



PPE for an Influenza Pandemic

Howard J. Cohen, Ph.D., CIH

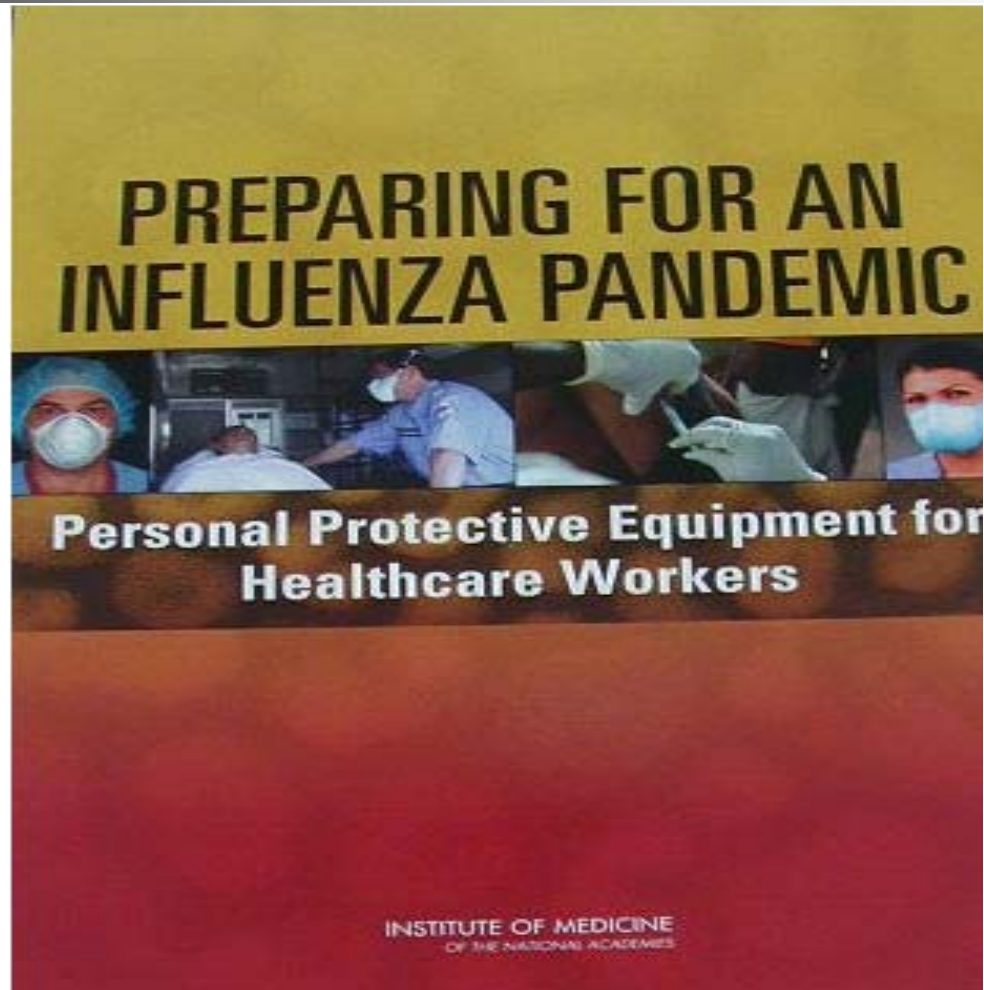
Professor, Occupational Safety and Health

University of New Haven, West Haven, CT

hcohen@newhaven.edu



Preparing for an Influenza Pandemic



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Influenza

- Annual influenza causes 35,000 deaths and 200,000 hospitalizations each year in the U.S.
- Influenza is categorized by two surface glycoproteins: hemagglutinin (H) and neuraminidase (N)
- There are 16 subtypes of H in birds of which H1, H2, H3 have resulted in global pandemics and seasonal epidemics
- Influenza undergoes frequent changes due to point mutations of the RNA



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Influenza Pandemics

- Occur every 10-50 years. There have been 31 pandemics described in the past 400 years
- In the 20th century pandemics occurred in 1918, 1957, 1968
- 1918 pandemic resulted in 675,000 deaths in U.S. and 50 million worldwide
- 1918 pandemic caused by H1N1 virus and occurred in 3 waves with the 2nd and 3rd wave more deadly
- 1918 pandemic impacted younger healthy persons



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Influenza Pandemics

- Current concern is with H5N1. Primarily an avian disease, but it has crossed over to humans
- Since May, 2007: 291 confirmed human cases and 172 deaths
- A few confirmed human-human transmissions among family members



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Influenza Transmission

- Direct contact
- Indirect contact: touching contaminated surfaces or objects
- Droplets: large aerosols generated from an infected person coughing or sneezing or during certain medical procedures (e.g. bronchoscopy)
- Airborne: small aerosols that remain airborne and can travel long distances. These are capable of being inhaled deep in the lungs



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Influenza Transmission Research

- 1941 study of ferrets confirmed that influenza could be airborne
- 1962 study of mice also demonstrated that influenza could infect animals from airborne transmission
- 2006 study demonstrated influenza could be spread from nasal secretions (sneezing) and respiratory tract (coughing)
- 2006 study demonstrated viral shedding occurs before the onset of symptoms and lasts from 12 hours-5 days
- Children shed larger quantities of the virus and for longer than adults



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Influenza Transmission Research

- Children are major sources of influenza transmission
- Immunocompromised individuals are more susceptible for acquiring illness
- For 1918 and 1957 pandemics there was excess mortality among pregnant women
- SARS found that some individuals were “super spreaders”



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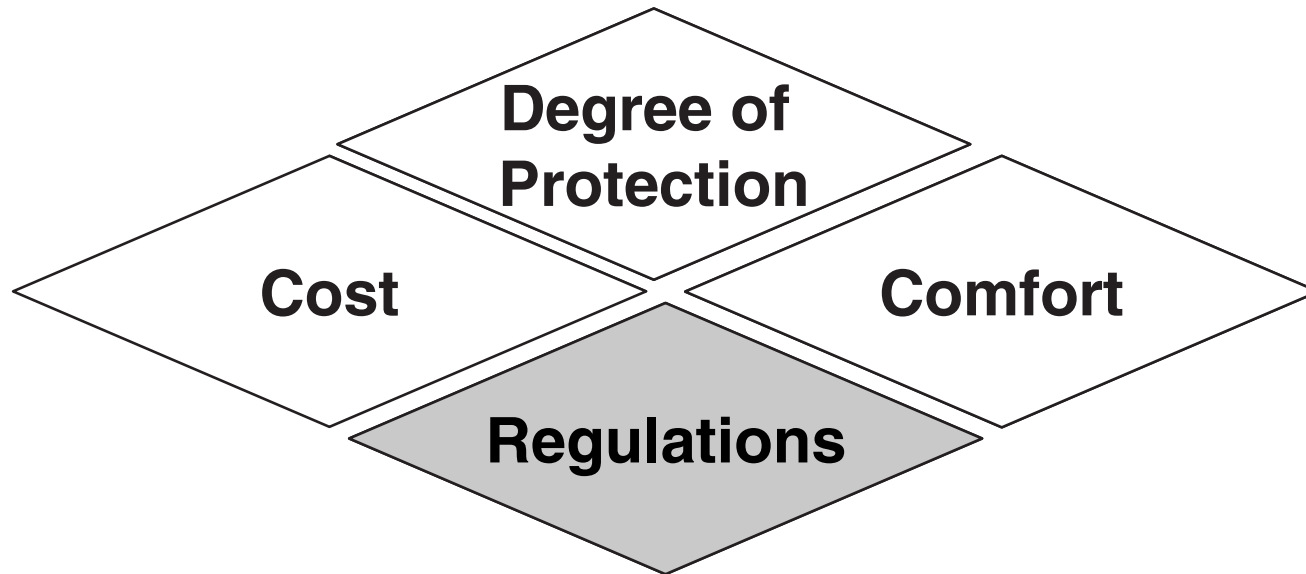
Influenza Transmission Research Questions

- What are major routes of transmissions, especially how important is infection from the spread of small aerosols?
- Can infection take place through mucous membranes or conjunctiva exposure?
- How viable is the virus on different surfaces (porous, non-porous) and for how long?
- What processes (e.g. UV light) or treatments (e.g. silver chloride) can inactivate the virus?
- Will masks worn by patients protect others?



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Design Considerations for Personal Protective Equipment





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A Structured Approach to Evidence-Based Performance Requirements

Functionality: protection against influenza

Usability: odor-free, hypoallergenic

Comfort and Wearability: breathable, low weight

Durability: strength, abrasion resistance

Maintenance and Reuse: decontaminate, replace parts

Aesthetics: variety of styles, color

Cost: life-cycle cost, minimal env. impact



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Respiratory Protection

- Filtering facepieces: N-95, maybe P-100
- Elastomeric half-facepiece respirators
- Loose-fitting powered-air purifying respirators

Note: FDA claims responsibility for all PPE when used to protect against illness transmission

- FDA requires NIOSH certified respirators + splash protection/liquid barriers and no exhalation valves



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Respiratory Protection: Key Questions

- There will not be sufficient filtering facepieces to protect the nation in the event of a pandemic
- Respirators will be required to be reused. Therefore, decontamination procedures and equipment must be in place
- The lack of fit testing and individuals unable to obtain a fit with a respirator will be a key problem
- Could surgical or cloth masks (not respirators) provide any protection to the public/workers?



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Other PPE

- Eye protection (e.g. goggles) may be required if working in close proximity to others who may sneeze, cough or otherwise produce droplets if the conjunctiva is a route of exposure
- Gloves will be required to be worn if fomites (transmission from surface contamination) is a significant risk factor
- Protective clothing than can be laundered may also be required for at least health care workers (note: 10% of the workforce can be defined in this category)



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Other PPE: Key Questions

- What level of training will be required to wear and take off PPE to avoid self-contamination? This was an important issue for SARS workers in Canada.
- How will PPE be decontaminated/cleaned since there will not be sufficient quantities to discard



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Other Important Considerations

- Vaccinations will be a key line of defense. It is unclear whether a vaccination can be available when the first truly human to human reassortment occurs.
- The role of hand cleaning with alcohol gels is thought to be an important line of defense
- The highest exposures levels are likely to be found in the home taking care of relatives
- Workers will not show up if they think that coming to work will result in a significant risk