not all patients in need of intensive care will be able to be accommodated in the ICU. Normal staffing ratios and standard operating procedures will not be able to be maintained.
- Plan for alternative sites to provide ICU-like care within the hospital, such as the catheterization lab, catheterization recovery, operating rooms, the post-anesthesia care unit, or the endoscopy unit.
- Acknowledge that alterations in normal care routines will be justified when those routines cannot be maintained despite the use of all available resources including mutual aid arrangements. The legal and ethical frameworks for these decisions should be considered well in advance of a crisis. Alterations in hospital policy and procedures should be implemented by an active decision of the hospital leadership in consultation with the medical staff and civil authorities.
- Create criteria and clinical guidelines for use (or denial) of resource-intensive services (e.g., admission, mechanical ventilation, invasive monitoring) based on national guidelines, such as those now being developed by the Agency for Healthcare Research and Quality,⁴ in regional collaboration with other hospitals.
- Establish a process for triage of patients who are competing for limited resources, including admission, early discharge, and life support. These decisions should not be made by one person. The criteria used to make these decisions should be created in advance and formally sanctioned by the medical staff and hospital administration.
- Anticipating supply and pharmaceutical needs; and
- Planning excess morgue capacity.

FUNDING FOR HOSPITAL PREPAREDNESS

The cost of implementing the actions we have described is substantial. We estimate the cost to be \$1 million for an average-sized hospital and much more for large institutions (Figure 2). However, the largest portion of this cost is for stockpiling PPE.

The federal government, states, and individual institutions all have a significant stake in hospitals being prepared, and all should share in the burden of paying for it. The federal government has appropriated funds for hospital preparedness through the Health Resources and Service Administration's (HRSA) National Bioterrorism Hospital Preparedness Program (NBHPP). This program, which provides an average of approximately \$100,000 per year per hospital, was not originally intended to be used for pandemic preparedness, but the preparedness goals have been modified to include pandemics. States are another potential source of funding for these efforts, but so far we are aware of no state that has stepped in to fully meet this need.

HOW TO PROCEED

In the meantime, hospitals should not delay. Decision makers at all levels—including hospital CEOs and their boards and state and federal officials—should consider these issues and plan how to proceed. Several of the high-priority items—comprehensive and collaborative planning, discussing allocation of scarce resources, and planning education and training—are relatively inexpensive, but they do take substantial time. Hospitals should begin these actions now and consider using their NBHPP funds to partially support these activities.

States should fund the creation and operation of regional hospital groups, including the cost of hospital participation. The federal government, in collaboration with the states, should address the issue of ensuring an adequate supply of personal protective equipment.

In the event of a pandemic, the predictable costs of not preparing, in human, societal, and political terms, will be huge.

OTHER ACTIONS

In addition to the priority actions listed above, a number of other items outlined in the HHS checklist would significantly add to hospital readiness. Hospitals should consider:

- Improving hospital surveillance;
- Planning internal and external communications;
- Developing education and training;
- Expanding occupational health;
- Implementing a process to assure appropriate use of limited antivirals and vaccines;

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