Infants and Influenza

✓ Influenza

✓ Acute infection of the respiratory tract
  ✓ Nose
  ✓ Throat
  ✓ Possibly lungs
Pathophysiology

- Respiratory transmission
- Coughing
- Sneezing
- Speaking
- Penetrates respiratory epithelial cells
  - Trachea and bronchi
  - Viral reproduction 4-6 hrs
**Pathophysiology**

**Viral replication**
- Binds to host cell wall
- Destroys cell wall
- Injects RNA
- Viral replication
- Destroys host cell.

**New Viruses destroy cell wall**
- Viral release/shedding
- Destroys host cell.
- Viremia does not occur
- Virus sheds in 5-10 days
Influenza Activity 2017

Influenza-Like Illness (ILI) Activity Level Indicator Determined by Data Reported to ILINet
2016-17 Influenza Season Week 12 ending Mar 25, 2017

CDC Weekly U.S. Influenza Surveillance Report
Figure 2b. All Respiratory Viruses (SNP) by Week for 2016 (Line Graph)
RSV vs Flu, CDC Region 7

[Graph showing the number of cases of Influenza and RSV over time (October 1998 to March 2001).]
Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, 2016-2017 and Selected Previous Seasons
Children commonly need medical care

- Highest numbers < 5 years
- Children < 5 years at high risk of serious complications.
- Risk increases < 2 years
- Risk highest among children chronic health problems
  - Serious complications
  - Any age
  - Asthma
  - Diabetes
  - Disorders of the brain or nervous system
Pediatric Outcomes

- Hospitalization rates
  - Low > 3 months
  - Highest < 3 months
    - Fever only
    - Very short LOS
    - Rare squali (Excludes high risk infants)

- CDC Stats
  - Influenza A (H3N2)
    - Overall moderate activity
  - 20 Deaths
    - 9-H3N2, 1-H1N1, 4-Inf B, r unreported
    - Annually range from 37-171. (Since 2004)
  - Highest mortality rate American Indians and Alaskan Natives
Laboratory-Confirmed Influenza Hospitalizations
Preliminary cumulative rates as of Mar 25, 2017

Age Group
- 0-4 yr
- 5-17 yr
- 18-49 yr
- 50-64 yr
- 65+ yr

Weeks 1 to 17 shown on the x-axis, with hospitalization rates per 100,000 population on the y-axis.
Pneumonia and Influenza Mortality from the National Center for Health Statistics Mortality Surveillance System
Data through the week ending March 11, 2017, as of March 30, 2017
High Risk Groups

- Highest risk for severe outcomes
- < 12 mo age
- Neuro and developmental abnormalities
- Pre-existing pulmonary disease
- Pre-existing cardiac anomalies
- Pre-existing immune dysfunction
- Co-infection / bacterial pneumonia
Symptoms < 12 Weeks Old

- Seek Medical Attention Immediately
- 911 if life threatening symptoms
- Apnea
Signs and Symptoms

- High fever
- Chills
- Myalgia
- Headache
- Fatigue
- Sore throat/pharyngitis
- Nasal congestion / Rhinitis
- Nonproductive cough
- Cervical lymphadenopathy
- Conjunctivitis
Common Pediatric Symptoms

- Fever (< 2yrs and >2yrs)
- Irritability (< 2yrs and >2yrs)
- Lethargy (< 2yrs and >2yrs)
- Cough Sore throat Fast Breathing
- Dehydration
- Vomiting
- Chest or stomach pain
- Dizziness
- Tachypnea
Elevated Respiratory Rate

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth up to 3 months</td>
<td>&gt; 60/min</td>
</tr>
<tr>
<td>3 months up to 1 year</td>
<td>&gt; 50/min</td>
</tr>
<tr>
<td>1 to &lt; 3 years</td>
<td>&gt; 40/min</td>
</tr>
<tr>
<td>3 to &lt; 6 years</td>
<td>&gt; 35/min</td>
</tr>
<tr>
<td>6 to &lt; 12 years</td>
<td>&gt; 30/min</td>
</tr>
<tr>
<td>12 to 18 years</td>
<td>&gt; 20/min</td>
</tr>
</tbody>
</table>

*Box 1: Definition of “Fast Breathing”*
<table>
<thead>
<tr>
<th>Flu vs. Colds: A Guide to Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Flu</strong></td>
</tr>
<tr>
<td>Onset</td>
</tr>
<tr>
<td>Fever</td>
</tr>
<tr>
<td>Exhaustion level / activity</td>
</tr>
<tr>
<td>Headache</td>
</tr>
<tr>
<td>Appetite</td>
</tr>
<tr>
<td>Muscle aches</td>
</tr>
<tr>
<td>Chills</td>
</tr>
</tbody>
</table>
Diagnosis

✅ It’s all about timing
  ✅ What season is it?
  ✅ Diagnosed on symptoms
  ✅ Flu tests indicated (RIDT or cultures)
    ✅ Early in season
    ✅ Symptomatic previously healthy infants
      ✅ NOTE: Rapid test helpful in ER
      ✅ NOTE: Cultures of limited value in ER
## Diagnosis

- **Influenza testing / Rapid Test (RIDT)**

<table>
<thead>
<tr>
<th>RIDT POSITIVE for one of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Influenza A</td>
</tr>
<tr>
<td>- Influenza B</td>
</tr>
<tr>
<td>- Influenza A and B (A/B)</td>
</tr>
</tbody>
</table>

**Interpretation:**  
*Influenza virus infection likely*<sup>1,2</sup>

**Actions:**  
- Initiate antiviral treatment for influenza if clinically indicated.
- Consider additional influenza virus testing to confirm RIDT results, for subtyping of influenza A virus, to distinguish between influenza A and B viruses, or for more specific analyses, if indicated.
- Consider additional diagnostic testing for other pathogens and/or empiric antibiotic therapy for bacterial co-infection, if indicated.<sup>3</sup>

<table>
<thead>
<tr>
<th>RIDT NEGATIVE for one or more of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Influenza A</td>
</tr>
<tr>
<td>- Influenza B</td>
</tr>
<tr>
<td>- Influenza A and B (A/B)</td>
</tr>
</tbody>
</table>

**Interpretation:**  
*Cannot rule out Influenza virus infection*<sup>1,2</sup>

**Actions:**  
- Use clinical signs, symptoms, history, examination, information on local influenza activity in the community to decide if antiviral treatment is indicated.
- Do not use negative RIDT results exclusively for clinical decision-making, or for public health decisions, including identifying influenza outbreaks, or for decisions on infection control measures.
- Consider additional influenza testing if indicated. Consider additional diagnostic testing and/or empiric antibiotic therapy for bacterial infection if indicated.<sup>3</sup>
Pediatric Treatment

✓ Prevention!!

All children > 6 mo

Any child with chronic illness

Egg allergy - OK for injectable form

6 mo – 8 yrs 2 doses

If first time vaccinated

1 dose reduced coverage
2016-2017 Vaccine

✓ Trivalent covers
  ✓ H1N1-like
  ✓ H3N2-like
  ✓ B/Brisbane/60/2008–like (Last year’s quad addition)

✓ Quadrivalent includes
  ✓ B/Phukjet/3073/2013-like (Last year’s tri addition)
  ✓ Not recommended < 2 yrs.

✓ Live attenuated not used < 2, >49 years
  ✓ Or if taking aspirin
Supportive care
- Acetaminophen for fever
- Cough suppressants and expectorants
- Humidifier
- Oral fluids
  - Intravenous if dehydrated
- Antiviral therapy for high risk
  - > 2 yrs
Antiviral Effectiveness

✓ Effectiveness against seasonal flu
  ✓ Oseltamivir / Tamiflu (+)
  ✓ Zanamivir / Relenza (+)
  ✓ Amantadine / Symmetrel (-)
  ✓ Rimantadine / Flumadine (-)
Infants With Influenza

- Tamiflu
  - J Inf Dis 2012(12)
  - Influenza Virus Types A and B
- Dose
  - Twice daily
    - Birth - 11 mo 3.0 mg/kg
    - Twice daily x 5 days
Infants With Influenza

✓ Isolation
  ✓ ? Cohort
  ✓ Full barrier
    ✓ (Should include eyes)

✓ Supportive care
  ✓ Pneumonitis likely
  ✓ Treat sepsis/shock
    ✓ Fluids
    ✓ ? Role of steroids
Infants With Influenza

- Treat ARDS / ALI
  - Positive pressure ventilation
  - Consider CPAP
  - Optimal PEEP strategies
  - High Frequency ?
- Nitric Oxide ???
- ECMO
  - 63% survival
- ? Surfactant
  - Reduced vent days