Practical Issues in Infection Prevention During a Pandemic
Dr. Fidelma Fitzpatrick, HSE-Health Protection Surveillance Centre, Dublin
A Webber Training Teleclass

Republic of Ireland

- 4.2 million population (2006 census)
  - 1.3 million 25-45 years
  - 3.6 million Roman Catholic
- Languages: English and Irish
- EU member

Healthcare In Ireland

- Mixed public (HSE) and private system
- Health Services Executive (HSE) run public healthcare
- 51 public hospitals
- External regulator = Health Information and Quality Authority (HIQA) produces standards and inspects healthcare facilities against them

Sources of Influenza Data in Ireland

- Primary care
- Virology lab
- Public Health Departments
- Other

Sentinel GP ILI consultations
Non-sentinel specimens
Sentinel hospital admissions
Sentinel school absenteeism
Enhanced influenza surveillance (0-14 yrs hosp.)
ILI influenza outbreaks
Influenza notifications
GP OOHs
Sentinel school absenteeism
Mortality data (GRO & DPH)
HSE-Influenza vaccine uptake
ILI surveillance

National surveillance centre: HSE-HPSC

Introduction

- Focus on healthcare settings – specifically hospital issues
- Hierarchy of risk controls
  - Review recent evidence: staff vaccination, influenza transmission, PPE
- Thoughts for the future

Hosted by Martin Kiernan
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### Disclosures
- No commercial disclosure
- 2 hats!
  - Consultant microbiologist in Irish hospital:
    - A tertiary referral centre (Beaumont Hospital, Dublin)
  - National remit:
    - Prevention of healthcare-associated infection...co-opted onto Department of Health (RoI) Influenza Expert Group

#### PRACTICAL ISSUE NO 1.....COPIING!

### Practical aspects?
- **Influenza** = primarily community infection but impacts on healthcare settings
- **Aim of infection prevention** = prevent cross infection (staff and patients)
- **Infection prevention has to cope in the real world:**
  - patients don’t come with clear cut presentations
  - compliance with infection control measures by staff never 100%!

### ‘Coping’ with a new virus
- Lots of unknowns and panics – especially early on...
  - What is the specific virus?
  - How is it transmitted?
  - Delay in diagnosis
  - Little, if any, native immunity
  - Vaccine not available immediately
  - Mortality ...?? high.
  - Nearly everything will be in short supply feed by lots of panic, rumors etc
    - Infection control supplies (alcohol hand rubs, masks)
    - Anti-virals etc
    - Staff

Hospital does not stop admitting non-flu patients
= demands ++ on infection control resources

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Need 2 types of approaches
1. Early on when don’t know much
2. Adapt as evidence/experience emerges
   - How to get clear message out to everybody??
   - Documentation overload!!
   - Burnout

THIS APPROACH ALSO HELPS OUTSIDE OF A PANDEMIC!

Hierarchy of Risk Controls
1. Elimination
2. Substitution
3. Isolation / Engineering Controls
4. Administrative Controls
5. Personal Protective Equipment (PPE)

PRACTICAL ISSUE NO 2..... IT IS NOT ALL ABOUT MASKS!

1. Elimination
   = the most powerful control

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How to ‘Eliminate’ exposures?

Patients with influenza-like illness (ILI)
- Telephone help lines
- Minimise outpatient visits (if low risk for complications)
- Postpone elective visits/procedures

Visitor Management
- Don’t visit a healthcare facility
- Limit visitors for patients in isolation
- Limit visitor movement (don’t wander around!)
- Ensure visitors are not present during aerosol generating procedures

Hierarchy of Risk Controls

1. Elimination
2. Substitution
3. Isolation / Engineering Controls
4. Administrative Controls
5. Personal Protective Equipment (PPE)

2. Substitution

• ....usually not an option.

3. Isolation/Engineering Controls

• Isolation = protection of others
  – patients with suspected or confirmed Influenza should be isolated in a single room
  – ....or cohorted.
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- Clinical signs/symptoms nonspecific
- Delay in diagnosis (in my hospital – virology off site)
- Non-flu patients that need isolation

Need clear policies and procedures (24/7)
- ED, GP, Wards etc.
- Documented risk assessments
- Communication ++
- Document control (avoid too many versions of same document), easily accessible

Engineering controls
- Physical Barriers in Emergency Department
  Reduce or eliminate exposures by shielding staff and other patients from potentially infected patients:
  • physical barriers such as partitions
  • curtains drawn between patients in shared areas
- Reduce exposures related to specific procedures
  e.g., closed suctioning systems for airways suction in ventilated patients
- Air-handling systems

Hierarchy of Risk Controls
1. Elimination
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4. Administrative Controls
- Consistent implementation
- Hospital management, staff & patients
  Standard and Transmission-based Precautions
  - HAND HYGIENE
  - Respiratory Hygiene
  - Cough Etiquette
  - Enforcing exclusion of ill HCW
  - Vaccination

• Let (symptomatic) patients know what to do when they arrive
  – Let staff know if I LI
  – Where to sit
  – When to use a facemask and hand hygiene

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- **Education** on ILI, respiratory and hand hygiene
  - Visual alerts in appropriate languages: on entry and in strategic places (waiting areas, coffee shop, etc)
  - Need to change frequently to avoid blending into background!
    - Respiratory and cough etiquette: How to use (facemasks or tissues when coughing or sneezing) + how to dispose
    - Hand hygiene: How and when to do

- **Make sure enough supplies**
  - Facemasks
  - Hand hygiene products and/or sinks
    - upon arrival (e.g., at entrances, waiting rooms, at patient check-in)
    - In ED, radiology, phlebotomy etc

- **Need method to identify symptomatic patients**
  - At registration: inquire re ILI, and if present, provide instructions of what to do
  - Triage: rapid screening of patients for ILI and separation from other patients.

- **Infrastructure**:
  - Enough space (?)
  - Patients with ILI to sit as far away from others as possible... separate waiting area (not always practical)

What about ill healthcare workers?

- **Clear policies and good communication**
- **Infection control, occupational health, management, staff**
  - Don’t come in
  - If in:
    - stop patient-care activities, don a facemask, and promptly notify supervisor and infection control / occupational health before leaving work.

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PRACTICAL ISSUE NO 4..... WHEN VACCINE BECOMES AVAILABLE
HOW TO GET STAFF TO TAKE IT
.....NEVER MIND THE LOGISTICS!

Vaccination

- In pandemic availability delayed – know from seasonal flu uptake in HCW poor
- Why so poor when we know we should?
  - HCW=higher risk for acquiring influenza
  - HCW can get flu in the community (no PPE!)
  - Critical HCW don’t go off sick to keep show on road
  - Poor response to vaccine in many patients = importance of staff
  - Asymptomatic infection common – up to 66% of all cases

So why so poor?

- Lack of knowledge ‘can get flu from the vaccine’
- Safety concerns
- Belief that low risk for getting flu/complications
- Inconvenient to get the vaccine
- Doubts regarding vaccine efficacy
- Belief that will not help protect patients
- Misinformation re risk of asymptomatic infection to patients
- Conversely increased patient contact, belief of being at high risk of infection, concerns re transmitting flu to patients = willingness to get vaccinated

So what can be done?

- Electronic database to keep track
- Education
- Local ‘champions’
- Marketing campaigns
- Incentives –raffles/chocolate!!
- Screen savers with local ‘champions’
- Providing vaccines on the wards/units
- Declination statements
- Make it mandatory

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Declination statement?
• Those who refuse vaccination
• Understand the rationale for vaccine and the risks involved with refusal
• Data on efficacy mixed – generates paperwork
• Many exemption requests reflected misinformation (e.g., cited chemotherapy or immunosuppression as reason not to get it)
• One US study – mandatory vaccination - fewer HCW sought exemptions than had signed declination statements the previous year

The case for mandatory vaccination -1?
HCW autonomy V patient safety
US healthcare group (11 hospitals, 3 LTCF, day care etc)
• Flu vaccine mandatory (condition of employment + patient safety initiative)
• 98% (n=25,980)vaccination rate.
• Exemptions = religious (0.3%) or medical (1.2%)
Pregnancy was permitted as an exemption!
• Employees not vaccinated/exempted by particular date – employment terminated (n=8!)

The case for mandatory vaccination -2?
• 5 year US study of mandatory vaccination of all HCW
• <0.7% exempted (religious/medical) + required to wear mask when patient contact

So what works?
• Misconceptions + lack of knowledge = persistent barriers but education alone does not work
• Successful programmes = multiple tools
  – Leadership
  – Infrastructure (clear and timely communication, education, program implementation)
  – Incentives
  – Accountability
• ? Pick a target (90%) and if nothing else works make it mandatory.....??

2010 SHEA Position Statement
• Universal staff vaccination = cornerstone to a comprehensive national effort to prevent the spread of influenza
• Support staff influenza vaccination as a condition of employment, unpaid service, and/or receipt of professional privileges and support declination of influenza vaccination only if medically contraindicated.

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Hierarchy of Risk Controls
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5. Personal protective equipment
- The ‘last resort’ since it is only as effective as
  the training, supervision and compliance with
  which it is used!
- Level of protection chosen should be
  appropriate to the hazard and informed by risk
  assessment.

....this is the bit everybody gets hung up about.....
- Mode of transmission will influence this and
  talk about masks usually dominates!
  1. Contact (direct and indirect)
  2. Droplet
  3. Airborne

....this is the bit everybody gets hung up about.....
- Mode of transmission will influence this and
  talk about masks usually dominates!
  1. Contact (direct and indirect)
  2. Droplet

Airborne
Role of airborne transmission in the spread of influenza
has generated much debate

1. Need for Contact Precautions
- Can survive on surfaces
  - 24-48 hours: hard, nonporous surfaces (stainless
    steel and plastic)
  - less than 8-12 hours: cloth, paper, and tissues
- Transferred from surfaces to hands (stainless
  steel 24 hr /tissues up to 15 min)
- Survives on hands for up to 5 min after
  transfer from environmental surfaces.

• Transmission is possible via contact - self
  inoculation

....does Hand Hygiene not address this?

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**Pandemic H1N1 2009**

- 'Gastrointestinal symptoms (including nausea, vomiting, and diarrhoea) occur more commonly than in seasonal influenza, especially in adults'

但是我未在文档中找到与「Pandemic H1N1 2009」相关的部分。
SO WHAT IS THE EVIDENCE?

Droplet? – thought to be predominant mode of transmission

1. Active surveillance
   Lack of time-space clusters of cases of nosocomial flu over 15 years with use of droplet precautions and private, but not negative pressure rooms

2. Plane (US-Hong Kong)
   - tourist (completed flight US-Hong Kong) became symptomatic on plane and then spent 3 days on tour bus with ~30 others
     - 9 secondary cases = 8 tour group members + 1 airplane passenger
       - All cases within 2 rows of index case and a secondary case
       - All infected tour members talked to case patient (increased role with increased duration of conversation)
       - No cases in 4 tour members who had not talked to index case + No other airline cases

3. Plane (Mexico–New Zealand)
   - 9 students with symptoms on the flight
     - only 2 other passengers, both seated within 2 rows of infected passengers developed H1N1 after the flight

The virus can survive as an aerosol...

- The virus can survive in air and humidity appears to have a role
  - up to 24 (low humidity) and for up to 60 min (higher humidity)
- Different strains have different survival characteristics
  - the rate of decay of aerosolised virus is higher in human and swine strains than in avian strains
- Animal studies? Aerosol transmission
  - Infected ferrets transmit to other ferrets in a separate cage connected by a tube with directional airflow (similar study in mice in different cages)
  - Long range transmission between cages 80-107cm apart (seasonal flu – guinea pigs)
  - PH1N1
    - Transmission of pH1N1 equally effective between guinea pigs in adjacent cages without contact as those in same cage (but did not look specifically droplet V airborne)....also ferrets

Airborne?

- ?? Data from planes
  - H3N2 symptomatic passenger sitting near lavatory.
  - Plane delayed for 4.5 hours and ventilation is off for 2-3 hours.
  - 72% of the 49 passengers and 5 crew developed flu-like illness within 72 hours of the flight.
  - 91% tested positive

Any evidence about masks?

- Observational study - No increase in acquisition of pH1N1 by HCW using surgical masks V N95 in Singapore hospital

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Any evidence about masks - 2?

- Multicentre randomised trial
- Surgical mask V N95 respirator
- Protection of health care workers V influenza during 2008-2009 season in 8 tertiary care hospitals
- Participants = 446 nurses caring patients with febrile respiratory illness while working in ED or inpatient medical or pediatric units.
  - Instructed to use mask or N95 when caring for patients with febrile respiratory illness
  - Glove and gown use required for all such encounters
  - No change in respiratory protection for aerosol-generating procedures


Follow-up (Jan-April 2009)
- twice-weekly assessment for signs /symptoms,
- laboratory testing of nasal specimens from participants with ILI
- Comparable:
  - Influenza-vaccination status between the nurses using surgical masks and those using N95 respirators (30.2% and 28.1%)
  - Rates of exposure to spouses/roommates (22.4% and 25.9%) or children (22.6% and 20.5%) with ILI.

Results

- The incidence of laboratory-confirmed influenza was similar between groups (23.6% and 22.9%).
- No significant between-group differences were noted in the incidence of ILI or infections with respiratory viruses

Physical Interventions & Spread of Respiratory Viruses

- Respiratory virus spread = prevented by hygienic measures, such as hand washing, especially around younger children.
- Implementing barriers to transmission, isolation, and hygienic measures are effective at containing respiratory virus epidemics.
- Limited evidence that N95 respirators superior to simple surgical masks, but were more expensive, uncomfortable, and caused skin irritation.

Physician interventions to interrupt or reduce the spread of respiratory viruses.

...Conclusion

- Many simple and probably low-cost interventions would be useful for reducing the transmission of epidemic respiratory viruses.
- Routine long-term implementation of some of the measures assessed might be difficult without the threat of a looming epidemic.

Conclusions

- Surgical masks appeared to be no worse than N95 respirators in preventing influenza. The fact that attack rates were similar may suggest that small aerosols did not dominate transmission.

"In routine health care settings, particularly where the availability of N95 respirators is limited, surgical masks appear to be non-inferior to N95 respirators for protecting health care workers against influenza."

Physician interventions to interrupt or reduce the spread of respiratory viruses.

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“What is missing in some of the debate about the respiratory protection of health-care workers is the importance of source control.
• Placing a surgical mask on a coughing patient infected with influenza stops the detection of the virus 20 cm away.
• As with TB, masking the infected patient, when tolerated, should be the foundation of infection control.

Finally, health-care workers can wear powered air purifying respirators, eye protection, gowns, and gloves when exposed to patients with influenza, but even if they properly remove their protective equipment, they can become infected from colleagues who work with influenza-like symptoms’

Supplies (or lack of them)

• SHEA member survey
  – 26% had difficulty obtaining N95
  – 5% difficulty obtaining surgical masks
  – 2.5% difficulty obtaining alcohol hand rub

PRACTICAL ISSUE NO 6: SUPPLIES

• Canada: Impact of H1N1 on facial protective equipment use and hospital employee absenteeism in 3 hospitals, June – Dec 2009
  • 865 patients admitted patients with ILI: 149 (17.2%) had laboratory-confirmed H1N1 influenza infection.

1. Facial protective equipment use doubled
  • 134,281 masks and 173,145 N95
  – double the weekly use of both items, compared with the previous influenza season.
  – A significant proportion used while managing suspected cases.

2. Use of disposable eyewear doubled.

3. Absenteeism mirrored the community epidemiologic curve, with a 260% increase in sick calls at the epidemic peak, compared with the nadir.

CONCLUSION:
Planners should prepare for at least a doubling in mask and respirator use, and a 3.6-fold increase in staff sick calls.

PRACTICAL ISSUE NO 7: WHAT DO YOU DO WHEN GUIDELINES DIFFER?
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What do you do when international guidelines differ???

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CDC</th>
<th>WHO</th>
<th>HICPAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerosol generating procedures</td>
<td>N95</td>
<td>Gowns</td>
<td>Goggles</td>
</tr>
<tr>
<td>Routine clinical procedures</td>
<td>N95</td>
<td>Gowns</td>
<td>Goggles</td>
</tr>
</tbody>
</table>

In September 2009, the Institute of Medicine supported the use of N95 respirators during the care of patients infected with H1N1 influenza, although this group was instructed not to consider the available supply or comfort of N95 respirators in their decision.

The ‘retrospective-scope’ is easy

- CDC guidelines, Sept 2010:
  - ‘multifaceted approach’:
    - clear administrative policies and organisational leadership
    - influenza vaccine
    - respiratory hygiene and cough etiquette
    - appropriate management of ill HCW
  - Droplet except for aerosol-generating procedures
  - environmental and engineering infection control measures

- “The mechanisms of person-to-person transmission of the 2009 H1N1 virus appear to be similar to those of seasonal influenza, but the relative contributions of small-particle aerosols, large droplets, and fomites are uncertain”

So what did we do?

- FFP2/3 initially – WHO guidance then = Droplet precautions except for aerosol generating procedures
- Lots of issues:
  - Supplies + quality of facemasks
  - Training, education re respirators
  - Too much focus on masks
  - Lots of documentation

Summary

Hierarchy of Risk Controls

1. Elimination
2. Substitution
3. Isolation / Engineering Controls
4. Administrative Controls
5. Personal Protective Equipment (PPE)
Summary - practical points

1. Its not all about masks - PPE should be considered the 'last line of defence' in a hierarchy of infection control measures
   • A single JAMA study will not end the debate over influenza respiratory protection for HCW
   • Focusing on masks distracted attention from the critical importance of implementing other strategies known to prevent the transmission of influenza in health care settings.

2. Speaking of masks...need to prioritise use
   - Supply issues
   - Delays in diagnosis
   - HCW education
   - Fit testing/checking so staff wear them correctly

3. Need to make sure enough respirators remain available for situations where respiratory protection is most important:
   - Aerosol-generating procedures on patients with suspected or confirmed influenza
   - Patients with other diseases e.g., TB.

4. Education = NNB in terms of Standard Precautions and appropriate PPE (audits of PPE /hand hygiene)

5. How to improve
   • HCW vaccine uptake, hand hygiene, communication, document control...burnout!!

Lessons for the future – SHEA members survey

• 50.9% - other important infection prevention activities neglected

• Shortages: antivirals (30.7%), N95 (26%)

• 39% reported personal stockpiling of antivirals + 51% actions taken in hospitals to prevent this

• 77.7% agree with mandatory flu vaccine

• Vaccine development, health care worker education, and revisions of pandemic influenza plans were identified as the most important future initiatives.

Lautenbach E. Clin Infect Dis 2010; 50:523-7

COMING SOON ...

19 September 11 (Free British Teleclass, Broadcast Live from the Infection Prevention Society Conference – www.ips.uk.net)
Stronger Together
Speaker: Anne Bialachowski, Past President, CHICA-Canada
Sponsored by: GOJO Industries – Europe Ltd (www.gojo.com)

21 September 11 (Free British Teleclass, Broadcast Live from the Infection Prevention Society Conference – www.ips.uk.net)
Current and Emerging Global Issues
Speaker: Sir Liam Donaldson, World Health Organization Patient Safety
Sponsored by: GOJO Industries – Europe Ltd (www.gojo.com)

27 September 11 (Free Teleclass) Voices of CHICA, Part 2
Speaker: Community and Hospital Infection Control Association Board and Guests

29 September 11 Nosocomial Transmission of Influenza and Healthcare Worker Vaccination
Speaker: Dr. Helena Maltezou, Helenic Center for Disease Control and Prevention, Greece

04 October 11 (Free WHO Teleclass) MRSA – Is Search & Destroy the Way to Go?
Speaker: Prof. Andreas Vosse, Nijmegen University Medical Center, Netherlands

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