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PREPARING FOR AN INFLUENZA PANDEMIC: PERSONAL PROTECTIVE EQUIPMENT FOR HEALTHCARE WORKERS

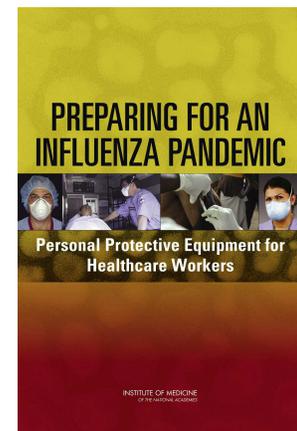
During an influenza pandemic, healthcare workers will be on the front lines delivering care to patients and preventing further spread of the disease. Protecting the more than 13 million healthcare workers in the United States from illness or from infecting their families or the patients in their care is critical to limiting morbidity and mortality and preventing progression of a pandemic. As the nation prepares for pandemic influenza, multiple avenues for protecting the health of the public are being carefully considered, ranging from rapid development of appropriate vaccines to quarantine plans should the need arise for their implementation. One vital aspect of pandemic influenza planning is the use of personal protective equipment (PPE)—the respirators, gowns, gloves, face shields, eye protection, and other equipment that will be used by healthcare workers and others in their day-to-day patient care responsibilities.

In 2006, the National Personal Protective Technology Laboratory (NPPTL) at the National Institute for Occupational Safety and Health (NIOSH) asked the Institute of Medicine (IOM) to conduct a study on the personal protective equipment needed by healthcare workers in the event of an influenza pandemic. The IOM committee determined that there is an urgent need to address the lack of preparedness regarding effective PPE for use in an influenza pandemic. Three critical areas were identified that require expeditious research and policy action:

- Understand influenza transmission.
- Commit to worker safety and appropriate use of PPE.
- Innovate and strengthen PPE design, testing, and certification.

UNDERSTAND INFLUENZA TRANSMISSION

Although it has been 70 years since the influenza A virus was discovered and despite the recognition that influenza causes severe morbidity and substantial mortality each year across the globe, little is known about the mechanisms by which the influenza virus is transmitted between individuals. Due to this lack of information, it is not possible at the present time to definitively inform healthcare workers about what PPE is critical and what level of protection this equipment will provide in a pandemic.



There is an urgent need to address the lack of preparedness regarding effective personal protective equipment (PPE) for use in an influenza pandemic.



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Debate continues about whether influenza transmission is primarily via the airborne or the droplet routes and the extent of the contribution of the contact route. Further, the aerosol-droplet continuum needs to be clarified as soon as possible in order to develop and implement effective prevention strategies. Without knowing the contributions of each of the possible route(s) of transmission, all routes must be considered probable and consequential, and the resources needed for prevention and control strategies cannot be rationally focused to maximize preparedness efforts.

Influenza transmission research should become an immediate and short-term research priority so that effective prevention and control strategies can be developed and refined. Opportunities abound for building on prior research and applying new technologies, as well as advances in research fields such as aerobiology and mathematical modeling, to the study of seasonal influenza and avian influenza. A global research effort is needed for influenza transmission and prevention and could provide much needed answers in a relatively short time frame. Equally important is the development of the technology and expertise to study pandemic influenza when it occurs. In this time of preparation for an influenza pandemic, the realization of how little is known about critical aspects of the disease should prompt immediate action to coordinate multiple resources and a diversity of research expertise to address the unknowns regarding influenza transmission and prevention.

COMMIT TO WORKER SAFETY AND APPROPRIATE USE OF PPE

Because PPE works by acting as a barrier to hazardous agents, healthcare workers face challenges in wearing PPE that include difficulties in verbal communications and interactions with patients and family members, maintaining tactile sensitivity through gloves, and physiological burdens such as difficulties in breathing while wearing a respirator.

Improving worker safety necessitates an organization-wide dedication to the creation, implementation, evaluation, and maintenance of effective and current safety practices—a *culture of safety*. Employees should feel *uncomfortable* when *not* wearing PPE during appropriate situations. Healthcare facilities need to foster and promote a strong culture of safety that includes a commitment to worker safety, adequate access to safety equipment, and extensive training efforts that utilize protocols requiring specific safety actions and detailing the consequences for noncompliance. Key components in promoting a culture of safety in healthcare facilities include: providing leadership and commitment to worker safety; emphasizing education and training; improving feedback and enforcement of PPE policies and use; and clarifying work practices and policies, including a commitment to expand and enforce regulatory policies. A concerted effort is needed to identify best practices in infection control and to disseminate this information to all sites where health care is provided.

INNOVATE AND STRENGTHEN PPE DESIGN, TESTING, AND CERTIFICATION

An integrated life-cycle approach is needed for healthcare PPE products. From the design of PPE that takes functionality, wearability, and other factors into account, to pre-market testing that examines the types of wear and tear and use of PPE in the workplace, through post-marketing evaluations of actual use in healthcare facilities, healthcare PPE needs to be considered an essential component of worker safety with concomitant resources devoted to the research and development efforts essential for the comprehensive protection of healthcare workers.

EVIDENCE-BASED PERFORMANCE REQUIREMENTS

Functionality

- Protect against influenza virus
- Guard against contact with contaminated fluids and aerosols

Usability

- Maintain biomechanical efficiency and sense of touch and feel
- Odor-free
- Hypoallergenic
- Accommodate wide range of users (face and body profiles)
- Compatibility across various elements of the PPE ensemble and with other equipment (e.g., stethoscope)
- Non-startling to patients and families
- Facilitate communication with others (verbal, facial)

Comfort and wearability

- Comfortable—no skin irritation or pressure points
- Prolonged use without discomfort
- Breathable—air permeable
- Moisture absorbent—wickability
- Low bulk and weight
- Dimensional stability
- Easy to put on and take off (don and doff)

Maintenance and Reuse

- Easy to decontaminate and discard disposable elements
- Easy to clean and replace parts in reusable PPE

Cost

- Product cost
- Total life-cycle cost
- Minimal environmental impact

Aesthetics

- Variety of styles and colors
- Customizable

Durability

- Adequate wear life
- Strength—tear, tensile, burst
- Abrasion resistance
- Corrosion resistance

In this era of moving toward preparedness for a pandemic, it is important to examine the level of rigor employed to ensure that all forms of PPE are deemed to be safe and effective medical devices. The varied regulatory, certification, and evaluation requirements for healthcare PPE have largely evolved in a fragmented manner and have not focused on the hazards of exposure to infectious agents. Many federal agencies have a distinct and vital role in ensuring the use of effective PPE, and there is a strong need for a coordinated effort to ensure harmonization of requirements and to focus on the entire process from product design (utilizing evidence-based performance requirements) to use in the workplace. Further, there are substantial gaps in knowledge regarding the design and implementation of PPE for family members and others who will provide care to influenza patients during a pandemic or who wish to use preventive measures to avoid influenza transmission.

Until more is known about influenza transmission, it will be critical to follow current infection control practices, to ensure that *all* available forms of protections are available to healthcare workers, and to heighten their knowledge of PPE and its use, while also obtaining the input of healthcare workers in designing, testing, and developing the next generation of PPE. The committee believes that improvements can be made so that healthcare workers will have PPE that provides protection against influenza transmission based on a rigorous risk assessment with solid scientific evidence.

In this era of moving toward preparedness for a pandemic, it is important to examine the level of rigor employed to ensure that all forms of PPE are deemed to be safe and effective medical devices.

OVERVIEW OF THE REPORT'S RECOMMENDATIONS

Understand Influenza Transmission

- Initiate and Support a Global Influenza Research Network

Innovate and Strengthen PPE Design, Testing, and Certification

- Define Evidence-Based Performance Requirements (Prescriptive Standards) for PPE
- Adopt a Systems Approach to the Design and Development of PPE
- Increase Research on the Design and Engineering of the Next Generation of PPE
- Establish Measures to Assess and Compare the Effectiveness of PPE
- Ensure Balance and Transparency of Standards-Setting Processes

- Strengthen Pre-market Testing of PPE for Healthcare Workers

- Strengthen Post-market Evaluation of PPE for Healthcare Workers

- Coordinate Efforts and Expand Resources for Research and Approval of PPE

Commit to Worker Safety and Appropriate Use of PPE

- Emphasize Appropriate PPE Use in Patient Care and in Healthcare Management, Accreditation, and Training
- Identify and Disseminate Best Practices for Improving PPE Compliance and Use
- Increase Research and Research Translation Efforts Relevant to PPE Compliance

FOR MORE INFORMATION...

Copies of *Preparing for an Influenza Pandemic: Personal Protective Equipment for Healthcare Workers* are available from the National Academies Press, 500 Fifth Street, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area); Internet, <http://www.nap.edu>. The full text of this report is available at <http://www.nap.edu>.

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COMMITTEE ON PERSONAL PROTECTIVE EQUIPMENT FOR HEALTHCARE WORKERS DURING AN INFLUENZA PANDEMIC

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