Much Ado About Flu - Resp We Forget...

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Public Health Ontario

What did we Learn from the 2014-15 Influenza Season?

• What life was like before use of influenza vaccines
  • 0% vaccine effectiveness for A(H3N2)

• Given 2013-14 season was principally H1N1 and B:
  • Virtually no H1N1
  • Some late B activity, well-matched to vaccine strain

• Lots of influenza-like illness (ILI) due to other respiratory viruses
What did we learn from the 2014-15 Influenza season? (cont.)

• Anti-viral issues /challenges
  • Lack of ability to assess appropriate and timely use of anti-virals
  • Use to control outbreaks in HC institutions
• Healthcare worker immunization challenges

Influenza A virus

- Negative sense RNA
- 7 to 8 gene segments
- Total genome length 10-15kb
2010/11 to 2014/15 Season – Influenza A

Figure 1. Number of reported confirmed cases of influenza A by surveillance week: Ontario, September 3, 2010 to April 25, 2015

Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (IPHS) database, extracted by Public Health Ontario [2015/04/29].

2010/11 to 2014/15 Season – Influenza B

Figure 2. Number of reported confirmed cases of influenza B by surveillance week: Ontario, September 3, 2010 to April 25, 2015

Source: Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (IPHS) database, extracted by Public Health Ontario [2015/04/29].
Figure 1. Percentage of respiratory viral pathogens (influenza A, influenza B, respiratory syncytial virus, and parainfluenza virus) detected among specimens tested by all methods: Ontario, July 19, 2014 to July 18, 2015.

Figure 2. Percentage of respiratory viral pathogens (adenovirus, human metapneumovirus, rhinovirus and coronaviruses) detected among specimens tested by all methods: Ontario, July 19, 2014 to July 18, 2015.

Source: These data have been obtained from the Public Health Agency of Canada’s (PHAC) Centre for Immunization and Respiratory Infectious Diseases (CIRID) respiratory virus detection tables as of July 12, 2015; they are based on data submitted to PHAC from 34 laboratories in Ontario.

Weekly influenza tests performed and percent positivity for selected respiratory pathogens, submitted from an acute care setting within Hamilton and surrounding area.

April 12, 2014 to October 24, 2015

Percent of Positive Tests

Number of Tests

Week Ending

Total Influenza Tests  % Positivity Influenza A  % Positivity Influenza B  % Positivity Parainfluenza  % Positivity RSV  % Positivity Other*  % Positivity Influenza 4

*Other (Adenovirus, RSV, Enterovirus, MPPV)

务必”有数的 positon”数 of positive results for pathogen / number of tests performed for pathogens, reported as %.

*Data Source: Hamilton Regional Laboratory Medicine Program. Prepared by: Hamilton Public Health Services.
2014-2015 Season – Anti-Viral Resistance

<table>
<thead>
<tr>
<th>Influenza strains</th>
<th>Amantadine</th>
<th>Oseltamivir</th>
<th>Zanamivir</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ONTARIO</td>
<td>CANADA</td>
<td>ONTARIO</td>
</tr>
<tr>
<td></td>
<td>R  S  S  R</td>
<td>R  S  R  S</td>
<td>R  S  R  S</td>
</tr>
<tr>
<td>Influenza A (H3N2)</td>
<td>395  1  1312  1</td>
<td>0  228  1  866</td>
<td>0  228  0  864</td>
</tr>
<tr>
<td>Influenza A (H1N1)pdm09</td>
<td>11  0  12  0</td>
<td>0  9  0  10</td>
<td>0  9  0  10</td>
</tr>
<tr>
<td>Influenza B</td>
<td>NA  NA  NA  NA</td>
<td>0  147  0  440</td>
<td>0  147  0  439</td>
</tr>
</tbody>
</table>

(R = Resistant, S = Susceptible, NA = Not Applicable)

Source: Influenza and Respiratory Viruses Section, National Microbiology Laboratory (NML).

Influenza Vaccine Effectiveness (VE)

- Current vaccines are good, not great
  - Need for annual administration

- Vaccine effectiveness depends on:
  - Strain matching (H3N2, H1N1, B components)
  - Timing
  - Health status (immune system, chronic illnesses)
  - Age
  - Duration of immunity
  - Cross-protection (e.g. results from quadrivalent flu vaccine studies)
  - Vaccine storage and handling
  - Proper administration (IM vs SC)
Influenza Vaccine Production

- Egg-based flu vaccines
- Cell-based flu vaccines
- Recombinant flu vaccines

Influenza vaccine effectiveness
Canada, 2007-08 to 2014-15 seasons

<table>
<thead>
<tr>
<th>Season</th>
<th>Influenza A/H1N1</th>
<th>Influenza A/H3N2</th>
<th>Influenza B</th>
<th>Overall</th>
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<tbody>
<tr>
<td>2007-08</td>
<td>69%</td>
<td>57%</td>
<td>55%</td>
<td>60%</td>
</tr>
<tr>
<td>2008-09</td>
<td>68%</td>
<td>55%</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>2009-10*</td>
<td>93%</td>
<td>-</td>
<td>-</td>
<td>93%</td>
</tr>
<tr>
<td>2010-11</td>
<td>59%</td>
<td>39%</td>
<td>25%</td>
<td>37%</td>
</tr>
<tr>
<td>2011-12</td>
<td>80%</td>
<td>51%</td>
<td>51%</td>
<td>59%</td>
</tr>
<tr>
<td>2012-13</td>
<td>59%</td>
<td>41%</td>
<td>68%</td>
<td>50%</td>
</tr>
<tr>
<td>2013-14</td>
<td>71%</td>
<td>-</td>
<td>73% (Yamagata)</td>
<td>68%</td>
</tr>
<tr>
<td>2014-15**</td>
<td>-</td>
<td>-8%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Influenza H1N1 Pandemic  
** Mid-season results for A/H3N2 only
Influenza vaccination rates have fallen in Ontario from 38% to 34%

Larger drop in persons 12-64yo with chronic conditions; 43% to 34%
Methods to Improve Influenza Vaccine Effectiveness

- Quadrivalent vaccines
- Live intranasal influenza vaccines
- Adjuvanted vaccines
- Higher dose vaccines

Developing the Ideal Influenza Vaccine...

- Object of active research
- Duration of protection multiple years/lifelong
- Effective against any influenza strain type/subtype
- Effective against seasonal or pandemic strains
- Excellent safety profile
- Use of rapid vaccine manufacturing technologies
- Cost/ease of administration
- Vaccines based on more conserved antigenic epitopes:
  - Extracellular portion of M2 protein
  - Conserved domains of HA vs. highly variable surfaces of HA and NA
  - Positive early results for “universal target” antigen vaccine in mouse model → years away from clinical trials
Influenza vaccine composition

<table>
<thead>
<tr>
<th>2015-16 Northern Hemisphere</th>
<th>2016 Southern Hemisphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/Switzerland/9715293/ 2013(H3N2)</td>
<td>A/Hong Kong/4801/2014 (H3N2)</td>
</tr>
<tr>
<td>A/California/7/2009 (H1N1)pdm09</td>
<td>A/California/7/2009 (H1N1)pdm09</td>
</tr>
<tr>
<td>B/Phuket/3073/2013 (Yamagata lineage)</td>
<td>B/Brisbane/60/2008 (Victoria lineage)</td>
</tr>
<tr>
<td>Quadrivalent</td>
<td>Quadrivalent</td>
</tr>
<tr>
<td>B/Brisbane/60/2008 (Victoria lineage)</td>
<td>B/Phuket/3073/2013 (Yamagata lineage)</td>
</tr>
</tbody>
</table>

Confirmed cases of Influenza by Type & Season:
Ontario, 2003-04 to 2013-14*

*2013-2014 season only includes cases reported up to the end of Week 28 (July 12, 2014).
Note: Counts from 2009-2010 are underreported and should be interpreted with caution due to modified reporting during the pandemic.
Source: Ontario Ministry of Health and Long Term Care, Integrated Public Health Information System (iPHIS) database, extracted by Public Health Ontario (2014/07/15)
Institutional Outbreaks of Influenza by Type & Season: Ontario, 2006-07 to 2013-14*

*Note: 2013-2014 season only includes outbreaks reported up to the end of Week 28 (July 12, 2014). Outbreaks with a missing date of onset were excluded.


Institutional respiratory infection outbreaks, Ontario October 5, 2014 to October 10, 2015

Possibilities for Ontario
2015-16 influenza season

Could be any of several possibilities:

- Mild season
- H3N2 matched or mismatched season
- pH1N1 season
- B season with Yamagata, Victoria or both
- Any combination of the above

Inability to predict with certainty

Australian laboratory-confirmed cases, January 1 to October 9, 2015
Ongoing monitoring

Information published in Ontario Respiratory Virus Bulletin:
Laboratory confirmed cases, percent positivity from PHOL, institutional outbreaks, hospitalizations, deaths, activity levels from health units, strain typing, antiviral resistance

Connections to national laboratory and epidemiology networks
Contact with local health units assist with monitoring for signs of unusual activity

Ability to perform viral sequencing

VE estimates from sentinel physician network:
Mid-winter, after potential H3N2 activity

Dissemination of surveillance information for respiratory pathogens

Ontario Respiratory Virus Bulletin 2015-2016
SURVEILLANCE WEEKS 39 AND 40 (September 27, 2015 = October 10, 2015)

The issue of the Ontario Respiratory Virus Bulletin provides information on the surveillance period from September 27, 2015 to October 10, 2015. The surveillance period is defined as the period from the end of the school holidays to the start of the cold season.

PublicHealthOntario.ca

Prevention and Control of Influenza Outbreaks in Long-term Care Facilities

- Influenza immunization for residents/staff
- Surveillance for ILI
- Lab testing to determine cause(s) of ILI
- Promotion of/adherence to IP&C guidelines and practices
- Timely communication
- Exclusion of ill staff, visitor exclusion, new admission deferral
- Antiviral treatment ill residents/staff
- Antiviral prophylaxis residents/non-immunized staff

Why Retirement Homes should be Considered as LCTFs for Anti-Viral Prophylaxis

- Age and co-morbidities of residents
- Greater mobility of residents
- Congregate activities/risks of transmission
- Greater interaction with surrounding communities/families
- Possibly greater challenges in screening visitors for ILI
- Less HC infrastructure to support detection of ILI/testing/isolation
- Challenges with IP&C measures in outbreak setting
- Anti-viral prophylaxis as standard of practice
What are the Challenges in Doing So?

- Early detection of/response to influenza outbreaks
- Greater mobility of residents/congregate activities
- Controlling visits from community/families
- Logistics of authorizing, obtaining, distributing and monitoring use of AVs


H Grant Stiver MD¹, Gerald A Evans MD², Fred Y Aoki MD³, Upton D Allen MBBS⁴, Michel Laverdière MD⁵
AMMI CANADA GUIDELINE

Guidance for practitioners on the use of antiviral drugs to control influenza outbreaks in long-term care facilities in Canada, 2014-2015 season

Fred Y Aoki MD1, Upton D Allen MBBS2, H Grant Stiver MD3, Michel Laverdière MD4, Danuta Skowronski MD5, Gerald A Evans MD6

Health care worker influenza immunization coverage data: Overview

• Ministry of Health and Long-Term care administers the Ontario Influenza Immunization Database
• Coverage data reported up to Dec. 15, 2014
• Local health units entered data/reported to Ministry by Jan. 31, 2015
• Public Health Ontario received a dataset from the Ministry for analysis Feb. 2015
• Third year that Public Health Ontario has undertaken these analyses
Provincial median influenza immunization coverage among health care workers, 2014-2015 season:

- **Hospitals: 60.5% (15.6% – 100.0%)**
- **Long-term care homes: 75.8% (11.9% – 100.0%)**

**Note:** Among 227 hospital sites in Ontario used as the denominator, 201 (89%) hospitals were included in the analysis.

**Note:** Among 634 Long-Term Care Homes in Ontario, 573 (90%) homes were included in the analysis.


<table>
<thead>
<tr>
<th>Staff Category</th>
<th>Immunization coverage</th>
<th>Number of hospital sites reporting coverage</th>
<th>Percent missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees on payroll</td>
<td>57.6</td>
<td>61.7</td>
<td>57.8</td>
</tr>
<tr>
<td>Licensed practitioners</td>
<td>58.8</td>
<td>67.9</td>
<td>34.2</td>
</tr>
<tr>
<td>Adult students/ trainees</td>
<td>100.0</td>
<td>96.5</td>
<td>20.3</td>
</tr>
<tr>
<td>Volunteers</td>
<td>47.5</td>
<td>55.2</td>
<td>22.0</td>
</tr>
<tr>
<td>Other contract staff</td>
<td>98.5</td>
<td>83.7</td>
<td>18.1</td>
</tr>
<tr>
<td>All</td>
<td>55.4</td>
<td>60.5</td>
<td>57.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Staff Category</th>
<th>Immunization coverage</th>
<th>Number of long-term care sites reporting coverage</th>
<th>Percent missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees on payroll</td>
<td>80.0</td>
<td>80.3</td>
<td>75.2</td>
</tr>
<tr>
<td>Licensed practitioners</td>
<td>100.0</td>
<td>100.0</td>
<td>81.1</td>
</tr>
<tr>
<td>Adult students/trainees</td>
<td>100.0</td>
<td>100.0</td>
<td>88.7</td>
</tr>
<tr>
<td>Volunteers</td>
<td>72.7</td>
<td>66.9</td>
<td>62.7</td>
</tr>
<tr>
<td>Other contract staff</td>
<td>100.0</td>
<td>100.0</td>
<td>79.4</td>
</tr>
<tr>
<td>All</td>
<td>78.0</td>
<td>75.8</td>
<td>74.0</td>
</tr>
</tbody>
</table>

Ontario hospital health care worker influenza immunization coverage: All hospitals (n=201), 2014-15 season
Ontario hospital health care worker influenza immunization coverage: Large Community (n=86), Other (n=115), 2014-15 season*

*Graph displays median influenza immunization rate for large community hospitals, relative to the median rate for all hospitals (including large community) for comparison purposes. The 'other hospitals' displayed on the graph exclude the large community hospitals.

Ontario hospital health care worker influenza immunization coverage: Small Community (n=56), Other (n=145), 2014-15 season*

*Graph displays median influenza immunization rate for small community hospitals, relative to the median rate for all hospitals (including small community) for comparison purposes. The 'other hospitals' displayed on the graph exclude the small community hospitals.
Ontario hospital health care worker influenza immunization coverage: Reported choice policy (n=47) vs. did not report choice policy (n=153), 2014-15 season

![Chart showing influenza immunization coverage for hospital health care workers]

Ontario long-term care home health care worker influenza immunization coverage: Nursing Home (n=410), Home for the Aged (n=162), 2014-15 season

![Chart showing influenza immunization coverage for long-term care home health care workers]
Ontario long-term care home health care worker influenza immunization coverage by public health unit, 2014-15 season

Summary of Arbitration Decision, Sept. 8, 2015

• Ontario Hospital Association (OHA) / Sault Area Hospital (SAH) vs. Ontario Nurses’ Association (ONA)
• Re: SAH Vaccinate or Mask (VOM) Policy
• Arbitrator: James Hayes
Background

• SAH implemented a VOM policy in January 2014 after 70% influenza vaccination coverage rate not achieved as of December 31, 2013

• VOM policy continued throughout the 2014/15 influenza season, even with significant A/H3N2 vaccine mismatch

• Many concerns in the development/implementation of VOM policy documented in the decision

• ONA filed a policy grievance in Dec. 2013, local ONA chapter filed a group grievance in Jan., 2014

• Grievances consolidated

ONA Concerns

• Weak evidence supporting use of masks

• Masks do not prevent transmission from or to HCWs

• VOM policy process was flawed, no staff or external consultant input

• Policy did not adjust for A/H3N2 VE during 2014/15 season

• VOM policy coercive, designed to increase vaccination coverage

• Violated employee privacy rights

Therefore, unreasonable exercise of management rights
Arbitration Decision

- Determined that there was:
  - “… scant, if any, evidence that asymptomatic or pre-symptomatic individuals play an important role in transmission.” (p. 100)
  - “There are limited data on the use of masks and respirators to reduce transmission of influenza...” (p. 101)
- Therefore arbitrator not convinced that VOM had a patient safety object
- Determined that core purpose of the VOM policy was to drive up staff influenza vaccination rates and therefore was a “coercive tool”
- Based on the above, VOM policy judged to be unreasonable and in violation of collective agreement that allows nurses to refuse any required vaccination
- The arbitrator did not accept that the policy violated employee privacy rights

Where To Now?

- VOM policies being made voluntary – Alberta, Saskatchewan, some Ontario hospitals
- Continue with education/access/promotion/declination measures
- Gear up for sub-optimal H3N2 VE and greater use of anti-virals
- Learning from the high end of large/small community hospitals
- Effective and continuous IP&C measures for the array of seasonal respiratory viruses
- No magic bullets in the near/mid-future...
MERS-CoV Rapid Risk Assessment (from ECDC)

Event background information

Worldwide situation
Since April 2012 and as of 13 October 2015, 1,616 cases of MERS, including 424 deaths, have been reported by health authorities worldwide (Figure 1 and 2, and Table 1).

Figure 1. Distribution of confirmed MERS cases by month* and probable place of infection, March 2012–13 October 2015 (n=1,616)

Figure 2. Distribution of confirmed MERS cases by place of probable infection, as of 13 October
MERS-CoV Rapid Risk Assessment (from ECDC)

Figure 3. Number of travellers on commercial air carriers (excluding unscheduled charters), by EU/EEA country, to and from Jordan, October—December 2014.

Sources: Blaadbild (formerly BioDispo), IATA 2014

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text snippet:

Middle East Respiratory Syndrome Coronavirus Superspreading Event Involving 81 Persons, Korea 2015

Since the first imported case of Middle East respiratory syndrome coronavirus (MERS-CoV) infection was reported on May 20, 2015 in Korea, there have been 186 laboratory-confirmed cases of MERS-CoV infection with 36 fatalities. Ninety-seven percent (181/186) of the cases had exposure to the health care facilities. We are reporting a superspreading event that transmitted MERS-CoV to 81 persons at a hospital emergency room (ER) during the Korean outbreak in 2015. The index case was a 35-year-old man who had vigorous coughing while staying at the ER for 58 hr. As in severe acute respiratory syndrome outbreaks, superspreading events can cause a large outbreak of MERS in healthcare facilities with severe consequences. All healthcare facilities should establish and implement infection prevention and control measures as well as triage policies and procedures for early detection and isolation of suspected MERS-CoV cases.

Keywords: MERS; Coronavirus; Superspreading Event; Emergency Room; Prevention
Why did the South Korean Outbreak Occur?

• Preparedness, screening, initial IP&C measures
• Initial imported case missed
• Multiple hospital contacts while symptomatic
• Practice of doctor/institution shopping
• Role of family in care for patient, Emerg or in-patient
• Outbreak brought under control by:
  
  Case detection
  
  IP&C measures
  
  Contact identification and follow-up

Genetic Origins of Avian Influenza A(H7N9)

Lineage origins of gene segments:

H7 – A/duck/Zhejiang/12/2011 (H7N3)

N9 – A/wild bird/Korea/A14/2011 (H7N9)

Internal genes:

A/brambling/Beijing/16/2012 (H9N2)

Emerged in China in February, 2013
Number of reported cases of avian influenza A (H7N9) by WHO by week of symptom onset ** and as of October 19, 2015, (n=686*)

Much larger 2nd wave in 2013/14 winter

Median age 57 years; 68% male
94% exposed to poultry; approximately 99% acquired in China
Case fatality rate 20%
Waves begin in October, peak in winter.

Two imported cases of influenza A(H7N9) to B.C., Canada in January, 2015
Our globally inter-connected reality

- The frontlines of infectious disease surveillance and response are not border-crossings/ports-of-entry.
- They are:
  
  Primary care/urgent care
  Emergency departments/hospitals

- EMS
- Community care
- LTC
Avian Influenza A (H5N2)

Frequently Asked Questions

What is avian influenza?

Avian influenza is a type of influenza A virus which is also known as "bird flu". Avian influenza is found in wild birds, and can also infect domestic poultry, such as chickens and turkeys. It is rare for people to become infected with avian influenza. If people do become infected, it is usually because they have had close contact with infected poultry or their environment. Close contact could involve working with infected poultry, having infected poultry in the backyard or house, touching infected poultry, their feces or bedding, or being in areas where infected poultry have recently been.

Avian influenza does not spread easily from person to person. In rare situations when avian influenza has spread from one person to another, it has occurred with close contact, such as to a caregiver from a family member who is sick with avian influenza.

Avian influenza viruses can be "low pathogenic", meaning that they cause little to no illness in infected domestic birds, or "highly pathogenic", meaning that they can cause severe illness or death in infected domestic birds. This terminology relates only to how the virus behaves in domestic birds and not to how it behaves in humans.

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- Avian Influenza A (H5N2)
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