NATIONAL INFLUENZA VACCINE SUMMIT:
STRATEGIES TO OVERCOME MYTHS AND MISCONCEPTIONS

Myth 1: I’m healthy and don’t need vaccine
Myth 2: I can’t get “flu” because I wash my hands

David J. Weber, MD, MPH
Professor of Medicine, Pediatrics, and Epidemiology
Associate Chief of Staff
Medical Director, Occupational Health & Infection Control
University of North Carolina, Chapel Hill, NC
Deaths
34,000
(8,000 - 68,000)

Hospitalizations
226,000
(55,000 – 431,000)

Physician visits
~ 25 million

Infections and illnesses
50 - 60 million

Influenza Disease Burden to U.S. Society in an Average Year

INFLUENZA: EPIDEMIOLOGY

- Geographic distribution - global
- Reservoir: Humans, swine, birds
- Incubation - 1 to 4 days (average, 2 days)
- Transmission
  - Droplet (airborne?) route
  - Direct contact
- Communicability
  - 1 to 2 days before onset of symptoms to 5-7 days post-onset (adults) or >10 days (children)
  - Attack rates: Up to 60%
- No carrier state (but unapparent illness may occur and such persons may be infectious)
## Clinical Manifestations by Age Group

<table>
<thead>
<tr>
<th>Influenza Sign/Symptom</th>
<th>Children</th>
<th>Adults</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough (nonproductive)</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Fever</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Myalgia</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Headache</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Malaise</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Sore throat</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Rhinitis/nasal congestion</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Abdominal pain/diarrhea</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>++</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

++ +++ Most frequent sign/symptom; + Least frequent; – Infrequent

Influenza Manifestations & Complications

<table>
<thead>
<tr>
<th></th>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequent</strong></td>
<td>Sinusitis, bronchitis, bronchiolitis, pneumonia, croup, acute otitis media</td>
<td>Primary viral pneumonia, secondary bacterial pneumonia, sinusitis, bronchitis</td>
</tr>
<tr>
<td><strong>Rare</strong></td>
<td>Encephalopathy, myositis, rhabdomyolysis, myocarditis, pericarditis, Reye syndrome, sepsis-like syndrome</td>
<td>Myositis, rhabdomyolysis, myocarditis, pericarditis</td>
</tr>
<tr>
<td><strong>Exacerbations of underlying disease</strong></td>
<td>Cardiovascular, diabetes, asthma, cystic fibrosis</td>
<td>Cardiovascular, diabetes, asthma, COPD</td>
</tr>
</tbody>
</table>

INFLUENZA VACCINE: INDICATIONS

- All persons who want to reduce the risk of becoming ill with influenza or of transmitting influenza to others
- Children aged 6-59 months
- Women who will be pregnant during influenza season
- Persons aged ≥50 years
- Children (6 mo–18 yr) receiving aspirin (risk for Reye syndrome)
- Adults and children with chronic cardio-respiratory illnesses
- Adults and children with chronic metabolic disorders, immune deficiencies, or immunosuppression
- Adults and children with any chronic condition that compromised respiratory tract function or at increased risk for aspiration
- Persons who live with people at high risk for influenza complications
- Residents of extended care facilities of any age
- Healthcare workers

ACIP. MMWR 2007;56(RR-6):1-53
MYTH 1

I don’t need an influenza vaccine because I am a healthy adult
EFFECTIVENESS OF INACTIVATED INFLUENZA VACCINES IN HEALTHY ADULTS

- Effectiveness against influenza
  - Influenza immunization 80% (95% CI, 56%-91%) effective against influenza {good vaccine strain match}
  - Influenza immunization 50% (95% CI, 27-65%) effective against influenza {poor vaccine strain match}

- Protection against complications
  - 13% (NS) against physician visits {N=2}
  - 13% (borderline significance) against working days loss (0.4 days){N=5}
  - 29% (NS) against days ill {N=4}
  - 11% (NS) against hospitalization {N=5}

Jefferson TO, Cochrane review, 2008
Healthy adults aged 16-65 years,
38 clinical trials, 66,248 participants
RANDOMIZED CONTROLLED TRIALS OF INFLUENZA VACCINE IN HEALTHY WORKING ADULTS

- 1994-95, N=849*
  - 25% reduction in episodes of URI
  - 43% reduction in sick leave from work
  - 44% fewer MD visits

- 1997-98 (N=1184) & 1998-99 (N=1191)** {attack rate 5-10%}
  - 1997-98: 50% reduction in influenza (p=0.33); No reduction in ILI, MD visits, or lost workdays
  - 1998-99: 86% reduction in influenza (p=0.001); Reduction of ILI = 34% (p<0.001), MD visits = 42% (p<0.001), & lost workdays = 32% (p=0.002)

INFLUENZA IN HEALTHCARE FACILITIES

- More than 25 outbreaks described in literature in acute care hospitals
  - Infected staff may initiate outbreak or aid in propagation
  - HCW infection may lead to absenteeism and disruption of health care
  - Attack rates in HCWs have ranged from 25% to 80%

- More than 15 outbreaks described in literature in extended care facilities
  - Important morbidity and mortality among residents may result
  - High rates of immunization (>60%) among staff may lead to decreased attack rate in residents
**INFLUENZA VACCINE COVERAGE IN HEALTHCARE WORKERS, NCHS**

<table>
<thead>
<tr>
<th>Occupational Category</th>
<th>1997</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD, dentist, veterinarian, optometrist</td>
<td>44.6%</td>
<td>35.8%</td>
</tr>
<tr>
<td>RN, PA, PT, pharmacist</td>
<td>34.6%</td>
<td>41.5%</td>
</tr>
<tr>
<td>Technologist/technician, LPN, dental hygienist, radiology technician</td>
<td>31.5%</td>
<td>44.6%</td>
</tr>
<tr>
<td>Dental assistant, health aid, nursing aid, orderly</td>
<td>31.2%</td>
<td>29.4%</td>
</tr>
<tr>
<td>Non-healthcare occupation in health industry</td>
<td>32.2%</td>
<td>37.0%</td>
</tr>
<tr>
<td>Non-healthcare worker</td>
<td>15.9%</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

Walker FJ, et al.  ICHE 2006;27:257-265
REDUCTION IN OUTCOMES IN HCWs RECEIVING INFLUENZA VACCINE

Influenza infection: Saxen 1999
-88% 28%

Sick days due to respiratory illness: Wilde 1999
-41% 41%

Days lost from work: Carmen 2000
-41% 41%

Patient mortality: Potter 1997
-39%

Attack rate unvaccinated = 13.4%

Indirect Benefits of Influenza Vaccination of Health Care Workers

- 20 long-term care facilities, stratified cluster randomization staff influenza vaccination or not
- Resident mortality odds ratio 0.58 (95% CI 0.40, 0.84) p=0.014

No significant difference in % residents positive for influenza:
‘Vaccine hospitals’ 5.4%; ‘no vaccine hospitals’ 6.7%

Indirect Benefits of Influenza Vaccination of Health Care Workers

Mortality of residents was significantly reduced (10% vs 17%) in nursing homes where the staff was vaccinated (SV) compared to facilities where they were not (S0)

MYTH 2

I don’t need to worry about influenza because I wash my hands
VALIDITY OF MYTH THAT HANDWASHING WILL PREVENT INFLUENZA

- Truthful aspects of statement
  - Antiseptics effective against the influenza virus
  - Hand hygiene indeed effective in reducing influenza infections

- False aspects of statement
  - Hand hygiene will not prevent aerosol transmission (droplet or airborne)
  - Hand hygiene often not done even in the healthcare setting
TRANSMISSION OF INFLUENZA: DIRECT OR INDIRECT CONTACT

- Environmental survival (Bean B, et al. JID 1982;146:47-51)
  - Influenza viruses can survive on nonporous surfaces (steel, plastic) 24-48 hr and porous surfaces (cloth, paper, tissues) 8-12 hr
  - Viable virus can be transferred from nonporous surfaces to hands for 24 hr and from tissues to hands for 15 min

- Environmental contamination (Boone SA, Gerba CP. J Infect 2005;51:303)
  - Influenza virus detected on 23% and 53% of inanimate objects present in day care centers in autumn and spring, respectively
  - Home with sick child = 60% objects contaminated

TRANSMISSION OF INFLUENZA:
AEROSOL TRANSMISSION, ANIMAL DATA

- Aerosolization in nonventilated room lead to infection in mice up to 24 hr after influenza virus introduced (Loosli CG, et al. Proc Soc Exp Biol 1943;53:205-6)

- Transmission of A/Panama/2007/99 (H3N2) virus shown between guinea pigs in the same cage, an adjacent cage, and a cage 91 cm away (Lowen AC, et al. PNAS 2006;103:9988-92)

- Transmission of influenza between ferrets despite physical separation (lateral distance = 1.6m, high = 1.0m) (Andrews C, Glover R. Br J Exp Pathol 1941;22:91-2)
AIRBORNE/DROPLET TRANSMISSION OF INFLUENZA: LESSONS FROM OUTBREAKS ON PLANES

- **Commercial plane, 1979**
  - 72% attack rate of travelers within 72 hours (travelers remained on non-ventilated plane for 3 hours during repair work)

- **Military transport, 1989**
  - Influenza A/Taiwan/1/86 – transmission on plane and ground

- **Commercial plane, 1999**
  - 15 passengers developed influenza within 4 days (9 of 15 seated within 2 rows, all seated within 5 rows of index case)
RATIONALE FOR HAND HYGIENE

- ~40% of healthcare-associated infections due to cross-transmission
- Many infectious agents are acquired via hand contact with contaminated surfaces
  - Contact transmission: Healthcare (MRSA, VRE), day care (MRSA), home (MRSA, “cold viruses”, herpes simplex)
  - Fecal-oral transmission: Day care (Shigella, E. coli O157:H7), home (Salmonella, E. coli O157:H7, Cryptosporidium)
- Hand hygiene effective in reducing or eliminating transient flora
- Hand hygiene demonstrated to be effective in preventing illness (especially fecal-oral diarrheal illnesses) in healthcare facilities, child care centers and homes, and households
Order of Resistance of Microorganisms to Disinfectants/Sterilants

- Prions
- Spores
- Mycobacteria
- Non-Enveloped Viruses
- Fungi
- Bacteria
- Enveloped Viruses

Increasing resistance to antiseptics and disinfectants

Increasing susceptibility to antiseptics and disinfectants
Efficacy of Hand Hygiene Agents in the Log Reductions of Gram-negative Bacteria (S. marcescens) after One Episode with 95% Confidence Intervals

Improved Patient Outcomes Associated with Proper Hand Hygiene

Ignaz Philipp Semmelweis (1818-1865)

Chlorinated Lime Hand Antisepsis
Hand-hygiene basin at the Lying-In Women's Hospital in Vienna, 1847

“All students or doctors who enter the wards for the purpose of making an examination must wash their hands thoroughly in a solution of chlorinated lime which will be placed in convenient basins near the entrance of the wards. This disinfection is considered sufficient for this visit. Between examinations the hands must be washed in soap and water.”

Courtesy of Didier Pittet and John Boyce
MATERNAL MORTALITY,  
VIENNA MATERNITY HOSPITAL, 1841-1855

Rate per 1,000 Births

MDs - Hand washing
with chloride of lime

Clinic 1: MDs
Clinic 2: Midwives

1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855

Ignaz Semmelweis
Four Years of Infection Control
Clin Infect Dis 1995;20:691
A review of 34 published studies of handwashing adherence among healthcare workers found that adherence rates varied from 5% to 81%.

The average adherence rate was only 40%.
Public Attractions Observations

– Among Complete Sample –

Based on the observation of 6,336 individuals in public restrooms located at major public attractions
Harris Interactive, 2005 findings, produced for ASM
UNC Hospitals Intensive Care Units
Hand Hygiene Compliance

Leadership presentations
Collected baseline data
Evaluated hand hygiene products
Began quarterly compliance reports to ICUs
Ongoing education
Evaluated hand hygiene products
Pocket-sized alcohol-based gel available
Implementation of Infection Control Liaisons
Staff HH compliance added to patient satisfaction survey
ICPs Cross-cover Units
Hospital Epidemiology
Confidential Information for CQI
SUMMARY

- Yearly influenza outbreaks have a high attack rate even among healthy adults
- Myth 1: I am healthy so I don’t need to worry about influenza
  - Studies support decreased infections in immunized healthy populations
  - Studies suggest immunization reduces days of lost work
  - Unclear if immunization prevents hospitalizations in healthy persons
- Myth 2: I wash my hands so I can’t get influenza
  - Handwashing likely to reduce influenza attack rate
  - Influenza also spread by droplet and possibly airborne route: handwashing will not prevent infection via these routes