Novel Influenza A H1N1 Update

Ted Cieslak COL MC USA
Department of Defense Liaison Officer
Where I Spend My Time
CDC Reorganization
Objectives

- Provide background information
  - influenza viruses
  - pandemics
- Describe the initial detection of novel H1N1
- Provide an update of current status
- Discuss implications for upcoming season
**Influenza Virus**

- **Hemagglutinin**
  Allows the flu virus to adhere to the respiratory tract

- **Neuraminidase**
  Allows the flu virus to escape from respiratory cells after replication
Eight Gene Segments
Allows the flu virus to easily exchange genes with other flu viruses
Influenza A Subtypes

H1  N1
H2  N2
H3  N3
H4  N4
H5  N5
H6  N6
H7  N7
H8  N8
H9  N9
H10
H11
H12
H13
H14
H15, H16
Influenza A Periodically Shifts to a New Predominant Subtype

- Spanish flu (H1N1)
- Asian flu (H2N2)
- Russian flu (H1N1)
- Hong Kong flu (H3N2)
- Avian flu viruses
- Human flu viruses

1918 '57 '68 '77 '97 '99 2003
Pandemic Influenza in the Past

- Past Pandemics
  - 1918 (H1N1)
    - 40-50 million deaths, 500K in US
  - 1957 (H2N2)
    - 2 million deaths, 70K in US
  - 1968 (H3N2)
    - 1-4 million deaths, 34K in US

www.cdc.gov/H1N1flu
Detection

www.cdc.gov/H1N1flu
Swine Influenza A (H1N1) Infection in Two Children – Southern California, March–April 2009

On April 21, this report was posted as an MMWR Early Release on the MMWR website (http://www.cdc.gov/mmwr).

- Increasing numbers of swine influenza cases being detected over past five years from improved surveillance – Shinde, NEJM 2009
- Increasing efforts at states, CDC, and USDA to investigate human cases of swine influenza
- Southern California, 2009 - MMWR 58(15);400-02
  - April 13 – 10 yo boy, recovered
  - April 17 – 9 yo girl, recovered
Detection of First Case

- Mesoscale device used to diagnose influenza in 10 year old boy during clinical trial in San Diego on April 1, 2009
- Result is influenza A positive, however, H1, H3, H5 negative
San Diego public health notified

- Recommends sending specimen on to designated reference laboratory in Wisconsin as part of the clinical trial
Detection of First Case

“Unsubtypable” confirmed by reference laboratory and by designated State Public Health Laboratory using FDA-cleared 5 Target PCR
Detection of First Case

- Specimen tested at CDC
- Identified as a novel H1N1 Swine, triple reassortant, where are the infected swine?
- Novel case reported to WHO...end of story?
Confirmed Cases of Human Infection with Novel Influenza A (H1N1) with Known Date of Illness Onset, United States, March 28 – May 5, 2009

1. Patient 1
2. Patient 2
3. Recognition of potential match between Mexico and US viruses
4. US declares a public health emergency
5. WHO raises to Pandemic Phase 4
6. WHO raises to Pandemic Phase 5

www.cdc.gov/H1N1flu
U.S. Military Laboratory-Based Influenza Surveillance

- Sentinel Site Surveillance
  - Through USAFSAM, Brooks City Base TX
  - Hospital & Clinic-Based
- Recruit Training Surveillance
  - Through NHRC, San Diego CA
- Overseas Surveillance
  - Through NAMRUs, other labs
H5N1 Avian Influenza
(Risk Factors: Urban Migration & Crowding)
Origin of “Swine-Origin” H1N1
Garten et al Science, 2009

Gene Segment | Host and Year of Introduction |
---|---|
PB2,PA: | ~ 1998 |
PB1: | ~ 1968 ~ 1998 |
HA, NP, NS: | ~ 1918 |
NA, MA: | ~ 1979 |

Triple reassortant
Classical swine
Eurasian swine

Novel H1N1
Response to H1N1

• Strategic National Stockpile
  • Distributed 25% pro rata supply
• Enhanced Surveillance Initiated
• PCR panH1N1 kits for testing
  • Development at CDC, EUA at FDA, manufacture at ATCC, and ready to ship in ~ 2.5 weeks
  • Distributed Kits, so far:
    • Domestic: 95 labs
    • DOD: 15 labs
    • International: >250 labs in 140 countries
• Virus Characterization
  • >1000 genes sequenced from >260 viruses
  • Submitted to GenBank
H1N1 “Current” Status

- Lab-Confirmed Cases
  - 44,317 total cases when reporting stopped in July
  - 8,842 hospitalized
  - 555 deaths
- Represents approximately 3 M cases
- Overall activity has declined since schools closed, but focal areas of activity have increased
- Viruses in US and Internationally show no evidence of significant genetic/antigenic change
Epidemiology/Surveillance
Percentage of Visits for Influenza-like Illness (ILI) Reported by the US Outpatient Influenza-like Illness Surveillance Network (ILINet), National Summary 2008-09 and novel 2009-H1N1 – 01 SEP 2009

Data are provisional and will not be officially released by the CDC until 1100 EDT
Internal Use Only (FIUO)---For Official Use Only (FOUO) -Sensitive But Unclassified (SBU)
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Epidemiology/Surveillance

Percentage of Visits for Influenza-like Illness (ILI) Reported by the US Outpatient Influenza-like Illness Surveillance Network (ILINet), National Summary 2008-09 and Previous Two Seasons

novel 2009-H1N1 – 01 SEP 2009

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Current Influenza Surveillance – ILINet Regions IV-VI
novel 2009-H1N1 – 01 SEP 2009

Region IV - AL, FL, GA, KY, MS, NC, SC, TN

Region V - IL, IN, MI, MN, OH, WI

Region VI - AR, LA, NM, OK, TX

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Epidemiology/Surveillance
novel 2009-H1N1 –1 SEPT 2009

ILINet, Number of ILI Visits and Number of Total Patient Visits,
2008-09, Alabama

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Majority of increase attributable to disease in 5-19 yo
Pandemic H1N1 Cases Rate per 100,000 Population by Age Group
As of 18 JUN 2009 (n=18,125*)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Rate / 100,000 Pop by Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 Yrs</td>
<td>10.2</td>
</tr>
<tr>
<td>5-24 Yrs</td>
<td>14.2 n=11,720</td>
</tr>
<tr>
<td>25-64 Yrs</td>
<td>2.5 n=4,041</td>
</tr>
<tr>
<td>≥65 Yrs</td>
<td>0.6 n=318</td>
</tr>
</tbody>
</table>

*Excludes 3,324 cases with missing ages.
Rate / 100,000 by Single Year Age Groups: Denominator source: 2008 Census Estimates, U.S. Census Bureau at:
Teens and young adults disproportionately affected
Few cases among elderly

Seasonal 2007-08
- 0-4 yrs
- 5-9 yrs
- 10-17 yrs
- 18-49 yrs
- 50-64 yrs
- 65+ yrs
N=3,930

2009 H1N1 (April - Jun)
- 0-4 yrs
- 5-9 yrs
- 10-17 yrs
- 18-49 yrs
- 50-64 yrs
- 65+ yrs
N=312

*April 12-June 30

www.cdc.gov/H1N1flu
Past Exposure to Influenza A May Provide Protection
The older an individual, the more protected

High Immune Response

Low Immune Response

1918 '57 '68 '77 '97 '99 2003

H1N1

H2N2

H3N2

Russian flu

Hong Kong flu

Spanish flu

Past Exposure to Influenza A May Provide Protection
The older an individual, the more protected
Hospitalization Rate per 100,000 Population by Age Group (n=5,207*)

novel 2009-H1N1 – 30 JUL 2009

Serologic studies corroborate findings

*Hospitalizations with unknown ages are not included (n=307)

*Rate / 100,000 by Single Year Age Groups: Denominator source: 2008 Census Estimates, U.S. Census Bureau at:
Pandemic H1N1 Hospitalizations Reported to CDC
Underlying Conditions as of 19 JUN 2009 (n=268)

*Excludes hypertension

![Bar chart showing the prevalence of various underlying conditions among hospitalized H1N1 patients and the general US population.](chart.png)

- **Asthma**: 32%
- **COPD**: 32%
- **Diabetes**: 14%
- **Chronic CVD**: 13%
- **Immunocompromised**: 10%
- **Current Smoker**: 9%
- **Chronic Renal Dis. (st. III&IV)**: 8%
- **Obesity**: 8%
- **Neurocognitive Dis**: 7%
- **Neuromuscular Dis**: 7%
- **Pregnant**: 6%
- **Seizure Dis**: 4%
- **Cancer**: 3%

**Prevalence, Hospitalized H1N1 Patients**  
**Prevalence, General US Pop**

*Excludes hypertension*
Pneumonia and Influenza Mortality for 122 U.S. Cities
Week Ending 07/25/2009
novel 2009-H1N1 – 31 JUL 2009

Weeks

% of All Deaths Due to P&I

Epidemic Threshold

Seasonal Baseline
Epidemiology/Surveillance
Deaths by Age Group
novel 2009-H1N1 – 30 JUL 2009 (n=353)

Mortalities

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Mortalities</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 Yrs</td>
<td>7</td>
<td>2%</td>
</tr>
<tr>
<td>5-24 Yrs</td>
<td>56</td>
<td>16%</td>
</tr>
<tr>
<td>25-49 Yrs</td>
<td>142</td>
<td>40%</td>
</tr>
<tr>
<td>50-64 Yrs</td>
<td>96</td>
<td>27%</td>
</tr>
<tr>
<td>≥65 Yrs</td>
<td>29</td>
<td>8%</td>
</tr>
<tr>
<td>Unknown</td>
<td>23</td>
<td>7%</td>
</tr>
</tbody>
</table>

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Novel H1N1 is co-circulating with seasonal influenza, mostly H3N2
Drifted H3N2 is emerging, may be in US in fall, not in vaccine
Viruses and severity do not appear different
Rapid Influenza Diagnostic Tests

- Nine FDA-Approved Rapid Influenza Diagnostic Tests
- Evaluated seven RIDTs compared to PCR
  - Sensitivity ranged 18-69%
- Interpretation
  - Positive results = flu likely in specimen
  - Negative results = can not rule out flu
    - Caution with cohorting or return to settings where transmission is a concern
Infection Control

www.cdc.gov/H1N1flu
Infection Control

- Current recommendations
  - Standard and Contact precautions
  - Eye protection
  - N95
  - Administrative, Source Controls
- Institute of Medicine convened on 8-12 to discuss PPE for novel H1N1, Report out 9-03
  - Attempt to address appropriate PPE to achieve healthcare worker protection

www.cdc.gov/H1N1flu
Vaccine Issues

www.cdc.gov/H1N1flu
ACIP met July 29 to discuss recommendations.

Novel H1N1 will be considered a strain change under routine licenses and not under an Emergency Use Authorization.

The committee recommended the vaccination efforts focus on five key populations.

Vaccination efforts are designed to help reduce the impact and spread of novel H1N1.

The key populations include:

- those who are at higher risk of disease or complications,
- those who are likely to come in contact with novel H1N1,
- those who could infect young infants.
Vaccine for Novel H1N1

- When vaccine is first available, the committee recommended that programs and providers try to vaccinate:
  - pregnant women,
  - people who live with or care for children younger than 6 months of age,
  - health care and emergency services personnel,
  - persons between the ages of 6 months through 24 years of age, and
  - people from ages 25 through 64 years who are at higher risk for novel H1N1 because of chronic health disorders or compromised immune systems.
- The groups listed above total approximately 159 million people in the United States.
- Vaccine distribution approach is under discussion
Antiviral Treatment

- Treatment is recommended for:
  - All hospitalized patients with confirmed, probable or suspected novel influenza (H1N1).
  - Patients who are at higher risk for seasonal influenza complications (see above).

- Post exposure antiviral chemoprophylaxis can be considered for the following:
  - Close contacts of cases (confirmed, probable, or suspected) who are at high-risk for complications of influenza
  - Health care personnel, public health workers, or first responders who have had a recognized, unprotected close contact exposure to a person with novel (H1N1) influenza virus infection (confirmed, probable, or suspected) during that person’s infectious period.
Antiviral Resistance

- Oseltamivir Resistance
  - H1N1 seasonal – 99.6% (1123/1128)
  - H3N2 – 0% (0/222)
  - B – 0% (0/635)
  - H1N1 novel – 0.6% (7/1117)
- Zanamivir Resistance
  - None reported for all subtypes/types
What’s Next?

- Disease likely persists through summer in US, possible surge in late August when school returns
- Monitor closely for genetic and antigenic virus changes
- Expected higher attack rate (20-30%) than in spring (6-15%), notably affecting younger individuals
- Vaccine availability possibly mid October, Federal funds for distribution and administration are available
- Healthcare facility support in part from HPP grants
- SNS Antiviral stocks likely to be distributed
- Drifted H3N2 may co-circulate with novel H1N1

www.cdc.gov/H1N1flu
The End
Questions?

COL Ted Cieslak
trc0@cdc.gov
### Antiviral Treatment

<table>
<thead>
<tr>
<th>Agent, group</th>
<th>Treatment</th>
<th>Chemoprophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oseltamivir</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adults</strong></td>
<td>75-mg capsule twice per day for 5 days</td>
<td>75-mg capsule once per day</td>
</tr>
<tr>
<td>Children ≥ 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 kg or less</td>
<td>60 mg per day divided into 2 doses</td>
<td>30 mg once per day</td>
</tr>
<tr>
<td>16-23 kg</td>
<td>90 mg per day divided into 2 doses</td>
<td>45 mg once per day</td>
</tr>
<tr>
<td>24-40 kg</td>
<td>120 mg per day divided into 2 doses</td>
<td>60 mg once per day</td>
</tr>
<tr>
<td>&gt;40 kg</td>
<td>150 mg per day divided into 2 doses</td>
<td>75 mg once per day</td>
</tr>
<tr>
<td><strong>Zanamivir</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adults</strong></td>
<td>Two 5-mg inhalations (10 mg total) twice per day</td>
<td>Two 5-mg inhalations (10 mg total) once per day</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td>Two 5-mg inhalations (10 mg total) twice per day (age, 7 years or older)</td>
<td>Two 5-mg inhalations (10 mg total) once per day (age, 5 years or older)</td>
</tr>
</tbody>
</table>