Respiratory Season 2017-18
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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, 2017 – April 30, 2018*

**Inpatient Visitor Screening and Restrictions**

Inpatient visitor screening and restrictions will begin on December 1, 2017. 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) **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) **Limiting the number of visitors who visit a single patient on any unit. 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. Surgery schedulers will notify families when we are in visitation restriction season and suggest making other arrangements for other children under 13 years of age.

**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)
Did you know?
Respiratory viruses can remain on surfaces (e.g., hands, countertops, tissues) for several minutes to hours.

### Epidemiology

<table>
<thead>
<tr>
<th>Organism</th>
<th>Illnesses</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenovirus</td>
<td>• Pharyngitis</td>
<td>Year-round peak late winter-spring</td>
</tr>
<tr>
<td></td>
<td>• Tonsillitis</td>
<td></td>
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<td></td>
<td>• Croup</td>
<td></td>
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<tr>
<td></td>
<td>• Bronchiolitis</td>
<td></td>
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<tr>
<td></td>
<td>• Pneumonia</td>
<td></td>
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<tr>
<td></td>
<td>• Conjunctivitis/ “pink eye”</td>
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<tr>
<td></td>
<td>• Common cold</td>
<td></td>
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<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>
<td></td>
</tr>
<tr>
<td>Coronavirus</td>
<td>• Common cold</td>
<td>Fall-winter</td>
</tr>
<tr>
<td></td>
<td>• Croup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pneumonia</td>
<td></td>
</tr>
<tr>
<td>Enterovirus</td>
<td>• Asthma</td>
<td>Spring-Fall</td>
</tr>
<tr>
<td></td>
<td>• Pneumonia</td>
<td></td>
</tr>
<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>
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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>Influenza virus (seasonal)</td>
<td>• Flu</td>
<td>Usually Dec-Feb (longer if new strains appear)</td>
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<tr>
<td></td>
<td>• Bronchitis</td>
<td></td>
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<tr>
<td></td>
<td>• Croup</td>
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<tr>
<td></td>
<td>• Pneumonia</td>
<td></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>
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<tr>
<td></td>
<td>• Common cold</td>
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<tr>
<td>RSV</td>
<td>• Bronchiolitis</td>
<td>December - April</td>
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<tr>
<td></td>
<td>• Pneumonia</td>
<td></td>
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<tr>
<td></td>
<td>• Croup</td>
<td></td>
</tr>
<tr>
<td>Rhinovirus</td>
<td>Common cold</td>
<td>Year-round, peaks in fall and spring</td>
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### Isolation

#### Basic Infection Control

Droplet Precautions should be implemented for any patient with symptoms of a “suspected” or a “proven” respiratory illness.

#### 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 antiviral therapy.
C. It has been at least 7 days from first positive specimen.
D. Patient will be hospitalized for 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”.


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**Epidemiology**

Organism:  
- Adenovirus: Pharyngitis, Tonsillitis, Croup, Bronchiolitis, Pneumonia, Conjunctivitis/“pink eye”, Common cold
- Bordetella pertussis, B. parapertussis: Whooping cough, “Pertussis”, Milder form caused by B. parapertussis
- Coronavirus: Common cold, Croup, Pneumonia
- Enterovirus: Asthma, Pneumonia, Acute flaccid myelitis
- Human meta-pneumovirus (HMPV): Bronchiolitis, Croup, Pneumonia
- Influenza virus (seasonal): Flu, Bronchitis, Croup, Pneumonia, Secondary bacterial infections
- Parainfluenza: Croup, Bronchiolitis, Bronchitis, Pneumonia, Common cold
- RSV: Bronchiolitis, Pneumonia, Croup
- Rhinovirus: Common cold

Illnesses:  
- Year-round peak late winter-spring
- No clear seasonality
- Fall-winter
- Spring-Fall
- Year round; mostly late winter - spring.
- Usually Dec-Feb (longer if new strains appear)
- Type 1,2 - fall
- Type 3 – spring
- Type 4 – year round; peak in fall
- December - April
- Year-round, peaks in fall and spring
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 720-777SICK1 (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: Aspirates or washes of the nasopharynx (NP) are the most suitable specimens for respiratory pathogen detection. NP flocked swabs can also be sent if the swabs reach the posterior NP and are rotated for 10-15 seconds before removal. Swabs of the anterior nares should never be sent because the diagnostic yield from this site is low. See our CHCO Clinical Policy “Nasopharyngeal Flocked Swabs” for swab collection instructions or call Respiratory Care (720-777-6227) for a demonstration. Bronchoalveolar lavage (BAL) provides the best recovery of pathogens causing lower respiratory tract disease, especially for immunocompromised patients, older children, and adults who tend to shed less virus than young and otherwise healthy patients.

Testing: Several polymerase chain reaction (PCR) assays are available to detect respiratory pathogens. The Respiratory Pathogen PCR (RPP) can detect the 17 viruses/types and 3 “atypical” bacteria (see table below) in 3 hours or less. RPP can detect Bordetella pertussis, but B. pertussis/parapertussis PCR is preferred for patients with suspected “whooping cough” because the B. pertussis component of RPP is less sensitive than the targeted assay. RPP can also misidentify B. parapertussis as B. pertussis, so confirmatory testing is necessary. A new PCR to detect enterovirus-D68 in respiratory specimens that are positive for enterovirus/rhinovirus by RPP is now available.

This season’s Influenza A/B PCR is more sensitive for the commonly-circulating and novel influenza viruses and provides results faster (in about 2 hours, compared to 3 hours) than last winter’s assay. Sensitivity of the influenza PCR and the influenza components of RPP are equivalent, but the influenza PCR costs less. The influenza A/B PCR cannot, however, be run on specimens from lower airways.

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

Cytomegalovirus (CMV) sometimes causes lower respiratory tract disease, especially in immunocompromised patients. Consider ordering CMV culture on respiratory specimens 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>TESTS AND RELATIVE VALUE</th>
</tr>
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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 Subtypes</td>
<td>Reported</td>
</tr>
<tr>
<td>RSV</td>
<td>++++</td>
</tr>
<tr>
<td>Parainfluenza Virus</td>
<td>++++ Reports all 4 types</td>
</tr>
<tr>
<td>HMPV</td>
<td>++++</td>
</tr>
<tr>
<td>Adenovirus</td>
<td>+++ Resp. types only</td>
</tr>
<tr>
<td>Rhinovirus/Enterovirus</td>
<td>+++ Detects but does not report EV-D68</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>+++ Doesn’t detect MERS or SARS</td>
</tr>
<tr>
<td>B. pertussis</td>
<td>++ B. pertussis/parapertussis PCR preferred</td>
</tr>
<tr>
<td>C. pneumoniae</td>
<td>+++</td>
</tr>
<tr>
<td>M. pneumoniae</td>
<td></td>
</tr>
<tr>
<td>Acceptable Specimens</td>
<td>NP wash, NP swab tracheal aspirate, BAL, tissue</td>
</tr>
<tr>
<td>Mean Turnaround</td>
<td>&lt;3 hours</td>
</tr>
<tr>
<td>Relative Cost</td>
<td>$$$$</td>
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</tbody>
</table>
Who to test?

The algorithm below summarizes our recommendations for ordering of respiratory pathogen tests, organisms detected, and specimen requirements. Viral testing is not routinely indicated in bronchiolitis. If considering treating for influenza, order flu A&B PCR.

**RESPIRATORY PATHogen TEST ALGORITHM**

- **Child with respiratory or flu-like illness**
  - **NO**
    - Do not test
  - **YES**
    - Will results change clinical care of the patient or clinical practice for other patients?
      - **E.g.** start or stop antimicrobials, assess need for prophylaxis, limit ancillary testing, decrease hospitalization
        - **YES**
          - If only influenza virus is relevant
            - **INFLUENZA VIRUS PCR**
              - Detects Influenza A/B only
              - Mean turnaround time - 2 hrs
              - Cost $$
              - Nasal wash or NP swab
          - **RESPIRATORY PANEL (FILM ARRAY)**
            - Detects influenza A/B, RSV, parainfluenza 1-4, HMPV, adenovirus, rhinovirus, 4 coronaviruses, M. pneumoniae, C. pneumoniae, B. pertussis
            - Mean turnaround time - 3 hrs
            - Cost $$
            - Nasal wash, NP swab, BAL, tracheal aspirates, lung
        - **NO**
          - If any common pathogen (including influenza) is relevant
Figure 3. Bronchiolitis Care Algorithm

<table>
<thead>
<tr>
<th>Mild Disease</th>
<th>Moderate Disease</th>
<th>Severe Disease</th>
</tr>
</thead>
</table>
| • Alert, active, feeding well  
• None to minimal retractions  
• RR normal to mildly elevated (less than 50) | • Alert, consoles, feeding decreased  
• Minimal to moderate retractions  
• RR is mildly to moderately elevated (50-70 in infancy, 40-60 for older infants/toddlers) | • Fussy, difficult to console, poor feeding  
• Moderate to severe retractions,  
• RR is moderately to severely elevated (greater than 60-70 age to be considered) |

*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:
    - May repeat as needed
    - Supplemental oxygen
    - Supportive care (suction & fluids)
    - Admit appropriate medical service
    - Consider CRV
  - If no response to neb suggest:
    - Blood gas
    - Supplemental oxygen
    - HHFNC – consider ICU admission for any infant on whom HHFNC is initiated
    - Consider CRV
    - Consider other etiologies – heart disease, sepsis, metabolic conditions
    - May require ventilation and ICU care

*Data suggestive that may be helpful in outpatient setting (1 to 2 doses)† Data is not good for any benefit‡*

‡ Data is not good for any benefit

† Data suggestive that may be helpful in outpatient setting (1 to 2 doses)
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: Guidelines from the AAP clearly state that children with bronchiolitis should not routinely receive bronchodilators (including racemic epinephrine and albuterol). Consider a trial of albuterol in patients who do not improve as expected or who progress from moderate to severe severity. Any such trial should be evaluated using objective clinical severity criteria. (See Clinical Pathways)

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

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

RSV Prophylaxis

The 2015 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: Classic and Enhanced Versions

Up-to-date information on currently circulating respiratory and enteric viruses detected by the CHCO Microbiology/Virology Laboratory can be provided to you weekly in our Bug Watch publication during the wintertime or twice a month spring-fall. Bug Watch is also posted on Children’s Colorado Internet at: https://www.childrenscolorado.org/globalassets/healthcare-professionals/bug-watch.pdf 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.

In addition, interactive Bug Watch dashboards will be available in January 2018 for CHCO-based personnel only. One dashboard will enable users to visualize the number and types of respiratory viruses and bacteria in a stacked graph with user-selected axes to display individual pathogens detected over specific time periods. Others will depict the pathogens detected by the Gastrointestinal and Meningitis-Encephalitis PCRs. Staff can access this new feature on the “Infection Prevention and Control” home page via QuickLinks on MyChildrens Colorado. Please contact Carolyn Brock as noted above if you want more information.
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.