Influenza in Hospitals
Dr. Alison McGeer
A Webber Training Teleclass

Influenza in hospitals
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Overview
- Influenza/nosocomial influenza
- Preparing for influenza season
- Surveillance during influenza
- Investigation/management of outbreaks

The influenza virus
- A single stranded RNA virus with an envelope and a genome with eight segments.
- Each segment codes for a protein:
  - Five internal structural proteins
  - Two non structural proteins
  - Three membrane proteins
- These membrane proteins include:
  - hemagglutinin
  - neuraminidase
  - matrix protein

Electron micrograph of Influenza viruses

Clinical Characteristics of Infection

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Complications of influenza

- febrile convulsions, *otitis media*, *croup*, *bronchiolitis*, Reye's syndrome
- *bronchitis, pneumonia, bacterial pneumonia*
- *exacerbations of asthma, COPD*
- *MI, CHF, sudden death*
- *myocarditis, encephalitis*

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Influenza

*Every year*

5 million Canadians (1 in 6) will be infected
50,000 will be hospitalized (1:100 >65 yrs)
4,500 people will die
7% of 2-6 yr olds will have acute otitis media
1.5 million work-days will be lost
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Nosocomial pneumonia and influenza, 1997/8, Ontario

Influenza in hospitals

Nosocomial influenza

Influenza outbreaks, acute care

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### Protecting your institution (patients and staff)
- Minimize the risk that persons infected with or incubating influenza enter your facility
- Reduce the risk of transmission from sporadic cases
- Recognize and optimally manage individual cases
- Detect outbreaks early, and manage them effectively

### Minimizing risk of introduction
- Vaccination
  - Vaccinate long stay patients
  - Vaccinate patients likely to return (70% of medical patients are readmitted within 6 mos)
  - Vaccinate staff, volunteers, physicians
  - Encourage the vaccination of families, visitors

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### Effect of influenza vaccine for staff and residents of long term care facilities

<table>
<thead>
<tr>
<th></th>
<th>Effect of vaccinating HCW</th>
<th>Effect of vaccinating residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>0.56 (0.40, 0.80)</td>
<td>1.2 (0.81, 1.6)</td>
</tr>
<tr>
<td>Mortality from pneumonia</td>
<td>0.60 (0.37, 0.97)</td>
<td>0.83 (0.5, 1.3)</td>
</tr>
<tr>
<td>LRTI</td>
<td>0.69 (0.40, 1.2)</td>
<td>0.67 (0.39, 1.4)</td>
</tr>
</tbody>
</table>

*Potter et al. JID 1997;175:1-6*

### Vaccination uptake and mortality among patients in long term care

*Carman et al. Lancet 2000;355:93*

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### Minimizing risk of introduction - II
- Visitor restriction during influenza season
  - Signed restriction of ill visitors
  - Articles in local papers
- Health care workers - during influenza season
  - Report respiratory illness
  - Rapid screen for influenza (NP swab)
  - Restrict if influenza

### Reduce transmission
- Handwashing
  - Alcohol handwash outside every door
  - Handwashing inservices
  - Feedback on amount of alcohol handwash/soap used
  - Reminders at beginning of influenza season

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**Impact of hand hygiene on infections**

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Setting</th>
<th>Impact on infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>Maki</td>
<td>ICU</td>
<td>Decreased</td>
</tr>
<tr>
<td>1984</td>
<td>Massanari</td>
<td>ICU</td>
<td>Decreased</td>
</tr>
<tr>
<td>1990</td>
<td>Simmons</td>
<td>ICU</td>
<td>No effect</td>
</tr>
<tr>
<td>1992</td>
<td>Dubebling</td>
<td>ICU</td>
<td>Decreased</td>
</tr>
<tr>
<td>1994</td>
<td>Webster</td>
<td>NICU</td>
<td>MRSA eliminated</td>
</tr>
<tr>
<td>1995</td>
<td>Zafar</td>
<td>Nursery</td>
<td>MRSA eliminated</td>
</tr>
<tr>
<td>1999</td>
<td>Pittet</td>
<td>Hospital</td>
<td>MRSA decreased</td>
</tr>
<tr>
<td>2000</td>
<td>Hammond</td>
<td>Schools</td>
<td>Illness/absenteeism decreased</td>
</tr>
<tr>
<td>2000</td>
<td>Dyer</td>
<td>Schools</td>
<td>Illness/absenteeism decreased</td>
</tr>
<tr>
<td>2001</td>
<td>Ryan</td>
<td>Army base</td>
<td>URI decreased</td>
</tr>
</tbody>
</table>

**Reduce transmission - II**

- Identifying infected patients during influenza season
  - rapid testing in ER - all acute RTI
  - notification from LTCF/PHL of outbreaks (isolate suspect)
- Precautions for infected patients
  - Private room
  - Droplet (mask, gloves)
- Duration of precautions
  - 3-4 days routine; until NP negative (neonates, severe IC)

**Duration of shedding**

- Healthy adults: 3-4 days
- Hospitalized immunocompetent adults: 4-5 days
- Elderly adults: up to 7 days
- Outpatient children: 7 days
- Nosocomially infected infants: up to 21 days
- Severely immunocompromised (advanced HIV, BMT, leukemia): median 7 days, up to 63 days

**Outbreaks - I: Preparation**

- Policies
  - Re-offer staff vaccine
  - Choice of antiviral for patients
  - Medical directive for antiviral order
  - Antivirals for staff - choice, payment, delivery
  - Work restriction for staff

- Communications
  - staff & PH re policies/union contracts
  - pamphlets for patients, visitors
  - mechanism for rapid identification of vaccinated vs. unvaccinated staff
  - mechanism for identifying location of discharged and transferred patients

**Outbreaks - II: Surveillance**

- Reminders when influenza season starts
- Surveillance
  - Acute respiratory illness in patients
    - during influenza season, obtain NP swabs
  - Clusters of ARI in staff

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Outbreaks - Detection
- Triggers for enhanced surveillance
  - one new onset patient with +flu on NP swab
  - 2 new onset ARI patients in 72 hrs
  - 2 or 3 staff who work together with acute ARI
- activate immediate NP swabs (staff and patients) with any illness
- look for “missed” cases
- notify senior medical and nursing staff

Outbreaks - Confirmation
- Outbreak
  - at least three ARI (broad definition)
  - at least two positive for influenza
  - no other virus identified
- Case definition
  - new illness with at least one of fever, or any respiratory symptom AND no other explanation
  - ?consider stricter definition on floors with younger, competent patients

Outbreaks - Management
- Define areas of the hospital and time period involved
- Consider closing unit
- Identify staff and patients who may carry influenza to other units/hospitals
- Stop transmission on unit
- Surveillance to track course/ensure control

Outbreaks - Management I
- Define areas of the hospital involved
  - experience in LTC is that containment to one unit is difficult
  - acute care should be ok, as long as too many staff are not shared
  - need enhanced surveillance on other units
  - need enhanced surveillance/adequate restriction for staff working on multiple units
- Identify first exposure time

Outbreaks - Management II
- Consider closing unit(s)
  - decide on safest management for most patients
  - never close if it means redeploying staff
  - alternative:
    - starting all newly admitted patients on prophylaxis
    - cohorting patients and care staff within the unit
    - using droplet precautions to protect new patients
    - cohorting staff who work on multiple units (eg. RT, chaplaincy, social work)

Outbreaks - Management III
- Identify staff/patients who may carry influenza to other units/hospitals
  - notify other institutions of recently transferred patients
  - if possible, via infection control
  - if not, with recommendations about duration of droplet isolation/prophylaxis or treatment
  - communicate with all unvaccinated staff who have worked since first exposure
  - activate mechanism for prophylaxis

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Outbreaks - Management IV

- Stop transmission - Patients
  - droplet precautions for symptomatic patients
    - private room or cohort: symptomatic, exposed (roommates), “non-exposed”
  - cancel shared activities
  - restrict transfers (patients may go in isolation, on prophylaxis)
  - consider restricting tests, etc. (depending on medical need)

Outbreaks - Management IV

- Stop transmission - Patients
  - classify patients
    - ill>48 hours - precautions, no therapy/prophylaxis
      - if uncertain if illness is influenza, use oseltamivir prophylaxis
    - ill <48 hours - precautions, treatment
      - ONLY use oseltamivir for treatment
    - not ill (yet) - prophylaxis

Why oseltamivir (vs. amantadine)?

- Active against influenza B
- Single dosage regimen, no interactions
  - only adjust dose for creatinine clearance<10ml/min
- High toxic/therapeutic ratio
  - amantadine errors can kill people
- Few side effects in patient populations
  - 1% nausea/vomiting, 1% headache
- Don’t have to worry about resistance

Rules for amantadine

- Calculate creatinine clearance based on gender, weight, serum creatinine
- Assess chronic illnesses and medications for interactions, risk of adverse events
- DO NOT TREAT symptomatic patients
- DO NOT give as prophylaxis for patients who have had an illness that MIGHT be influenza
- Watch for neurologic adverse events

Outbreaks - Management V

- Stop transmission - Staff
  - classify into vaccinated/unvaccinated
    - if vaccinated, ok (restrict if ill)
  - classify unvaccinated into exposed/ not exposed
    - exposed should be offered prophylaxis ASAP
    - non-exposed can start prophylaxis when they come in
    - offer vaccine again (outbreak may not be controlled; other exposures likely)

Outbreaks - Management VI

- Stop transmission - Staff
  - restrict those unvaccinated who refuse prophylaxis
    - if unexposed, consider policy that permits work elsewhere (CANNOT GO TO UNIT)
    - if exposed, must be off work ANYWHERE until a full 96 hrs after exposure
    - remember, hospital outbreaks occur in setting of community activity - allowing these staff to work anywhere poses a risk

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Outbreaks - Management VII

- Stop transmission - Visitors
  - do not permit ill visitors
  - consider restricting visitors overall
    - based on needs of nursing staff
    - nursing staff can make exceptions based on need
  - pamphlets, etc. for explanation

Outbreaks - Management VIII

- Discharges - coordinate with PH
  - if going home, ok (need to be aware of risk of illness, take oseltamivir for 2-4 days at home)
  - to other units/hospitals - ok if:
    - transmission has stopped (no new cases >48 hrs)
    - more than 4-7 days after onset of illness
    - taking oseltamivir for >48 hrs and symptomatic

Influenza A in a nursing home
Staynor et al., CJIC, 1994

Influenza outbreak - NH E

When is it over?

- Various definitions
  - usually, 1 incubation periods (ie 4 days) after the last case day of exposure
  - longest case scenario - last case is patient who is not discharged - infectious for 4 days (ie. 8 days after onset of last case)
  - shortest - 5-6 days
  - always balance risk of re-starting outbreak against care compromises occurring because of outbreak

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