Planning for the Inevitable: Preparing for Epidemic and Pandemic Respiratory Illness in the Shadow of H1N1 Influenza

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The recent outbreak of novel H1N1 influenza has underscored the importance of hospital preparedness in responding to epidemic and pandemic respiratory illness. Comprehensive planning for the emergence of novel respiratory pathogens should be based on an all-hazards approach, with the input of key stakeholders. A staged, scalable model allows for a flexible response, and the addition of a medical control chief and a situational assessment chief to the incident command system provides the clinical and epidemiologic expertise essential for effective implementation. Strategies for coordinated and efficient communication both within and outside the institution should be clearly outlined. Furthermore, the outbreak of novel H1N1 influenza demonstrated the necessity of (1) additional support roles within the hospital, (2) development of employee databases, and (3) incorporation of disease severity into staged planning. Careful consideration of these issues will allow institutions to better meet the challenges of treating epidemic and pandemic respiratory illness, both now and in the future.

Since 11 September 2001 and the 2003 severe acute respiratory syndrome (SARS) outbreak, the health care and public policy communities have extensively discussed the importance of disaster planning. Significant steps have been taken by national and international health care organizations to prepare for the burden on health systems that such events might pose [1]. The 2009 H1N1 influenza outbreak has underscored the importance of preparedness at the hospital level. Some hospitals have effectively integrated the infection prevention and disaster planning lessons learned from SARS and previous influenza pandemics. However, experts continue to worry that other novel respiratory pathogens may spread in an explosive fashion in health care settings, taxing an already stressed infrastructure. Data from the early 2009 H1N1 influenza response confirm that the concern for risk in health care settings is warranted. In one report, the Centers for Disease Control and Prevention noted that 50% of health care personnel with documented H1N1 infections were infected in a health care setting [2]. Furthermore, expert estimates regarding the expected volume of patients in a pandemic [3], although variable, highlight the need for plans that incorporate measures to (1) provide quality care to affected patients, (2) protect patients and health care personnel from health care–associated infection, and (3) maintain continuity of core operations in the face of epidemic and pandemic respiratory illness (EPRI). Few resources are available, however, to guide hospital EPRI planning efforts, and early experiences in the 2009 H1N1 influenza outbreak highlighted key planning issues that had previously been inadequately addressed. Herein, we offer an approach to hospital EPRI response planning that incorporates lessons learned in the initial response to 2009 H1N1 influenza. We review the all-hazards model for disaster planning, discuss unique issues in EPRI readiness, and offer tools for effective EPRI response.

ESTABLISHING A FRAMEWORK: THE ALL-HAZARDS APPROACH

Disaster planning best practices dictate that an all-hazards approach provides the strongest basis for a functional institutional response to critical events [4]. All-hazards planning is based on the concept that most disaster-response functions are common to all disaster types, and unified planning provides the

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strongest basis for effective response. As hospital disaster planners develop comprehensive approaches to threats to infrastructure and ongoing clinical operations, all-hazards planning using the Incident Command System (ICS), developed as part of the National Incident Management System [5], provides a common framework that is easily interpretable across institutions and departments. An example of an ICS adapted for EPRI to include critical infection control resources is shown in Figure 1.

MODIFICATION OF THE ALL-HAZARDS APPROACH FOR EPRI PLANNING

Use of the ICS for EPRI response provides the most effective use of health care epidemiologic data and infectious disease resources. However, EPRI requires planners to explicitly address several problems unique to outbreaks of pathogens that are efficiently transmitted from person to person. An outbreak of a pathogen with the potential for propagation (eg, SARS or novel influenza) requires different mitigation strategies than a single-source bioterrorism event, such as release of anthrax spores. Comprehensive EPRI plans must therefore address the following:

1. Screening, surveillance, and tracking of exposed individuals
2. Controlled hospital access
3. Prevention strategies
   A. Isolation and cohorting
   B. Personal protective equipment use
   C. Vaccination
   D. Antiviral prophylaxis
   E. Modification of environmental controls
4. Disease-specific admission criteria, treatment, and triage algorithms
5. Continuity of limited clinical operations

Table 1 summarizes functions to be addressed, involved departments, and tools for executing effective responses. A comprehensive discussion of admission criteria and continuity of operations planning is beyond the scope of this article.

EPRI PLANNING: THE PROCESS

Engagement of stakeholders. To address unique EPRI issues and promote engagement and support for the alterations in hospital operations that may be necessary in pandemic response, the planning process must involve numerous stakeholders. Our planning efforts centered in the Department of Hospital Epidemiology and Infection Control (HEIC) and the Office of Emergency Management, but core leadership for the planning process will vary by institution. Key clinical departments, including medicine, pediatrics, obstetrics and gynecology, emergency medicine, microbiology, pharmacy, and occupational health, must be integrally involved in the planning process to ensure development of an effective response to a large-scale outbreak. In addition, psychiatry, social work, chaplaincy, and palliative care must be strategically involved because a prolonged EPRI outbreak may require major efforts in family education, grief and stress management, and compassionate

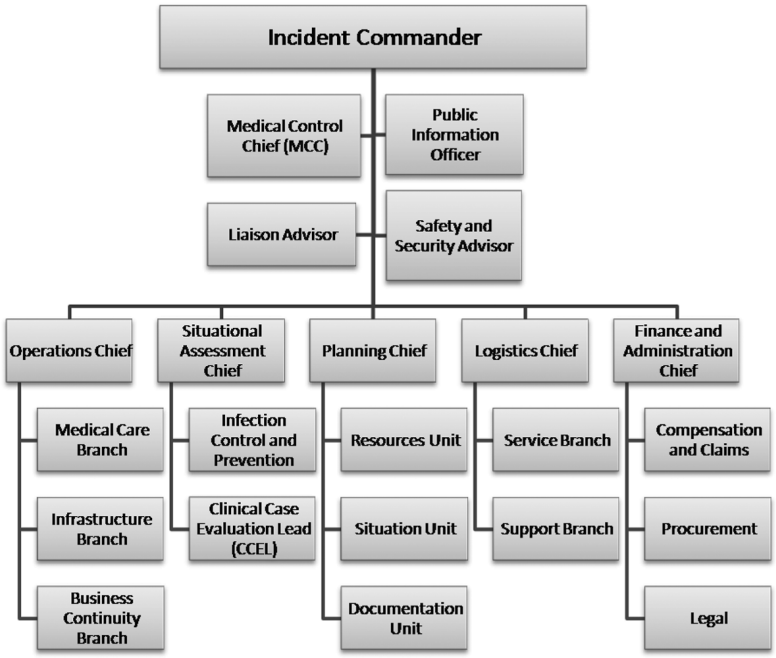


Figure 1. Example of an incident command system adapted for epidemic and pandemic respiratory illness to include critical infection control resources.

Table 1. Essential Epidemic and Pandemic Respiratory Illness Response Functions

Function	Departments involved	Tools
Screening and surveillance	1. Security 2. HEIC 3. OHS 4. Human Resources	1. Supplemental staffing strategy 2. Respiratory virus screening tool
Hospital access	1. Security 2. Emergency Medicine 3. Medicine/Infectious Diseases 4. HEIC	1. Hospital access control plan 2. Triage protocol
Prevention Strategies	1. HEIC 2. Infectious Diseases 3. OHS 4. Human Resources 5. Administration	1. Patient prioritization algorithm 2. Vaccine prioritization strategy 3. Vaccine and prophylaxis distribution plan

NOTE. HEIC, Hospital Epidemiology and Infection Control; OHS, Occupational Health Services; PPE, personal protective equipment.

care of patients who are too sick to save. Without question, administrative input from human resources, ethics, and legal affairs must be given high priority, as must security and environmental services. EPRI response planning is an iterative process and requires coordination of multiple parties. Some stakeholders, however, may be involved only at major decision points.

The overarching goal of hospital planning is to outline broad objectives and then encourage and empower departments to develop their own plans within key parameters, as dictated by infection prevention principles, ethical standards, and operational pragmatism. In Table 2, we outline suggested responsibilities for representative departments. Specific means to meet these objectives may be left to departmental planners.

Formulation of a staged approach. Once key stakeholders have been identified, the EPRI planning group should identify and review available planning resources. We relied on both bioterrorism response groundwork laid after 11 September 2001 and SARS planning at our institution, as well as input from colleagues from other health care facilities of similar size. The planning group agreed that an EPRI plan must be framed in a staged manner, as has been used by established health entities, such as the World Health Organization.

Staged, scalable plans must specifically address disease activity in and around the individual institution, knowledge about the epidemiology of the disease, and an understanding of vulnerable populations. The plan should provide specific, practical recommendations to health care professionals and should effectively empower infection control practitioners to contain the outbreak by all reasonable means. Our staged response was outlined to include specific direction in the following areas: (1) surveillance and screening, (2) hospital access and triage, and (3) infection control and prevention.

Much thought and planning for early response of novel respiratory pathogens has been shaped by the 2003 SARS experience. That outbreak was associated with a case fatality ratio of 9.6% [6]. However, 2009 H1N1 influenza has presented as a mild illness with low associated morbidity and mortality rates in most patients [7]. Given this low severity of disease, some stringent containment measures, such as mandatory daily symptom screening of all employees, may be more onerous and disruptive than beneficial.

The 2009 H1N1 pandemic demonstrated that response plans should include provisions for phased implementation based on both case location and severity of illness. As such, our initial 6-stage plan was expanded to 10 stages. In initial planning, stages were delineated by type of transmission, geographic location of cases, and nature of disease transmission at our facility. In the final plan, disease severity was included as a criterion for the various stages. The hospital epidemiologist was given the responsibility of determining severity, taking into account such variables as disease transmission patterns, morbidity, mortality, hospitalization rates, and availability of vaccine or treatment measures. To identify the stage at which the plan should be implemented, the geography and severity are plotted on the grid shown in Figure 2. For example, if EPRI cases were present within the surrounding area and the hospital epidemiologist determined the severity of the illness to be moderate, a stage 8 response would be implemented. An example of the detailed response plan for stage 8 is presented in Table 3.

Development of unique EPRI response leadership roles. Once a staged plan has been developed, decision makers must be identified and communication strategies defined. Furthermore, given that standard all-hazards planning requires some modifications for prolonged outbreaks, planning teams may find it prudent to outline specific additions to the standard ICS.

Our EPRI team chose to make 3 key modifications to the ICS: (1) addition of the medical control chief (MCC), (2) addition of the situational assessment chief (SAC), and (3) de-

Table 2. Epidemic and Pandemic Respiratory Illness (EPRI) Response Functions of Selected Departments

Department	Functional responsibilities
Hospital Epidemiology and Infection Control	1. Provide status reports at initial briefing, interval updates, and leadership meetings 2. Coordinate epidemiologic investigation activities and notify health department of cases 3. Appoint a clinical case evaluation lead and response documents coordinator 4. Determine and monitor implementation of isolation and cohorting strategies 5. Collaborate with pharmacy and antibiotic management to implement and monitor vaccination and/or chemoprophylaxis distribution 6. Develop recommendations for prophylaxis and treatment of patients and HCWs in conjunction with antibiotic management and infectious disease divisions
Medicine and Pediatrics	1. Implement management of triage level 4 and 5 febrile respiratory illness cases in specified area 2. Set up inpatient respiratory isolation unit or units as needed to care for admitted patients 3. Provide resident and attending physicians and nurses to staff emergency overflow area in outpatient medicine and pediatric clinics (for noncontagious patients) and inpatient unit(s) 4. Divisions of infectious diseases, adult and pediatric A. Assist with cohorting and isolation strategies as recommended by HEIC B. Arrange for transfer of triage level 4 and 5 patients from EDs to the appropriate clinical area and provide support staffing for level 4 and 5 EPRI clinic to be set up in reallocated space
Psychiatry	1. Establish services for EPRI-affected psychiatric patients presenting to EDs and outpatient clinics 2. Monitor health care team stress levels and implement appropriate intervention 3. Establish rest and recuperation areas for staff 4. Coordinate community crisis response efforts with faculty and staff counseling services, pastoral care, psychiatry, social work, and psychological first aid via faith communities 5. Provide staff emotional support, demobilization, and disaster counseling 6. Assist external triage ED area(s) to identify patients requiring only psychiatric care
Security	1. Open, prepare, and secure ICC, as directed 2. Implement controlled access to hospitals with closure of unmonitored entrances and tunnel access 3. Redirect visitors and staff to respective screening stations 4. Secure adult and pediatric EDs and close all hospital entrances not designated as screening areas 5. Secure family information center and prophylaxis and vaccination locations 6. Provide 2-way radios to ICC and key departments
Social Work	1. Establish and coordinate activities of the family information center 2. Establish rest and recuperation areas for staff in coordination with pastoral care and psychiatry 3. Facilitate emergency discharge planning with established facilities. 4. Along with pastoral care and psychiatry, provide patients and families with disaster counseling
Emergency Medicine	1. During stage 6 or higher, evacuate nonurgent, EPRI-negative patients when possible to ambulatory medical teams located at the designated alternative care areas 2. Set up and implement established procedures for level 1, 2, and 3 EPRI and AFRI cases 3. Maintain communication with ICC and MIEMSS Emergency Management Response Center
Occupational Health Services	1. Set up and maintain employee screening stations with OHS staff, reassigned staff, and volunteers 2. Supervise development of database with vaccination and prophylaxis profiles of employees and work assignments with human resources and forward reports to HEIC daily 3. Track employees who develop EPRI, record exposures to EPRI patients, order and follow up appropriate diagnostic testing, and dispense prophylaxis based on HEIC recommendations
Microbiology laboratory	1. Coordinate testing approval, specimen collection, and results interpretation with ID division and HEIC 2. Maintain specimen logs and ensure safety of laboratory environment 3. Secure separate area in contained zone to package microbiologic specimens per guidelines and to perform nonmicrobiologic testing

NOTE. ED, emergency department; HCWs, health care workers; HEIC, Department of Hospital Epidemiology and Infection Control; ICC, incident command center; ID, infectious disease; MIEMSS, Maryland Institute for Emergency Medical Services Systems; OHS, Occupational Health Services.

velopment of an expert advisory panel. The MCC reports directly to the incident commander (IC) and has responsibility for coordinating assignments and responsibilities of all medical faculty and house staff through the departmental directors in concert with the operations chief. The MCC is also responsible for coordinating and advising the IC on decisions regarding standards of care, allocation of scarce resources, triage and admission criteria, and physician staffing. The role of the MCC should be filled by a physician with knowledge and/or experience in the broad range of clinical and operational issues that must be integrated in a comprehensive plan.

Given the unique nature of EPRI events, our planning team strongly supported the need for real-time assessment of infection control risks, triage planning, and containment strategies by an infection control expert who could be continuously available within the ICS. For this reason, the role of the SAC was instituted. The hospital epidemiologist or his/her designee serves as the SAC and reports directly to the IC and the MCC on the outlook for the event and recommended isolation, treatment, and mitigation procedures. The SAC is responsible for decisions pertaining to prevention, control, and containment of infected or infectious patients and health care personnel. He/

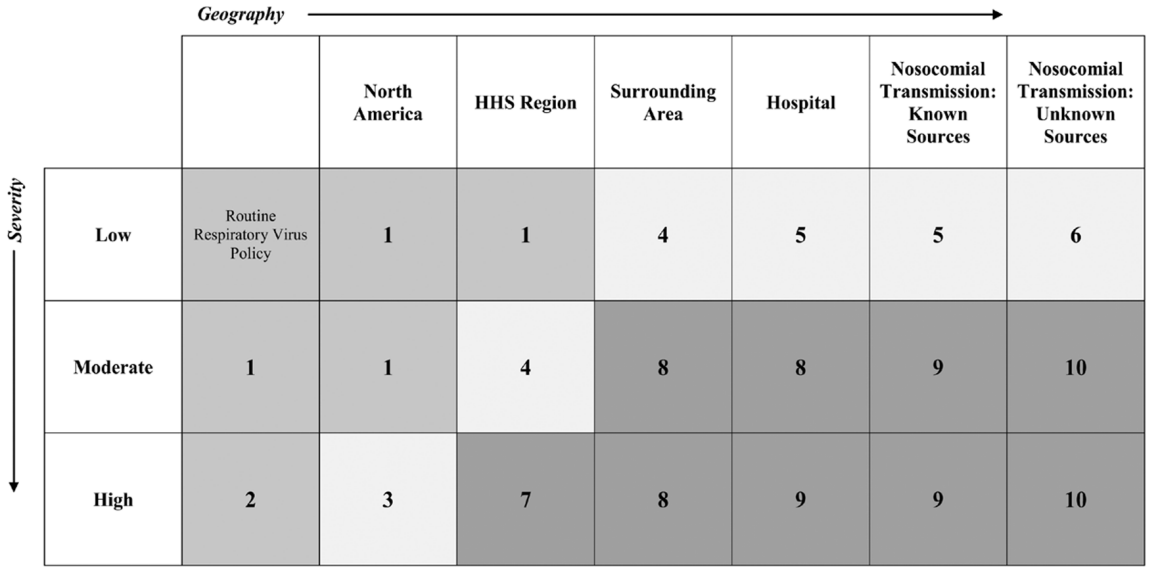


Figure 2. Example of an implementation grid for staged epidemic and pandemic respiratory illness response. The numbers in the grid correspond to epidemic and pandemic respiratory illness plan stages. The implementation stage is determined by the combination of geographic spread of disease and severity of the epidemic, as determined by the hospital epidemiologist. That determination is based on disease transmission patterns and associated morbidity, mortality, hospitalization rates, and availability of vaccine or treatment. HHS, United States Department of Health and Human Services.

she also directly oversees the antibiotic management program and the deployment of the infectious diseases staff in evaluation of EPRI patients. Furthermore, the SAC, along with the IC and MCC, is responsible for making decisions regarding initiating escalating stages of plan implementation. Decisions are generally made by consensus among this group, but in the case of a disagreement, ultimate authority rests in the hands of the IC.

Finally, to capitalize on the expertise in a large academic institution, an advisory panel should be developed to provide input in real time during biologic disasters. The aim is to establish a comprehensive inventory of local intellectual resources that might be brought to bear on complex clinical and operational challenges, recognizing that such input will be invaluable in handling both incidents of unusual magnitude and those resulting from novel pathogens.

Clarification of communication strategies. After defining key leadership functions, core communication strategies should be delineated. Much communication will follow ICS guidelines, but given the nature of EPRI events, delineation of certain communication functions may be beneficial. For example, once entering a stage in which a significant EPRI threat is present in the region, our plan dictates that an incident command center be opened and initial briefing of core hospital leadership be conducted by the IC, MCC, and hospital epidemiologist or designated SAC.

Disaster communications strategies must be carefully coordinated to avoid mixed messages or delays in dissemination of information. In addition, provisions must be made for efficient communication among key leaders. At our institution, the SAC representing HEIC will serve as the direct contact for city, state, and federal public health officials. In all stages of the plan, HEIC staff is responsible for reporting EPRI among patients or employees to the local health departments per established guidelines, including exposure tracking. All information communicated to and received from the health departments should be transmitted in real time to the IC, incident command public information officer, and health system critical events coordinating office so that it may be disseminated across the health system in a timely and consistent fashion.

Redundant communication is essential for ensuring rapid dissemination of key messages. Redundant internal communication systems should be coordinated through the incident command public information officer and institutional communications office and may include informational Web pages, e-mail alerts, posters, communication monitors located throughout the hospital, and group educational updates, when they are deemed safe on the basis of available infection control guidance. Redundant external communications may include Web sites, telephone hotlines, and regular press briefings. External communications should also be coordinated with the incident command public information officer but may alternatively be disseminated through a central health system critical event coordinating office.

Tools for implementation. To augment the directives of the

Table 3. Example of Detailed Stage 8 Response

Surveillance, screening, access, and triage		
Surveillance and screening	Hospital access and triage	Infection control and prevention measures
• All persons entering the hospital will be screened at entrances. • Patients: Patients who are identified with symptoms should be instructed to don a surgical mask, use alcohol hand rub, and go to a designated evaluation location. Visitors who are identified with symptoms will be asked to leave campus unless they require hospitalization, in which case they should be referred to the appropriate evaluation location. • After evaluation, no one who has symptoms will be allowed to remain on campus unless the person requires hospitalization. The name, telephone number, and address of all patients sent home with suspected EPRI should be reported to HEIC. • For patients requiring hospitalization with suspected EPRI, the HEIC on-call practitioner or CCEL should be paged immediately. • Patients calling for same-day appointments and those being contacted with appointment reminders will be screened for AFRI by telephone. Patients who screen positive for AFRI symptoms will be telephone triaged to a clinician who can further screen for EPRI risk factors and determine the need for additional evaluation. • Employees: All students, employees, volunteers, and faculty with symptoms will be considered possible cases. Employees will be screened at entrances, and any employee identified with symptoms should be instructed to don a surgical mask, use alcohol hand rub, and go to a designated evaluation area. If at home, they should call OHS for evaluation before reporting for work. If they develop symptoms at work, they should call OHS and be instructed where to report for evaluation. After evaluation, no staff with AFRI or other suspicious viral syndrome will be allowed to remain on campus unless the person requires hospitalization. OHS will maintain a list of evaluated staff and students and update HEIC on a daily basis. • Testing: All patients and employees with AFRI or other suspicious viral syndrome should have appropriate specimens obtained for testing, regardless of epidemiologic risk.	• Security will control hospital access and require strict photographic identification checks and proof of screening of all individuals entering the hospital. Only hospital entrances with adequate security and health screening personnel will be open for use by patients and employees. Security and support personnel will be provided with a means to identify those individuals who have been screened. • Hand hygiene will be required on hospital entry. Universal masking of patients entering the hospital may be instituted at the discretion of HEIC. Entrance to the hospital will be restricted to employees with valid identification, patients with appointments, 1 adult accompanying a patient, or 1 parent of a hospitalized child. Patients, employees, and visitors who screen positive will be denied entrance and directed to the appropriate location for evaluation. Nonessential employees or employees that can telecommute may be asked to work off-site. • Signs will be posted at the main hospital entrances to alert everyone to the symptoms of EPRI and its prevention. Respiratory etiquette will be encouraged for all patients, visitors, and staff. • Hand hygiene will be encouraged, and alcohol hand rub, surgical masks, and tissues will be provided throughout all public areas, as well as the ED and outpatient waiting and registration areas. • Concerned family members should be directed to the family information center to be set up in a designated location. • For pediatric patients, hospital visitation will be limited to 1 adult visitor per child and no more than 3 total visitors for the duration of the hospital stay. Each adult visitor to a sick child must have a completed security authorization obtained from the family information center. This individual must be screened for EPRI before entering the hospital. Exceptions to visiting policies will be granted only by the nurse manager and the attending physician. • Volunteer activities, continuing education programs, Narcotics Anonymous and Alcoholics Anonymous meetings, and nonessential meetings will be suspended.	• Standard precautions and hand hygiene shall be strictly followed in all plan stages. Hand hygiene is mandatory on entering and leaving all patient rooms. • Mask use and hand hygiene are required for all patients entering hospital facilities with any symptoms of EPRI to prevent droplet spread. Pediatric patients will be encouraged the wear a surgical mask as tolerated. Patients with symptoms must be physically separated from those patients without symptoms. HCWs will strictly adhere to PPE requirements when in contact with AFRI or suspicious viral syndrome cases until an alternate diagnosis to EPRI is made. Individuals who are performing screening will wear a surgical mask or other PPE as directed by HEIC. • In outpatient settings, patients with AFRI or other suspicious viral syndrome should be given a surgical mask, asked to perform hand hygiene, and placed in a patient care room and away from other patients immediately pending evaluation by a clinician. If there are high patient volumes such that patients cannot be immediately placed in treatment rooms, patients with AFRI or other suspicious viral syndrome may be cohorted in a separate waiting area or as directed by HEIC. • HCWs will be cohorted such that HCWs assigned to patients with known or suspected EPRI will not care for those not infected with or exposed to EPRI. Before caring for patients without symptoms, HCWs will be screened for 1.5 times the EPRI incubation period. • Patients with either AFRI or other suspicious viral syndrome, regardless of epidemiologic risk factors, will be admitted to private rooms with isolation precautions as indicated by HEIC. Isolation must be continued for at least 1.5 times the incubation period from onset or until patient is without symptoms, whichever is longer, or as otherwise directed by HEIC. • Gloves and gowns are required to enter the room. All protective attire must be removed before leaving the room and hand hygiene must be performed. Eye protection should be worn within 6 ft of an isolated patient. Visitors must comply with precautions. Aerosol-generating procedures may require a higher level of protection, which will be determined by HEIC.

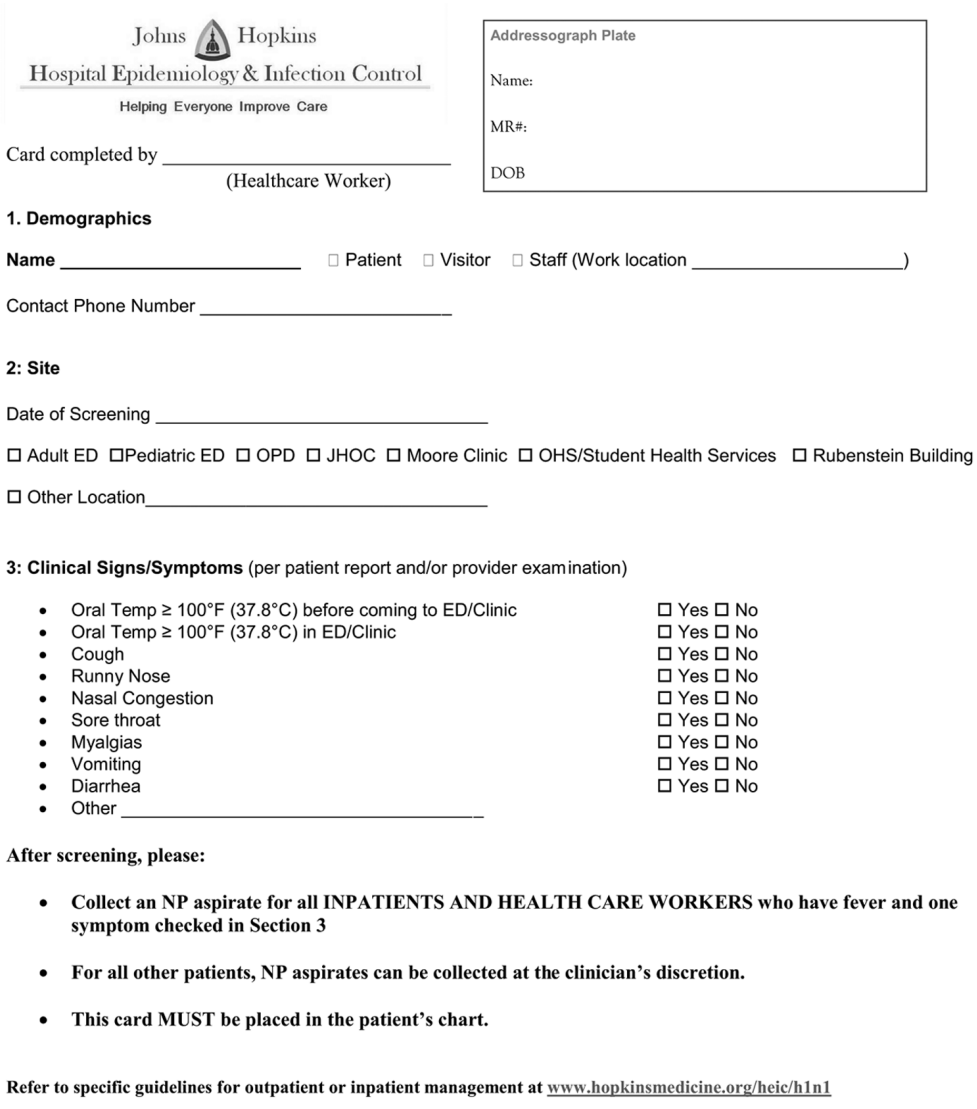
- The florist, gift shop, book store, and optical shop may be closed, and large meetings and educational gatherings (eg, Grand Rounds), may be restricted. Pediatric play areas may be closed. Elective surgical procedures, admissions, and outpatient appointments may be suspended as directed by the MCC, IC, or HE.
- Weinberg inpatient units may be designated for exclusive admission of urgent and emergent non-EPRI patients, as directed by the MCC, IC, and HE.
- The fatality management area may be set up as directed by the MCC, IC, or HE.
- Routine research enterprise operations may be curtailed, as directed by the Incident Command Team.

- All infected persons shall be confined to their rooms except for travel for essential testing. Whenever possible, medical testing of EPRI patients shall be performed on the ward. The highest tolerated level of PPE must be used by such patients while they are being transported. Under no circumstances will infected persons be allowed in hospital common areas (cafeteria, smoking area, gift shop).
- All inpatients will be educated about isolation policies, PPE requirements, and hand hygiene.
- All visitors and employees entering BMT or acute leukemia patient rooms must wear surgical masks.
- In the event that the number of individuals requiring hospitalization with suspected EPRI exceeds current isolation and department cohorting capacities, the primary isolation unit will be evacuated of its regular inpatient population and established as the receiving unit for all adult EPRI admissions. A separate but similar unit will be established for pediatric EPRI admissions.
- Once the primary isolation unit has been activated, a secondary unit may be evacuated of non-EPRI patients and EPRI patients will be cohorted there and in designated pediatric units. The decision to occupy the secondary isolation unit will be made by the HE, IC, and MCC.
- Employees with symptoms of EPRI must remain home until they have been without symptoms for 48 hours and are cleared by OHS to return to work. Those employees who test positive or are highly suggestive of having EPRI will be furloughed for at least 1.5 times the incubation period of the disease or as otherwise directed by HEIC.

NOTE. AFRI, acute febrile respiratory illness; BMT, bone marrow transplantation; CCEL, clinical case evaluation lead; ED, emergency department; EPRI, epidemic and pandemic respiratory illness; HCWs, health care workers; HE, hospital epidemiologist ; HEIC, Department of Hospital Epidemiology and Infection Control; IC, incident commander; MCC, medical control chief; OHS, Occupational Health Services; PPE, personal protective equipment.

outlined plan, planners should adopt ready-to-use tools to facilitate plan implementation. For example, the need to screen all staff, patients, and potential visitors as the plan progresses through higher stages will likely present the planning team with a daunting task because it will require a highly efficient means of screening hundreds of individuals at least daily at the height of an outbreak. We developed a screening tool to allow efficient, uniform screening, recordkeeping, and symptom tracking among individuals presenting to our facility for any reason during the outbreak. An abbreviated version of the tool is shown in Figure 3. Of note, to maximize efficiency of symptom tracking and assessment of shifting symptom patterns, integration of the tool into electronic medical records should be a key priority. Once fully implemented, this approach can allow download of outbreak data in real time by the hospital epidemiologist.

Another key resource for plan implementation is an algorithm for case detection and clinical management. The goals of such an algorithm include both effective case detection and appropriate risk stratification. Effective infection control necessitates the limitation of admissions to those with identified need for and probable benefit from in-hospital support. A carefully developed tool to triage patients needing essential care will streamline efforts to manage markedly increased patient volume. A modified version of a triage and management algorithm, as developed by our EPRI team in concert with HEIC and the Division of Infectious Diseases, is shown in Figure 4. Of note, such algorithms require regular updating during any



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Addressograph Plate
Name:
MR#:
DOB

Card completed by _____
(Healthcare Worker)

1. Demographics

Name _____ ☐ Patient ☐ Visitor ☐ Staff (Work location _____)

Contact Phone Number _____

2: Site

Date of Screening _____

☐ Adult ED ☐Pediatric ED ☐ OPD ☐ JHOC ☐ Moore Clinic ☐ OHS/Student Health Services ☐ Rubenstein Building

☐ Other Location_____

3: Clinical Signs/Symptoms (per patient report and/or provider examination)

- Oral Temp ≥ 100°F (37.8°C) before coming to ED/Clinic ☐ Yes ☐ No
- Oral Temp ≥ 100°F (37.8°C) in ED/Clinic ☐ Yes ☐ No
- Cough ☐ Yes ☐ No
- Runny Nose ☐ Yes ☐ No
- Nasal Congestion ☐ Yes ☐ No
- Sore throat ☐ Yes ☐ No
- Myalgias ☐ Yes ☐ No
- Vomiting ☐ Yes ☐ No
- Diarrhea ☐ Yes ☐ No
- Other _____

After screening, please:

- **Collect an NP aspirate for all INPATIENTS AND HEALTH CARE WORKERS who have fever and one symptom checked in Section 3**
- **For all other patients, NP aspirates can be collected at the clinician's discretion.**
- **This card MUST be placed in the patient's chart.**

Refer to specific guidelines for outpatient or inpatient management at www.hopkinsmedicine.org/heic/h1n1

Figure 3. Example of the respiratory virus screening tool. ED, emergency department; JHOC, Johns Hopkins Outpatient Center; NP, nasopharyngeal aspirate; OHS, Occupational Health Services; OPD, outpatient dialysis.

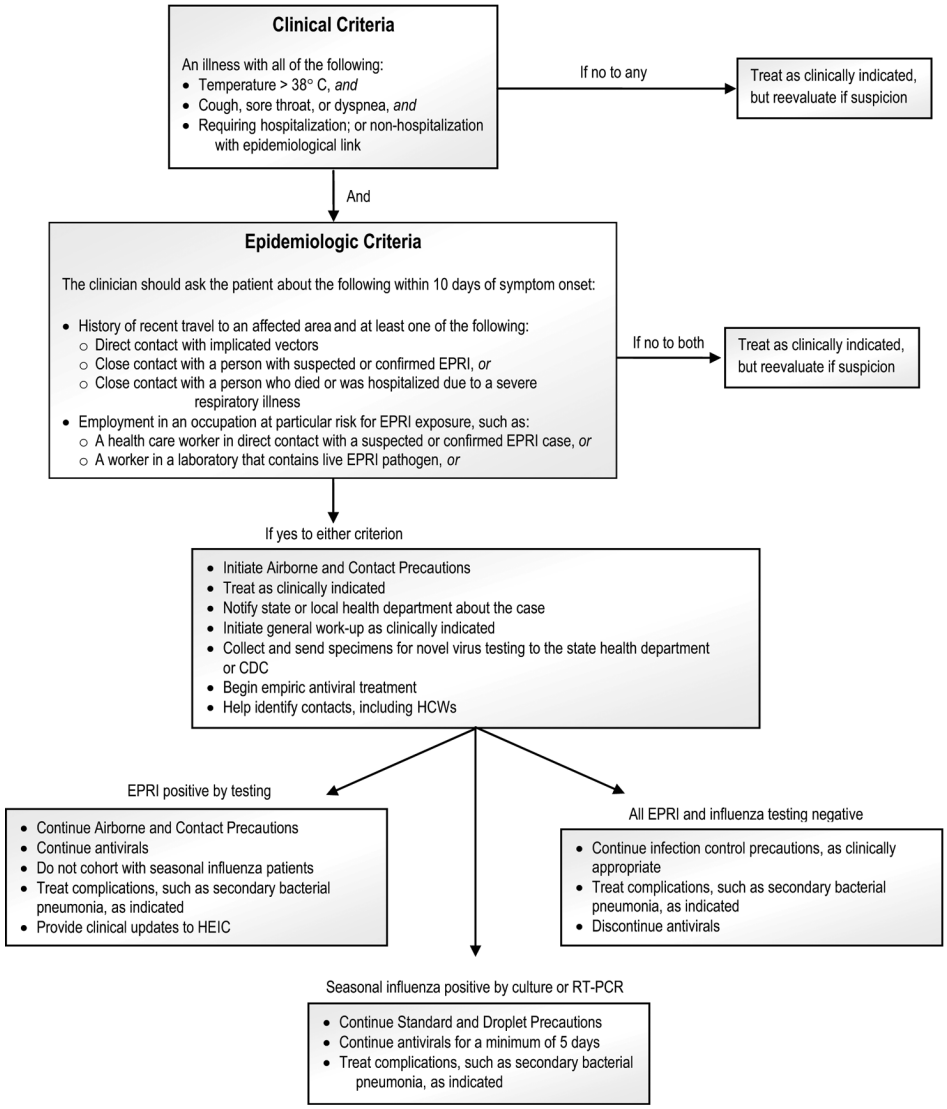

Figure 4. Example algorithm for case detection and management in the context of epidemic and pandemic respiratory illness (EPRI) with moderate or high severity and person-to-person transmission localized outside the United States. CDC, Centers for Disease Control and Prevention; HEIC, Department of Hospital Epidemiology and Infection Control; RT-PCR, reverse-transcription polymerase chain reaction.

outbreak as clinical data become available. Pre-event tools should not be considered to be static guidance but rather a framework from which to build event-specific responses.

2009 H1N1 AND FUTURE DIRECTIONS

During the 2009 H1N1 influenza response, we identified 2 additional roles that were critical to effective internal and external communication. Early in the outbreak, testing of cases suggestive of H1N1 influenza was mandated and performed by the state. To facilitate efficient interactions with the state health department regarding cases at our institution, we identified a physician who was assigned as the clinical case evaluation lead (CCEL). The CCEL triaged calls to the infection control center regarding potential cases within the hospital and carefully reviewed the history and findings with the reporting physician. Once the CCEL determined that a given case met H1N1 influenza case criteria, he/she communicated with the health department and served as the point of contact for communication of test results from the state to the hospital. The CCEL kept a log of possible cases, including symptoms, testing, and disposition. The other key role identified in the early H1N1 influenza response is that of a response documents coordinator. During the early phase of the response, multiple documents were generated to facilitate information dissemination, screening, and triage. Given the rapidly evolving situation, these documents required frequent updating and, in some cases, pro-

vided overlapping information. The coordinator was appointed to review all documents before dissemination to ensure consistency, accuracy, and timely integration with changes in state and national guidance.

As the H1N1 influenza response progressed, it was also recognized that effective infection control required the compilation of key data regarding employees that could be rapidly accessed by occupational health and infection control personnel. Data deemed essential to these efforts included details regarding fit testing of N-95 respirators (date of testing, mask type), seasonal influenza vaccination status, reporting of exposures or epidemiologic links, data regarding symptomatic employees (date of onset, disposition), respiratory virus testing results, and whether treatment and/or prophylaxis had been administered. Given the large, complex data set needed and the necessity of reliable, real-time information, it was recognized that development and refinement of a secure, interactive database should be a key EPRI response planning priority.

As H1N1 influenza has demonstrated, behind each resolved planning challenge lies another more complex challenge. No EPRI response plan can anticipate every eventuality, and thoughtful planning reveals a priority list for future work. Our planning identified the following priority areas for future work:

1. Development of educational plans
2. Integration with health system planning
   A. Coordination of triage within a health system
   B. Sharing of staff
3. Integration with regional and state planning
   A. Scarce resources allocation
   B. Interfacility communication

The 2009 H1N1 influenza outbreak has highlighted gaps in health care response planning in a variety of arenas. Many have been addressed. Some have not. Nature rarely provides the opportunity to implement and evaluate EPRI plans on a large scale. We must heed the lessons of the early 2009 H1N1 influenza outbreak to ensure that future EPRI responses are as effective as possible.

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