While we all plan for the upcoming holiday season, we need to also prepare for the inevitable viral respiratory season that fills our clinics and our inpatient beds with sick children. As in years past, we are already seeing an early increase of respiratory pathogens, including RSV and influenza. Specifics for influenza were covered in the October editions of Contagious Comments, so this edition will highlight management of other respiratory pathogens.

Each year, a multidisciplinary group of Children’s Hospital Colorado clinicians meet to review virus epidemiology data from years past and what viruses we expect to circulate this season. Preventative strategies are discussed to determine what should be implemented this year to minimize the spread of these infections at Children’s. Although our influenza vaccination campaign has been in full swing for several weeks, that alone is not enough.

This edition will provide reminders about basic principles as well as information on testing, patient management, visitation practices and prevention. Throughout the season, be sure to monitor “Bug Watch” so you can see what pathogens we are detecting in our lab from patients seen throughout our Children’s Hospital system.

**Important information for this season:**

**Visitation Restrictions: December 1st, 2013 – April 30, 2014**

**Inpatient Visitor Screening and Restrictions**

On December 1st, 2013 we implemented our respiratory season visitation restrictions on the inpatient units to help protect these patients from ill visitors. This date has been moved up by a few weeks since influenza has arrived earlier again this season. Visitation hours are 9a – 9p. The visitation restriction program includes the following:

1) All visitors (including siblings) must be at least 13 years of age to visit. Please advise your patient’s family of our visitation restrictions when referring them to Children’s to prevent any confusion when they arrive at our facility. This really helps!

2) Only 4 visitors (this number includes the parents) at a patient bedside at a given time.

3) No ill visitors.

4) ALL parents and visitors will be screened daily before entry into the inpatient units. Each unit has a screening station located at the entry to the unit. All visitors who meet criteria and are not ill will be given an apple sticker to wear indicating they have been screened.

5) Visitors must adhere to any isolation precautions noted on the patient room door sign and are to wash hands before leaving the room. **Exception:** Parents may refrain from wearing isolation apparel, but need to wash hands each time upon entering and before leaving the room.

6) In the event the primary caretaker (parent/guardian) has a respiratory illness, he /she is requested to wear a mask and wash hands when outside the room and to limit activity (and wear a mask) during the following:

   a. Obtaining food in cafeteria (should return to patient room to eat, if possible).

   b. Avoid crowded areas in hospital (e.g., gift shop).

   c. Avoid high-risk patient visitation (if possible); if unavoidable (primary caregiver only), must wear a mask, gown and gloves. Discourage “close” patient contact.

7) Some of our higher risk units (ICUs, BMT) have more stringent visitor restrictions that may affect the number of people allowed to visit based on a pre-approved visitor list for each patient.

8) Decreasing the number of people visiting a single patient will decrease exposure risks and also provide an opportunity to educate a select group of visitors on the important steps to prevent transmitting infectious illnesses to our patients.

**Outpatient Clinic /Therapy & Surgery/Procedure Visits:**

Due to an increase in respiratory illnesses in the community during these months, we discourage bringing siblings or friends who are under 13 years of age, especially when ill, to your child’s scheduled visits to these areas.

**Respiratory Infection Tips & Tools**

**Mode of Transmission of Most Respiratory Agents**

Transmitted in large droplets by:

- Direct or close contact with secretions (e.g., close face to face contact), or
- Touching contaminated objects in the environment and inoculating self or others (e.g. hand-to-eye, hand-to-mouth)
Remember...

**RSV Persists:**
- Up to 30 minutes for secretions in facial tissues.
- 30 minutes or more on hands.
- Up to 6 hours on surfaces (some viruses can be even longer).

**Incubation Period** is 2 - 8 days (4 - 6 days most common).

<table>
<thead>
<tr>
<th>Organism</th>
<th>Illnesses</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenovirus</td>
<td>Pharyngitis, Tonsillitis, Croup, Bronchiolitis, Pneumonia, Keratoconjunctivitis, Common cold</td>
<td>Year-round, peak late winter-spring</td>
</tr>
<tr>
<td><em>Bordetella pertussis, B. parapertussis</em></td>
<td>Whooping cough, “Pertussis”, Milder form caused by <em>B. parapertussis</em></td>
<td><em>B. pertussis</em> at “epidemic” levels in CO since 2012  <em>B. parapertussis</em> is less common.</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>Common cold, Croup, Pneumonia</td>
<td>Fall-winter</td>
</tr>
<tr>
<td>Human meta-pneumovirus (HMPV)</td>
<td>Bronchiolitis, Croup, Pneumonia</td>
<td>Year round; most late winter - spring.</td>
</tr>
<tr>
<td>Influenza (seasonal)</td>
<td>Flu, Bronchitis, Croup, Pneumonia, Secondary bacterial infections</td>
<td>Late Dec/Jan/Feb, Can persist into spring if other types or strains appear.</td>
</tr>
<tr>
<td>Parainfluenza</td>
<td>Croup, Bronchiolitis, Bronchitis, Pneumonia, Common cold</td>
<td>Type 1,2 - fall Type 3 – spring Type 4 – year round; peak in fall</td>
</tr>
<tr>
<td>RSV</td>
<td>Bronchiolitis, Pneumonia, Croup</td>
<td>December - April</td>
</tr>
<tr>
<td>Rhinovirus</td>
<td>Common cold</td>
<td>Year-round with peaks in fall and spring</td>
</tr>
</tbody>
</table>

**Isolation**

**Basic Infection Control**

For patients with symptoms of a “suspected” or a “proven respiratory” illness.

**Droplet Precautions**

1. PLEASE do not tell patients in isolation that they can walk in halls or go to playroom, cafeteria, etc. Patients in isolation are not allowed to leave their room unless they are going to another department for a procedure that cannot be performed in their room. Isolation precautions are to be used during transport and the receiving department should be notified in advance of the need for isolation precautions for the patient.

2. Gown, glove and mask or face shield are needed by staff whenever coming into contact with the patient or anything in the environment. ALSO, REMEMBER TO USE EYE PROTECTION WHEN SUCTIONING OR IF IN CLOSE CONTACT WITH A COUGHING PATIENT. If no such contact occurs, and you are not within a few feet of the patient, you are exempt as long as you are healthy and do not touch any items in the room!

3. N95 masks should be used by staff performing cough inducing and aerosol generating procedures such as nasal suctioning, collecting nasopharyngeal washes or swabs etc.

4. Hospital staff with respiratory illness should consult policy Employee Infectious Illness Exposure (OHS-003) to assess if they should be working with patients or are too ill to be at work. If you have any questions regarding this policy you can reach Occupational Health at 7-6577.

5. Use good handwashing / hand hygiene after removing gloves (prior to leaving the patient room).

6. Don’t forget to disinfect your stethoscope and any other equipment that is used between patients.

**DISCONTINUING ISOLATION**

**FOR PATIENTS WITH VIRAL RESPIRATORY ILLNESS**

(This does not apply to patients with Pertussis.)

May discontinue isolation if ALL of the following conditions are met:

A. Patient is currently asymptomatic.
B. It has been at least 7 days from first positive specimen.
C. Patient will be hospitalized at least 2 more weeks.
D. No underlying immunodeficiency or chronic respiratory condition.  
E. If repeat PCR for the virus involved is negative.

1. If immunocompromised or with a chronic respiratory condition, then the 
   individualized decision requires Epidemiology evaluation and consensus 
   recommendation (at least 2 members of the Infection Control Executive 
   Committee). Epidemiology will document recommendation in the 
   patient record (progress notes). 
   For BMT patients refer to “BMT Respiratory and Enteric Disease Isolation 
   Guidelines” P&P (ONC-001-A) in the IC manual on Planet TCH 

   *Children’s Infection Control Policy: “Isolation and Standard Precautions 
   (IC-008)”.

### Sick Staff

Many respiratory illnesses present in adults as a slight cold or 
persistent cough, however, large numbers of organisms can be 
shed by sneezing/coughing, etc, and when transmitted can cause severe 
disease in our patients. If you have mild URI symptoms (minus fever), you may work if you wear a mask (changed 
frequently throughout the day), wear gloves with patient contact, 
and wash hands frequently or use alcohol based hand rub. 

Exceptions:

1. You should not care for high-risk patients (e.g. BMT, organ transplant, and immunocompromised).
2. No ill staff allowed in the BMT unit.
3. WASH YOUR HANDS after removing gloves.

### Avoid contact with high-risk patients if you are ill.

### Diagnosis

**Specimens:** Nasopharyngeal (NP) aspirates or washes are the preferred upper airway specimen for hospitalized or immunocompromised patients.

NP flocked swabs are an alternative way to collect NP specimens, but should only be used with immune-normal outpatients or if vacuum is not available. Flocked swabs get their name from the hundreds of soft tinyprojections on their tips, like the “flocking” on Christmas trees. These projections capture respiratory epithelial cells and fluids extremely well, so flocked swabs recover almost as many respiratory pathogens as aspirates or washes. They also cost less than mucus traps and the collection process is rapid and not as frightening for children. The sensitivity of tests collected using flocked swabs, however, is slightly less than for aspirates or washes. Therefore we do not recommend flocked swabs for hospitalized or immunocompromised patients.

Tracheal aspirates or BALs are most useful to diagnose lower respiratory tract disease, especially in immunocompromised patients or adults who often shed lower amount of pathogens in their upper airways.

**Testing:** Two respiratory virus polymerase chain reaction (PCR) assays are again available this winter, the influenza virus PCR and the comprehensive panel respiratory virus PCR. See our previous edition of Contagious Comments and the “Respiratory Virus Testing Algorithm” below for further information about influenza PCR.

New this winter is that the comprehensive PCR panel is being performed exclusively by Film Array. This system provides rapid PCR results in 6 hours or less on average, 24/7, once specimens arrive at the Anschutz Campus laboratory (compared to a day or longer with our previous system). Film Array detects the same 14 respiratory viruses as our previous system (see Algorithm), and can also subtype (i.e. determine the hemagglutinin or H gene designation) of all common circulating, influenza A viruses.

Testing for the new Middle-Eastern Respiratory Syndrome coronavirus, MERS, or SARS coronavirus are only available through our State Health Department. If an unusual coronaviruses or novel influenza virus is suspected, contact Epidemiology and Infectious Diseases for guidance immediately.

Also new this year is *Bordetella parapertussis* PCR. This organism causes whooping cough which differs from that due to *B. pertussis*, in that symptoms are milder and less prolonged so prophylaxis of contacts is usually unnecessary. *B. parapertussis* PCR can be ordered alone or when *B. pertussis* PCR is ordered. Specimen requirements for both tests are the same.

Cytomegalovirus (CMV) and herpes simplex virus (HSV) are not detected by the respiratory virus PCR panel or influenza PCR. CMV or HSV can cause lower respiratory tract infection, especially in immunocompromised patients, and may respond to antiviral treatment. Consider ordering CMV or HSV culture for seriously ill patients or for a change in symptoms, even if more common respiratory viruses have been detected. Results are available in 1-2 days.
<table>
<thead>
<tr>
<th>Virus Detected</th>
<th>Test &amp; Relative Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resp. Viral PCR (RVP)</td>
</tr>
<tr>
<td>Influenza A, B</td>
<td>++++</td>
</tr>
<tr>
<td>Influenza A Subtype</td>
<td></td>
</tr>
<tr>
<td>RSV</td>
<td>++++</td>
</tr>
<tr>
<td>Parainfluenza Virus</td>
<td>++++</td>
</tr>
<tr>
<td>HMPV</td>
<td>++++</td>
</tr>
<tr>
<td>Adenovirus</td>
<td>++++</td>
</tr>
<tr>
<td>Rhinovirus</td>
<td>++++</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>+++ Reports only the 4 common types. Cannot detect MERS or SARS CoV</td>
</tr>
<tr>
<td>Acceptable Specimens</td>
<td>Nasal wash, tracheal aspirate, BAL, or lung tissue. NP swab (outpatients only)</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>6 hrs average</td>
</tr>
<tr>
<td>Relative Cost</td>
<td>$$$$$</td>
</tr>
</tbody>
</table>

**Who to test?**

The algorithm below summarizes our recommendations for ordering of respiratory virus tests, viruses detected, and specimen requirements.

![Respiratory Virus Test Algorithm Diagram](image-url)

**RESPIRATORY VIRUS TEST ALGORITHM**

- **Child with respiratory or influenza illness**

  - **Will the results change clinical practice for the patient or patients?**
    - **NO**
      - Do not test
    - **YES**
      - E.g., Start or stop antivirals, assess need for prophylaxis, limit antibiotics and/or ancillary testing, decrease hospitalization

  - **If only influenza virus is relevant**
    - **YES**
      - **INFLUENZA VIRUS PCR**
        - Detects influenza A, B, RSV, FLU, parainfluenza 1-4, HMPV, adenovirus, rhinovirus, CoV's OC43, 229E, NL63 HKU1, Mean turnaround time: 3 hrs
      - Cost $  
      - Nasal wash or NP swab
    - **NO**
      - **RESPIRATORY VIRUS PCR**
        - Detects influenza A, B, parainfluenza 1-4, MERS, SARS CoV  
        - Mean turnaround time: 6 hrs
      - Cost $$$$  
      - Nasal wash, NP swab, tracheal aspirate, BAL, lung
Figure 2
Bronchiolitis Care Algorithm

All Patients should receive upper airway suctioning prior to classification of disease severity.
Do not use treatment algorithm in the toxic appearing patient.

Mild Disease
- Observe
- Supportive care (suctioning, & fluids)
- Teach supportive home care
- Discharge when criteria met
- Supplemental oxygen if RA sat consistently less than or equal to 88%

Moderate Disease
- Consider supportive care measures only
  - If nebulizer treatment considered:
    - First Choice: Racemic epinephrine 0.25 mL (less than 5kg) or 0.5 mL (5kg+) via Nebulizer *
    - Alternate Choice: May consider Albuterol 2.5 mg ↑
  - If positive response↑ to neb suggest:
    - Observe
    - Supplemental oxygen
    - Supportive care (suctioning, & fluids)
    - Teach supportive home care
    - Discharge when criteria met
  - If no response to neb suggest:
    - Observation
    - Supplemental oxygen
    - Supportive care

Severe Disease
- First Choice: Racemic epinephrine 0.25 mL (less than 5kg) or 0.5 mL (5kg+) via Nebulizer *
  - Alternate Choice: May consider Albuterol 2.5 mg ↑
  - If positive response to neb suggest:
    - May repeat
    - Supportive care (suctioning, & fluids)
    - Supplemental oxygen
    - Admit appropriate medical service
  - If no response to neb suggest:
    - Blood gas
    - Supplemental oxygen
    - Consider CXR
    - Consider other etiologies- heart disease, sepsis, metabolic conditions
    - May require intubation and ICU care

Bronchiolitis Severity Classification

<table>
<thead>
<tr>
<th>Mild Disease</th>
<th>Moderate Disease</th>
<th>Severe Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert, active, feeding well</td>
<td>Alert, consoles, feeding decreased</td>
<td>Fussy, difficult to console, poor feeding</td>
</tr>
<tr>
<td>None to minimal retractions</td>
<td>Minimal to moderate retractions</td>
<td>Moderate to severe retractions,</td>
</tr>
<tr>
<td>RR normal to mildly elevated (less than 50)</td>
<td>RR is mildly to moderately elevated (50-70)</td>
<td>RR is moderately to severely elevated (greater than 70)</td>
</tr>
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</table>

*data suggestive that may be helpful in outpatient setting (1 to 2 doses)
↑ data is not good for any benefit
↑15 to 30 minutes post neb- decrease in one level of severity classification
Therapies

Supportive Therapy: Adequate hydration, upper airway suctioning, and oxygenation are the mainstays of treatment for most infants with viral pneumonia and bronchiolitis.

Bronchodilators: Consider these if Severity Classification is moderate or severe. First Choice: Racemic Epinephrine. Alternate Choice: Albuterol via nebulizer. (See Clinical Care Guidelines)

Evaluating Clinical Status and Response to Treatment:

1. On initial assessment, determine Severity Classification
2. Decide on intervention (based on Care Algorithm (Figure. 3)
3. Repeat severity classification to determine if intervention was helpful

Respiratory Severity Classification:

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Supportive Care - Routinely Indicated:

Oxygen is probably the most effective therapy in infants and children with bronchiolitis and/or viral pneumonia.

- Oxygen to achieve SaO₂ ≥ 90%
- P.O. / I.V. fluids as needed
- Suction upper airway (use saline PRN):
  - Prior to feeding
  - Prior to clinical assessment
  - PRN evidence of upper airway obstruction

RSV Prophylaxis

In 2009, the American Academy of Pediatrics Committee on Infectious Diseases (Redbook) updated their recommendations regarding prophylaxis for RSV in an effort to ensure optimal balance of benefit and cost of this intervention. The recommendations were based on additional data regarding seasonality of RSV disease as well as limitations in available data on risk factors for identifying children at increased risk of serious RSV lower respiratory tract disease.

To view these new recommendations please use the following link:

http://www.cdc.gov/rsv/clinical/prophylaxis.html

Some Final Thoughts

Finally, remember to adhere to infection prevention practices and isolation procedures. Avoid inappropriate use of antibiotics for viral illness, continue vaccination for influenza and now that you are knowledgeable about the management of patients with viral bronchiolitis etc., you can help to dispel the many widely prevalent myths regarding ineffective therapies and patient management.

Bug Watch

Up-to-date information on currently circulating respiratory and enteric viruses detected by the Children’s Microbiology/Virology Laboratory can be provided to you weekly during the wintertime or twice a month spring-fall. It is also posted on Children’s Colorado Internet at: http://www.childrenscolorado.org/news/publications/bugwatch.aspx or you may receive it by email. Contact Carolyn Brock by email carolyn.brock@childrenscolorado.org or phone (720-777-6412) to begin receiving your personal copy.

VISITATION REMINDER!
12/1/2013 – 4/30/2014

Inpatient Units:

All visitors (including siblings) must be at least 13 years of age to visit.

Only 4 visitors (this # includes parents) at the bedside at a given time.

No ill visitors.

ALL parents and visitors will be screened daily before entry into the inpatient units.

Outpatient clinics/Network of Care sites:

Due to an increase in respiratory illnesses in the community during these months, we discourage bringing siblings or friends who are under 13 years of age to your child’s scheduled visits to these areas.

Thank You!
We are modifying our distribution process for Contagious Comments. If you wish to receive this publication please provide us with your E-mail address below.

Name: __________________________________________________  
(Print clearly please)  
E-mail Address: ________________________________________  
(Print clearly please)  

Both the Contagious Comments and Bug Watch publications are always posted on Children’s Hospital Colorado website at:  

Please return your E-mail address to: Carolyn Brock Children’s Hospital Colorado, Epidemiology – Box B276, 13123 E. 16th Avenue, Aurora, CO 80045 or E-mail address: carolyn.brock@childrenscolorado.org.  

Thank you for your interest in our publication.

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