During the winter months we see a variety of respiratory viruses causing coughs and colds, as well as lower respiratory tract disease.

This edition provides reminders about basic principles as well as information on testing, patient management, visitation practices and prevention of respiratory virus infections. Throughout the season, be sure to monitor “Bug Watch” so you can see what pathogens our lab is detecting from patients throughout the Children’s Hospital Colorado (CHCO) system.

**Important information for this season:**

### Visitation Restrictions:
**December 1, 2016 – April 30, 2017**

**Inpatient Visitor Screening and Restrictions**

Inpatient visitor screening and restrictions will begin on December 1, 2016. The visitation restriction program includes the following:

1. Visitation hours are 9am – 9pm.
2. 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!
3. Only 4 visitors (this number includes the parents) at a patient bedside at a given time.
4. No ill visitors.
5. 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.
6. Visitors must adhere to any isolation precautions (i.e. gown, gloves, mask) noted on the patient room door sign and are to wash hands before leaving the room. *Exception: Parents, siblings, or guardians living in the same household as the patient may refrain from wearing isolation apparel, but need to wash hands each time upon entering and before leaving the room.*
7. In the event the primary caretaker (parent/guardian) has a respiratory illness, he/she is requested to wear a yellow apple sticker, mask, and wash hands when outside the room and to limit activity (and wear a mask) during the following:
   a. When obtaining food in cafeteria (should return to patient room to eat, if possible).
   b. When walking through crowded hospital areas (e.g., atrium).
8. Avoid high-risk patient visitation (if possible); if unavoidable, the primary caregiver must wear a mask, gown and gloves. Discourage “close” patient contact. 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.
9. Decreasing the number of people visiting a single patient. This practice decreases exposure risks and counseling visitors about the practice provides an opportunity to educate them about important steps to prevent transmitting infections 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).
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 3 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 720-777-6577.

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

Don’t forget to disinfect your stethoscope and any other equipment that is used between patients. Hospital approved disinfectant wipes (e.g. Oxivir Tb) are appropriate for use on these items.

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 has been asymptomatic for 48 hrs.
B. Patient is not receiving anti viral therapy.
C. It has been at least 7 days from first positive specimen.
D. Patient will be hospitalized at least 2 more weeks.
E. No underlying immunodeficiency or chronic respiratory condition.
F. If repeat PCR for the virus involved is negative.

1. For guidance regarding patients with chronic respiratory conditions or are immunocompromised, refer to the algorithm “Discontinuing droplet precautions for patients with respiratory viral illness”

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

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<table>
<thead>
<tr>
<th>Epidemiology</th>
<th>Illnesses</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adenovirus</td>
<td>- Pharyngitis</td>
<td>Year-round, peak late winter-spring</td>
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<tr>
<td></td>
<td>- Tonsillitis</td>
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<tr>
<td></td>
<td>- Croup</td>
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<tr>
<td></td>
<td>- Bronchiolitis</td>
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<tr>
<td></td>
<td>- Pneumonia</td>
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<tr>
<td></td>
<td>- Keratoconjunctivitis</td>
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<tr>
<td></td>
<td>- Common cold</td>
<td></td>
</tr>
<tr>
<td>Bordetella pertussis, B. parapertussis</td>
<td>- Whooping cough</td>
<td>No clear seasonality</td>
</tr>
<tr>
<td></td>
<td>- “Pertussis”</td>
<td></td>
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<tr>
<td></td>
<td>- Milder form caused by B. parapertussis</td>
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</tr>
<tr>
<td>Coronaviruses</td>
<td>- Common cold</td>
<td>Fall-winter</td>
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<tr>
<td></td>
<td>- Croup</td>
<td></td>
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<tr>
<td></td>
<td>- Pneumonia</td>
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<tr>
<td>Enterovirus</td>
<td>- Asthma</td>
<td>Spring-Fall</td>
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<tr>
<td></td>
<td>- Pneumonia</td>
<td></td>
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<tr>
<td></td>
<td>- Acute flaccid myelitis</td>
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<tr>
<td>Human meta-pneumovirus (HMPV)</td>
<td>- Bronchiolitis</td>
<td>Year round; mostly late winter - spring.</td>
</tr>
<tr>
<td></td>
<td>- Croup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pneumonia</td>
<td></td>
</tr>
<tr>
<td>Influenza (seasonal)</td>
<td>- Flu</td>
<td>Usually Dec - Feb. Can persist longer if new viruses appear.</td>
</tr>
<tr>
<td></td>
<td>- Bronchitis</td>
<td></td>
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<tr>
<td></td>
<td>- Croup</td>
<td></td>
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<tr>
<td></td>
<td>- Pneumonia</td>
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<tr>
<td></td>
<td>- Secondary bacterial infections</td>
<td></td>
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<tr>
<td>Parainfluenza</td>
<td>- Croup</td>
<td>Type 1,2 - fall</td>
</tr>
<tr>
<td></td>
<td>- Bronchiolitis</td>
<td>Type 3 – spring</td>
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<tr>
<td></td>
<td>- Bronchitis</td>
<td>Type 4 – year round; peak in fall</td>
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<tr>
<td></td>
<td>- Pneumonia</td>
<td></td>
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<tr>
<td></td>
<td>- Common cold</td>
<td></td>
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<tr>
<td>RSV</td>
<td>- Bronchiolitis</td>
<td>December - April</td>
</tr>
<tr>
<td></td>
<td>- Pneumonia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Croup</td>
<td></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

Droplet Precautions should be implemented for any patient with symptoms of a “suspected” or a “proven respiratory” illness.
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. If you are too ill to work, please call 720-775ICK1 (74251), and leave the department you work, the time your symptoms started, and a list of your symptoms. This is an anonymous reporting and surveillance system to aid in the detection of outbreaks. You will still need to call your supervisor/charge to call out sick.

Diagnosis

Specimens: Nasopharyngeal (NP) aspirates or washes are the best upper airway specimen for hospitalized or immunocompromised patients. NP flocked swabs should only be used for otherwise healthy outpatients, because swabs may not contain sufficient diagnostic material unless they reach the NP and are rotated there for 10-15 seconds. Swabs of the nares should never be sent because yield of viruses from the nose is low. See our CHCO Clinical Policy “Nasopharyngeal Flocked Swabs” for swab collection instructions or call Respiratory Care (720-777-6227) for a demonstration.

Tracheal aspirates or bronchoalveolar lavage are best to diagnose lower respiratory tract viral disease in immunocompromised patients and older children or adults due to lower amounts of virus in their NP.

Testing: Several polymerase chain reaction (PCR) assays are available for respiratory pathogens. The Respiratory Pathogen PCR (RPP) detects the 17 viruses/types and 3 “atypical” bacteria listed in the table in 3 hours or less after specimens arrive at the Anschutz Campus laboratory. RPP can identify Bordetella pertussis but the B. pertussis/parapertussis PCR should be ordered for suspected “whooping cough.” RPP is slightly less sensitive than Pertussis PCR and can misidentify high concentrations of B. parapertussis as B. pertussis, necessitating confirmatory testing which delays results.

Influenza A/B PCR is as sensitive and rapid but less expensive than RPP for influenza virus detection. It cannot, however, be used to test specimens from lower airways. New this season, influenza A/B PCR will not separately call out influenza A(H3N2).

Testing for the Middle-Eastern Respiratory Syndrome coronavirus (MERS) is available only through the State Health Department. If an unusual coronaviruses or novel influenza virus is suspected, contact Epidemiology and Infectious Diseases for guidance for isolation and appropriate testing.

Cytomegalovirus (CMV) and herpes simplex virus (HSV) are not detected by RPP or influenza PCR, but can reactivate and cause lower respiratory tract disease, especially in immunocompromised patients. Consider ordering CMV/HSV culture for high-risk patients with severe respiratory symptoms that persist or worsen, even if other respiratory pathogens are detected. Positive results are usually available in 2-3 days.

<table>
<thead>
<tr>
<th>ORGANISM DETECTED</th>
<th>TEST AND RELATIVE VALUE</th>
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<tbody>
<tr>
<td></td>
<td>Resp. Pathogen PCR</td>
</tr>
<tr>
<td>Influenza A, B</td>
<td>+++</td>
</tr>
<tr>
<td>Influenza A Subtype</td>
<td>0</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/Enterovirus</td>
<td>+++</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>+++</td>
</tr>
<tr>
<td>B. pertussis</td>
<td>++</td>
</tr>
<tr>
<td>C. pneumoniae</td>
<td>+++</td>
</tr>
<tr>
<td>M. pneumoniae</td>
<td>+++</td>
</tr>
</tbody>
</table>

Acceptable Specimens: NP wash, NP swab, tracheal aspirate, BAL, tissue

Mean Turnaround: <3 hours, <3 hours, 1.5 day

Relative Cost: $$$$$, $, $$ (if both ordered)
Who to test?

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

RESPIRATORY PATHOGEN TEST ALGORITHM

Child with respiratory or flu-like illness

Will results change clinical care of the patient or clinical practice for other patients?

NO
Do not test

YES
E.g. start or stop antimicrobials, assess need for prophylaxis, limit ancillary testing, decrease hospitalization

If only influenza virus is relevant

INFLUENZA VIRUS PCR
Detects Influenza A/B only
Mean turnaround time - 3 hrs
Cost $$
Nasal wash or NP swab

If any common pathogen (including influenza) is relevant

RESPIRATORY PANEL (FILM ARRAY)
Detects influenza A/B, RSV, parainfluenza 1-4, HMPV, adenovirus, rhinovirus, 4 coronaviruses, M. pneumoniae, C. pneumoniae, B. pertussis
Average time turnaround time - 3 hrs
Cost $$$$ 
Nasal wash, NP swab, tracheal aspirates, BAL

Children's Hospital Colorado
Microbiology Laboratory 10/06/14
Figure 3. Bronchiolitis Care Algorithm

<table>
<thead>
<tr>
<th>Mild Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Alert, active, feeding well</td>
</tr>
<tr>
<td>• None to minimal retractions</td>
</tr>
<tr>
<td>• RR normal to mildly elevated (less than 50)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Moderate Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Alert, consoles, feeding decreased</td>
</tr>
<tr>
<td>• Minimal to moderate retractions</td>
</tr>
<tr>
<td>• RR is mildly to moderately elevated (50-70 in infancy, 40-60 for older infants/toddlers)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severe Disease</th>
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</thead>
<tbody>
<tr>
<td>• Fussy, difficult to console, poor feeding</td>
</tr>
<tr>
<td>• Moderate to severe retractions,</td>
</tr>
<tr>
<td>• RR is moderately to severely elevated (greater than 60-70 age to be considered)</td>
</tr>
</tbody>
</table>

*Do not use treatment algorithm in the toxic appearing patient*

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

- **Moderate Disease**
  - Consider supportive care measures only
  - For patients who are admitted for > 48 hours you may try 4 ml of 3% HTS (pretreat with Albuterol)
  - If positive response to neb:
    - Observe
    - Supplemental oxygen
    - Supportive care (suction & fluids)
    - Teach supportive home care
    - Discharge when criteria is met
  - If no response to neb suggest:
    - Observe
    - Supplemental oxygen
    - Supportive care (suction & fluids)
    - Admission to ICU

- **Severe Disease**
  - For patients who are admitted for > 48 hours you may try 4 ml of 3% HTS (pretreat with Albuterol)
  - If positive response to neb:
    - Observe
    - Supplemental oxygen
    - Supportive care (suction & fluids)
    - Teach supportive home care
    - Discharge when criteria is met
  - If no response to neb suggest:
    - Observe
    - Supplemental oxygen
    - Supportive care (suction & fluids)
    - Admission to ICU
    - May require ventilation and ICU care
Therapies

Supportive Therapy: Adequate hydration, upper airway suctioning, and oxygenation are the mainstays of treatment for most infants with viral pneumonia and bronchiolitis. Current AAP guidelines suggest that clinicians may consider a trial of nebulized hypertonic saline to infants and children who are hospitalized with bronchiolitis. Though commonly utilized, routine chest physiotherapy is also not supported in the current guidelines.

Bronchodilators: New guidelines from the AAP clearly state that children with bronchiolitis should not routinely receive bronchodilators (including racemic epinephrine and albuterol). Many practitioners will consider a careful trial of a bronchodilator in the presence of a typical wheeze, or a strong atopic history. Any such trial should be evaluated using objective clinical severity criteria. (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 Fig. 3)
3. Repeat severity classification to determine if intervention was helpful

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 at or above 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
The 2014 AAP guidelines for bronchiolitis include revised recommendations for the use of palivizumab (Synagis®). Children who are otherwise healthy and with a gestational age of at least 29 weeks and 0 days should not receive palivizumab. Those for whom 5 doses of palivizumab are recommended include infants during the first year of life with hemodynamically significant heart disease or chronic lung disease of prematurity defined as preterm infants <32 weeks 0 days’ gestation who require >21% oxygen for at least the first 28 days of life.

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.childrenscolordo.org/health-professionals/publications/bug-watch or you may receive it by email. Contact Carolyn Brock by email carolyn.brock@childrenscolordo.org or phone (720-777-6412) to begin receiving your personal copy.
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: http://www.childrenscolorado.org/health-professionals/publications/bug-watch

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.