Influenza and other Respiratory Viruses Update--2017

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and

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Learning Objectives

• Review of influenza basics
• Review of the 2016-2017 influenza season.
• Influenza A H7N9 and “variant” virus update.
• RIDT update.
• Discuss surveillance strategy for 2017-2018
Influenza

The latest information
www.cdc.gov/flu/index.htm

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Antigenic Drift
Manifests in HA and NA as a result of continuous and gradual accumulation of point mutations in the HA and NA genes

www.flu.gov
**Seasonal Influenza-Related Morbidity and Mortality**


### ARD Hospitalizations

- Rates: Per 10^4
- P-I Mortality
- Per 10^4
- Per 10^2

### Medically Attended Illness

- Age (Years):
  - <5
  - 5-9
  - 10-14
  - 15-19
  - 20-24
  - 25-34
  - 35-44
  - 45-54
  - 55-64
  - >65

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**Estimated Annual Burden of Seasonal Influenza in the United States**

- Deaths: 12,000 - 56,000 since 2010
- Hospitalizations: 140,000 - 710,000
- Cases: 15 - 60 M

Direct medical costs: $10.4 billion

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10/9/2017
Influenza in the US: 2016-17

Influenza in WI, 2016-2017
Influenza in the U.S. 2016-17

Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (U.S. ILI), Weekly National Summary, 2016-2017 and Selected Previous Seasons

Influenza in the U.S. 2016-17

Pneumonia and Influenza Mortality from the National Center for Health Statistics Mortality Surveillance System. Data through the week ending August 19, 2017, as of September 7, 2017.
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Influenza Hospitalizations

Number of Influenza-Associated Pediatric Deaths by Week of Death: 2013-2014 season to present

- 2013-2014: Number of Deaths Reported = 111
- 2014-2015: Number of Deaths Reported = 146
- 2015-2016: Number of Deaths Reported = 92
- 2016-2017: Number of Deaths Reported = 100

In contrast, 2015-16:
- 280 deaths
- 80 deaths
Influenza 2016-17

What was expected...
- A/Hong Kong/4801/2014(H3N2)
- A/California/7/2009
- B/Phuket/3073/2013 (B/Yamagata-lineage)
- B/Brisbane/60/2008 (B/Victoria-lineage)

... and that’s what we got😊

The Changeability of Influenza

Antigenic Shift

www.flu.gov

Antigenic Shift
When a new subtype (a novel HA and/or NA) of influenza A emerges in the host (humans)
Infectious Diseases at the Human-Animal Interface

Influenza as an Example

Influenza at the Human-Animal Interface

Influenza A
- H1 - H18
- N1 - N11

Aquatic birds

Poultry

Humans

Pigs

Horses

Aquatic mammals

Cats

Dogs
Timeline of Pandemic Influenza A Viruses in Humans

Type A


H1  H2  H3

2009 H1pdm A

Timeline of Other Emergent Influenza A Viruses in Humans

Type A


H1  H2  H3

2009 H1pdm A

Swine H3
Swine H1
Avian H9
Avian H7
Avian H5
This suggests that the virus has spread, and emphasizes that further intensive surveillance and control measures in both the human and animal health sector remain crucial (WHO Risk Assessment, 2017)
Why Avian Influenza A (H7N9)?

- 5\textsuperscript{th} epidemic mutations detected
  - **Highly Pathogenic Avian Influenza** (HPAI); Refers to avian species pathogenicity.
  - Reduced susceptibility to antivirals
- Antigenic drift ---new CVV required
- CDC IRAT Evaluation Tool
  - Highest pandemic risk amongst novel influenza viruses detected.
Domestic Novel Influenza A

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Source: https://www.cdc.gov/flu/swineflu/h3n2v-case-count.htm

The Recipe for a Human Influenza Pandemic

- Emergence of a novel subtype of influenza
- An immunologically naïve population
- Replication in humans → disease
  - Efficient human-to-human transmission
Influenza surveillance are strengthening (US and globally)

- Enhances our ability to monitor for novel viruses with pandemic potential.
- In Wisconsin, the number of PCR tests performed surpasses RIDT.
- In the US, the number of PCR tests reported (CDC) exceeded 40,000 per week.
- The number of global NIC’s increased.

Rapid Influenza Diagnostic Tests (RIDTs)
A perennial discussion

www.cdc.gov/flu/professionals/diagnosis/clinician_guidance_ridt.htm
www.jointcommission.org/siras.aspx
Improving RIDT Performance

At last, the Final Rule has arrived!

If you are an RIDT user...

What do the new regulations entail?

- Reclassifying RIDTs from Class I to Class II
- Premarket notification to assure safety and effectiveness – 510(k) clearance
- Add “special controls”
  - Set minimum clinical performance criteria for sensitivity and specificity
  - Appropriate comparator tests for new assays
  - Accuracy assessed by manufacturers each year and when novel strain emerges (within 30 days)
  - By July 31, results of past 3 years analytical reactivity testing must be included in labeling
If you are an RIDT user...

When will this happen?
• For existing tests enforcement as of **1/12/2018**

What about your particular test?
• **Contact the manufacturer**, there will not be a central resource of information at this point
• If special controls not met, manufacturers expected to stop sales/distribution. However...
  • **You may be able to get test yet** - Don’t!
  • **Do not use up existing inventory**
  • Keep an eye on kit labeling and company website

**Likely Impact: Better tests? Fewer tests?**

Influenza and non-influenza virus respiratory surveillance
Influenza season, 2017-2018

Early season

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Tasmania (Australia) is in the "peak phase" of the most devastating flu season in recent memory, Health Minister Michael Ferguson warned.

As of [12 Sep 2017], there were 2337 confirmed cases of influenza and 21 deaths since [1 Jan 2017]. Last year [2016], 14 people died, and only 969 influenza cases were reported.

Source: The Advocate [edited]
Influenza Vaccine composition

2017-2018 Northern Hemisphere
A/Michigan/45/2015 (H1N1)pdm09-like virus;
A/Hong Kong/4801/2014 (H3N2)-like virus;
B/Brisbane/60/2008-like virus;
B/Phuket/3073/2013-like virus

2018 Southern Hemisphere
A/Michigan/45/2015 (H1N1)pdm09-like virus;
A/Singapore/INFIMH-16-0019/2016 (H3N2)-like virus;
B/Brisbane/60/2008-like virus
B/Phuket/3073/2013-like virus.

What do we do with the specimens submitted?

- Subtype characterization
- Antiviral resistance monitoring
- Whole genome sequencing
  - 3c.2a and 3c.2a1
- Provide specimen/isolates to CDC
- Provide weekly summary of testing data
## Antiviral Resistance Monitoring—Wisconsin, 2017

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<th>Month</th>
<th># Reduced inhibition</th>
<th># Tested</th>
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<td></td>
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- Oseltamivir
- Zanamivir
- Peramivir

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**# Flu PCR Labs Reporting Data, WI**

- **# Flu PCR Labs**
- **Linear (# Flu PCR Labs)**

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Rapid Influenza Reporting Sites, 2014-2017, WI

Number of Wisconsin Rapid Sites Reporting Influenza to WSLH

- No. of Sites Rptg Flu
- Sites Rptg Flu
Influenza Surveillance in Wisconsin

Multi-element approach

1. Rapid Influenza Diagnostic Testing (RIDT) Sites

   Now <50% of influenza testing in WI!
   - Confirmatory testing during periods of low prevalence (June to October).
   - Please notify WSLH of suspected performance issues (e.g. False positives/negatives)

WSLH can provide confirmatory testing for the first positive influenza specimens.

2. Enrolled Surveillance Sites

   - 17 labs in 5 public health regions.
   - Provide randomized specimens weekly.

Request to continue to submit the first 1-2 specimens per week with influenza test requests to WSLH.
Influenza Surveillance in Wisconsin

Multi-element approach

3. PCR Labs
   - “Gold Standard” testing.
   - Provide weekly testing data summary reports.
   - Do NOT need to send positive specimens.

Request to report both the **number positive** and the **number tested** weekly.

**Send Flu A unsubtypable specimens when subtyping for both 2009 H1N1 and seasonal H3 were attempted (Ct<35).**

Laboratory-based Surveillance

All Clinical Laboratories performing influenza diagnostic testing

**All Labs:**
- Send those with international travel histories
- *One* influenza-related hospitalization per week
- Unusual presentations/results
- Contact with swine/ sick or dead poultry
- Antiviral treatment failure
- It is no longer necessary for labs to report testing data to the National Respiratory and Enteric Virus Surveillance System (NRVESS).
- The WSLH is now reporting this data electronically to NREVSS for all labs in Wisconsin that report to WSLH.

**Summary of Surveillance Changes**

**RIDT Sites**
- Confirm the first influenza positive specimen if needed.

**Hospitalized Patients**
- Limit to one specimen per week

**Enrolled Regional Surveillance Sites**
- Send the first 1 to 2 specimens/week

**Student Health**
- Limit to one specimen/week

All labs: Please continue to send all out-of-season positive influenza A specimens (e.g. June-October 1).
Laboratory-based Surveillance

All Clinical Laboratories performing influenza diagnostic testing

All Labs:
• Send those with international travel histories
• *One* influenza-related hospitalization per week
• Unusual presentations/results
• Contact with swine/ sick or dead poultry
• Antiviral treatment failure

THANK YOU