**Bronchiolitis Pathway Guidelines**

**Definition:**
Bronchiolitis is a disorder most commonly caused in infants by viral lower respiratory tract infection and is the most common lower respiratory infection in this age group. It is characterized by acute inflammation, edema, and necrosis of epithelial cells lining small airways, increased mucus production, and bronchospasm (American Academy of Pediatrics).

**Incidence:**
Almost all children are exposed to RSV, one of the most common viruses causing bronchiolitis by the age of 2. In children exposed to RSV for the first time, 20 to 40% develop bronchiolitis and 0.5 to 2% of those children require hospitalization.

**Etiology:**
The most common etiology is the respiratory syncytial virus (RSV). Other viruses identified as causing bronchiolitis are human metapneumovirus, influenza, adenovirus, and parainfluenza.

**Differential Diagnosis:**
- Asthma
- Foreign body
- Myocarditis
- Cystic fibrosis
- BPD
- Immunodeficiency

**Guideline Eligibility Criteria:**
Patients >28 days and <24 months with clinical symptoms of increased WOB, persistent cough, feeding difficulty, +/- fever, first episode of wheezing OR with a diagnosis of bronchiolitis.

**Guideline Exclusion Criteria:**
Patients with comorbid or complex medical conditions such as: chronic lung diseases, CF, congenital heart disease, immunodeficiency, toxic appearance/shock, neuromuscular disease, artificial or abnormal airway, recurrent wheezing.

**Diagnostic Evaluation:**
History and exam should include history of rhinorrhea, with or without cough and fever, possible exposure through others infected, possible wheeze, difficulty breathing, feeding difficulties, pallor or cyanosis and changes in behavior.

**Physical Examination:**
Assessment Guidelines for Symptom Severity
*(Consensus; weak recommendation; low quality of evidence)*

**Mild Symptoms**
- Alert, active, feeding well
- None to minimal retractions
- RR normal to mildly elevated (less than 50)
- >95% on RA

**Moderate**
- Alert, consoles, feeding decreased
- Minimal to moderate retractions
- RR is mildly to moderately elevated (50-69)
- 91-94% on RA

**Severe**
- Fussy, difficult to console, poor feeding
- Moderate to severe retractions
- RR moderately to severely elevated (>70)
- <90% on RA

**Laboratory Tests:**
Not routinely recommended for typical mild to moderate bronchiolitis.
*(Strong recommendation; Moderate quality evidence)*
If patient is febrile and >28days and ≤90 days consider: UA, urine culture *(47-51)*, CBC, and blood culture.
*(Strong recommendation; High quality evidence)*

**Critical Points of Evidence:**
**Evidence Supports**
*(Strong recommendation; Moderate quality evidence)*
- Supportive care including supplemental oxygen to maintain SaO2 >90%

**Evidence Lacking/Inconclusive**
*(Consensus; Weak recommendation; Moderate quality evidence)*
- 3% Saline Neb*
- HFNC*
- Use of dexamethasone *(29-30)*
- Clinical assessment tools *(4-11)*

POSTED: November 2014
Critical Points of Evidence Continued:

Evidence Against
(Strong recommendation; Moderate quality evidence)
- CXR (14-22)
- RSV testing (43-46)
- Deep suctioning
- CPT*
- CBC/blood culture (unless clinically indicated) (23-28)
- Antibiotics (unless confirmed bacterial source present)
- Corticosteroids
- Epinephrine*
- Use of inhaled bronchodilators*

Practice Recommendations and Principles of Clinical Management
The bronchiolitis diagnosis should consist of supportive care treatments as the main foundation for care. Support of respiratory symptoms, clearance of airways and dietary support are essential in the care and treatment of a child with bronchiolitis.

Treatment Recommendations
(for full recommendations see attached pathway and addendums)

Supportive Care:
- Supplemental oxygen should be administered to maintain SaO2 >90%
- Nasal suction using nasal aspirator to maintain and clear airway
- Assess and treat hydration status
  - Give PO challenge
  - Administer fluids as needed
  - Administer tube feeds as required (see addendum 2)

3% Saline Neb:
- Care Provider can order 4ml Q4 hrs for severe symptoms
- Multiple doses may be required to assess for effectiveness
- Patient should be re-evaluated Q24 hours and the treatment should be reordered if it is to be continued
- Once initiated: If the patient moves to a moderate assessment, the treatment can be continued if it is found to be effective
- If the treatment has been stopped, it can ONLY be reordered if the patient is experiencing severe symptoms

High Flow Nasal Cannula (Addendum 1) (31-39)
- Patient to be watched for at least 30 minutes after starting high Flow in the ER. If no worsening of symptoms, PCRS IMC resident notified.
- Any flow rates above what is listed below require an Intensivist consult:

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- For further guidelines and recommendations for use please see addendum 1.

Pediatric Bronchiolitis Severity Score (BSS)*
The BSS serves as a method to document patient status and acuity over the course of care. It can also be used to assess response to interventions. The tool is based on five key assessment areas; respiratory rate, oxygen need, wheezing, work of breathing, and presence of retractions.

The Bronchiolitis Severity Score (BSS) is an assessment tool and is not intended to determine admission and/or placement of the patient.

Admission Criteria
Floor:
- Moderate WOB, tachypnea
- O2 requirement
- Requires frequent suctioning
- Dehydrated or unable to maintain oral feedings
- Parent unable to care for infant at home

Pulmonary Unit- High Acuity (Floor criteria + any of the following):
- Moderate to severe WOB
- O2 requirement (< 50% FiO2)
- HFNC (see Addendum 1)

IMC (Floor, Pulmonary Unit criteria + any of the following):
- HFNC (see Addendum 1)
- Co-morbidities (CLD)
- BP requires close monitoring

PICU (Floor, Pulmonary Unit, IMC criteria + any of the following):
- Positive pressure ventilation
- Witnessed episode of apnea
- Severe dehydration/shock
- HFNC (see Addendum 1) or if not improving on HFNC after 30 minutes
Consults and Referrals
Consults and referrals should be ordered on an individual basis based on patient requirements.

Infection Control
Bronchiolitis/RSV require CONTACT isolation.
Special Considerations:
- Patients with additional symptoms of influenza should be placed into droplet isolation until the diagnosis of influenza is confirmed as negative.
- Staff should wear additional personal protective equipment when suctioning or performing assessments or treatments bringing them into close contact with the patient.
- Wash hands thoroughly after contact with the patient

Caregiver Education
- Hand washing after handling the patient or the patient's belongings
- Importance of not bringing other siblings to the hospital for visits
- Understanding of signs/symptoms of increasing respiratory distress
- Proper nasal suctioning (must demonstrate ability with bulb suction)
- Risk of passive smoke exposure
- Encourage Direct Breastfeeding whenever possible

Discharge Criteria
- SpO2 ≥ 90% on RA for ≥ 2 hours
- Respirations less than 60 per minute and/or minimal to no evidence of increased work of breathing
- Oral feedings tolerated at a level to maintain hydration
- Parents comfortable with providing home care, and parent education complete, including understanding:
  - Signs/symptoms of increasing respiratory distress
  - Proper nasal suctioning (must demonstrate ability with bulb suction)
  - Risk of passive smoke exposure
  - Need for PCP follow-up

Follow-Up Care
Ideally follow-up care should be planned for 2-3 days post-discharge with the patient’s primary care doctor

Prevention
Avoid contact with others who are ill
Wash hands

Outcome Measures
Length of stay
Cost (testing, antibiotics)
Pathway compliance
**ED Bronchiolitis Pathway**

**Exclusion Criteria:** Children w/ Comorbid/ complex medical conditions such as: chronic lung disease, CF, congenital heart disease, immunodeficiency, toxic appearance/shock, neuromuscular disease, immunodeficiency, toxic diseases, CF, congenital heart conditions such as: chronic lung.

**Inclusion criteria:**
- >28 days and <24 months with clinical symptoms of ↑WOB, persistent cough, feeding difficulty, +/- fever, first episode of wheezing OR with a diagnosis of bronchiolitis
- Supplemental oxygen should be administered to maintain SaO2>90%
- Nasal suction
- If febrile and >28 days & ≤90 days consider: UA, urine culture, CBC, & blood culture

**Assess Disease Severity**

- **Mild Symptoms**
  - Observe
  - Nasal suction using nasal aspirator
  - Assess hydration status
  - Give po challenge

- **Moderate Symptoms**
  - Nasal suction using nasal aspirator
  - Assess hydration status (PO ad lib OR NPO w/IVF or NG feeds)

- **Severe Symptoms**
  - Notify Provider
  - Nasal suction using nasal aspirator
  - Assess hydration status (consider IVF, check glucose/electrolytes for significant dehydration)
  - Consider 3% Saline Neb- (4ml Q4hr)

**Reassess Disease Severity**

Meets Discharge Criteria**

- Discharge Home

Meets Admission Criteria***

- Admit to Inpatient Unit Based on Admit Criteria (not score)

**INTERVENTIONS:**
All interventions should have a pre and post score to evaluate for effectiveness.

**High Flow Nasal Cannula Guidelines (see addendum 1)**

Patient to be watched for at least 30 minutes after starting High Flow in the ER. If no worsening of symptoms, PCRS IMC resident is notified. Any flow rates above what is listed below require an intensivist consult.

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*Assessment Guidelines*

Mild
- Alert, active, feeding well
- None to minimal retractions
- RR normal to mildly elevated (less than 50)
- ≥95% RA

Moderate
- Alert, consoles, feeding decreased
- Minimal to moderate retractions
- RR is mildly to moderately elevated (50-69)
- 91-94% on RA

Severe
- Fussy, difficult to console, poor feeding
- Moderate to severe retractions
- RR moderately to severely elevated (≥70)
- ≤90% on RA

**Discharge Criteria**

- SpO2 ≥ 90% RA
- Respirations less than 60 per minute and/or minimal to no evidence of increased work of breathing
- Oral feedings tolerated at a level to maintain hydration
- Parents comfortable with providing home care, and parent education complete, including understanding:
  - signs/symptoms of increasing respiratory distress
  - proper nasal suctioning (must demonstrate ability with bulb suction)
- Risk of passive smoke exposure
- Need for PCP follow-up
- Encourage continued DBF
- Prevention education
- Need for PCP follow-up

**Admission (Unit) Criteria**

**Floor:**
- Moderate WOB, tachypnea
- O2 requirement
- Requires frequent suctioning
- Dehydrated or unable to maintain oral feedings
- Parent unable to care for infant at home

**Pulmonary Unit- High Acuity (Floor criteria +):**
- Moderate to severe WOB
- O2 requirement (≤ 50% FiO2)
- HFNC (see right)

**IMC (Floor, Pulmonary Unit criteria +):**
- HFNC (see right)
- Co-morbidities (CLD)
- BP requires close monitoring

**PICU (Floor, Pulmonary Unit, IMC criteria +):**
- Positive pressure ventilation
- Witnessed episode of apnea
- Severe dehydration/shock
- HFNC (see right) or if not improving on HFNC after 30 minutes

The BSS is an assessment tool and is not intended to determine admission and/or placement of the patient.

PC 02-19-15
Addendum 1

High Flow Nasal Cannula (HFNC)
Recommended Guidelines for Use by PCRS

Recommendations:

1. It is desirable that all PCRS faculty have the same general approach for this technology in the interest of safety, mutual understanding of what to expect when cross covering, and to be consistent in our education roles.

2. This document is not a protocol but rather an internal document to guide us.

3. Variation from this guideline is appropriate so long as documentation exists.

4. Patient to be watched for at least 30 minutes after starting High Flow in the ER. If patient improves or there is no worsening of symptoms, PCRS IMC resident is notified.

5. Criteria for use on the Pulmonary Unit:
   - “Classic Bronchiolitis” w/o significant comorbidity (e.g. no chronic lung disease [abnormal compliance], no symptomatic congenital heart disease and without suggestion of impending respiratory failure)
   - Post-conceptual age > 44 wks but < 2 yrs
   - Moderate to severe disease (further definition of this pending)
   - FiO2 < 50% to maintain SaO2 > 90%
   - Flow Rates are recommended within the following parameters:

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6. Use of HFNC in IMC:
   - Same age criteria as the floor
   - Comorbidities above may be managed in IMC
   - Patients with mild respiratory acidosis may be managed in IMC at provider’s discretion

7. Critical Care consultation suggested for:
   - Any patient worsening after 30 minutes on HFNC
   - Any patient in severe distress not improving after 30 minutes on HFNC
   - FiO2 >50%
   - Flow rates above the recommended parameters
   - Apnea

8. Feeding while on HFNC (see addendum 2):
   - No evidence exists regarding risks of feeding while on HFNC
   - Consider NPO initially with decision for NGT or PO trial made after some stability reached

9. Weaning:
   - O2 wean by RT based on SaO2 goals
   - Flow wean to start by a physician’s order but generally not until stabilized for 8 -12 hrs.
   - Decrease flow by 2 lpm every 4 hrs
   - Change to NC when on 2 lpm for 4 hrs

prepared by: Duc, Cossey, Iyer & Holt
Exclusion Criteria:
Children with Comorbid or complex medical conditions such as: chronic lung diseases, CF, congenital heart disease, immunodeficiency, toxic appearance/shock, neuromuscular disease, artificial or abnormal airway, recurrent wheezing

Inpatient Bronchiolitis Pathway

Inclusion criteria: >28 days and <24 months with clinical symptoms of ↑ WOB, persistent cough, feeding difficulty, +/- fever, first episode of wheezing OR with a diagnosis of bronchiolitis

- Supplemental oxygen should be administered to maintain SaO2 >90%
- If febrile and >28 days & ≤90 days consider: UA, urine culture, CBC, and blood culture

Assess Disease Severity

**Mild Symptoms**
- Supportive Care
- BSS Score Q4hrs and prn
- PO ad lib
- Strict I&O
- Nasal suction using nasal aspirator

**Moderate Symptoms**
- Supportive Care
- BSS Score Q4hrs and prn
- PO ad lib OR NPO w/ IVF or NG feeds
- Strict I&O
- Nasal suction using nasal aspirator

**Severe Symptoms**
- Notify Provider
- NPO w/ IVF
- Interventions as ordered
- Consider initiation of HFNC****

Treatment Option (Ordered by MD):
3% Saline Neb-Order 4ml Q4 hrs
- Multiple doses are required to assess effectiveness
- Pt should be re-evaluated Q24 hrs and the treatment should be reordered if it is to be continued
- Once initiated: if the pt moves to a moderate assessment, the treatment can be continued if it is found to be effective
- If the treatment has been stopped, it can ONLY be reordered if the pt is experiencing severe symptoms

***Admission (Unit) Criteria
- Moderate WOB, tachypnea
- O2 requirement
- Requires frequent suctioning
- Dehydrated or unable to maintain oral feedings
- Parent unable to care for infant at home

Pulmonary Unit- High Acuity (Floor criteria +):
- Parent unable to care for infant at home
- Requires frequent suctioning

IMC (Floor, Pulmonary Unit criteria +):
- O2 requirement (< 50% FiO2)
- Moderate to severe WOB

Floor:
- Moderate WOB, tachypnea
- O2 requirement
- Requires frequent suctioning
- Dehydrated or unable to maintain oral feedings
- Parent unable to care for infant at home

INTERVENTIONS:
All interventions should have a pre and post score to evaluate for effectiveness.
(including, but not limited to: suctioning, repositioning, switch to NPO, implementation or discontinuation of O2, nebs)

**Scoring:** RN: Q4 hrs and pre/post intervention

Mild
- Alert, active, feeding well
- None to minimal retractions
- RR normal to mildly elevated (less than 50)
- ≤95% RA

Moderate
- Alert, consoles, feeding decreased
- Minimal to moderate retractions
- RR is mildly to moderately elevated (50-69)
- 91-94% on RA

Severe
- Fussy, difficult to console, poor feeding
- Moderate to severe retractions
- RR moderately to severely elevated (≥70)
- ≤90% on RA

**Assessment Guidelines**

**Discharge Criteria**

- SpO2 ≥ 90% RA for ≥ 2 hours
- Respirations less than 60 per minute and/or minimal to no evidence of increased work of breathing
- Oral feedings tolerated at a level to maintain hydration
- Parents comfortable with providing home care, and parent education complete, including understanding:
  - signs/symptoms of increasing respiratory distress
  - proper nasal suctioning (must demonstrate ability with bulb suction)
  - risk of passive smoke exposure
  - encouraged continued DBF
  - prevention education
  - Need for PCP follow-up

**Discharge Using Discharge Criteria**

NO Improvement
After Interventions, Initiation of HFNC, OR Minimal Improvement

**Severe Symptoms**
- Notify Provider
- NPO w/ IVF
- Interventions as ordered
- Consider initiation of HFNC****

Improvements
After Interventions

YES

*** Transfer to Pulmonary Unit, IMC OR Consult w/Intensivist for transfer to PICU

**High Flow Nasal Cannula Guidelines**

HFNC**** (see addendum 1)

Any flow rates above what is listed below require an Intensivist consult.
(See addendum 2 for feeding guidelines)

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PC 02-19-15
Addendum 2
Bronchiolitis and High Flow Nasal Cannula FEEDING Guidelines
Recommended Guidelines for Use by PCRS

Nutrition remains an important element to the treatment and healing of a child with bronchiolitis. There is little research that specifically addresses the safety of PO feeding a child with bronchiolitis AND has been started on high flow nasal cannula (HFNC). Below are guidelines based on literature review and the medical opinion of the DCMC Bronchiolitis workgroup.

Upon initiation of HFNC, the child should remain NPO to assess clinical response for approximately 1 hour. At that time, a discussion amongst the medical team and led by the attending physician will determine the appropriate method of nutrition.

- Should the child’s hydration status at the induction of HFNC be of concern, the medical team can choose from the following options:
  - Nasogastric tube (NGT)*
  - IVF
  - NGT + IVF
  - NJT (Nasojejunal tube)

If PO feeds have been started, it is strongly recommended to make the child NPO and consider the above options if:

- Choking/gasping and/or an increase in work of breathing during or acutely after PO feeding
- Respiratory rate consistently >60 bpm beyond 15 minutes
- Child is titrated to the maximum flow rate of HFNC for weight

At any time, the physician has the option to make the child NPO and hydrate the child by other means.

*Recommend initial NGT trial of pedialyte before (EBM or formula) to assess the child’s tolerance gastric distention while experiencing respiratory distress.
**Complete Blood Count and Blood Culture Testing**


**Chest X-ray**


**Complete Blood Count and Blood Culture Testing**


**Epinephrine and Dexamethasone**


**High Flow Nasal Cannula**


**Pulse Oximetry Monitoring**


**Respiratory Syncytial Virus Testing**


**Urinalysis and Urine Cultures**


