Pediatric Bronchiolitis, ED, Inpatient and ICU, Pathway

Last updated: September 22, 2022

Summary clinical algorithm:

Clinical pathway summary

CLINICAL PATHWAY NAME: Pediatric Bronchiolitis

PATIENT POPULATION AND DIAGNOSIS: Patients under the age of 2 years old, diagnosed with bronchiolitis

APPLICABLE TO: Helen DeVos Children’s Hospital and SH regional sites treating patient population

BRIEF DESCRIPTION: The goal of this pathway is to provide an evidence-based approach to the diagnosis and management of bronchiolitis in infants and children through 23 months of age. This pathway is intended for pediatricians, family medicine physicians, emergency
Bronchiolitis is a disorder commonly caused by viral lower respiratory tract infection in infants. It is characterized by acute inflammation, edema and necrosis of epithelial cells lining small airways, along with increased mucus production. Signs and symptoms include rhinorrhea and cough which may progress to tachypnea, wheezing, rales, retractions and/or nasal flaring. Bronchiolitis can be caused by many viruses; the most common is respiratory syncytial virus (RSV). Bronchiolitis is the most common cause of hospitalization among infants during the first 12 months of life.

TEAM LEADER(S): Dr. Allison Long, Dr. Erica Michiels, Dr. Andrea Hadley, Dr. Elizabeth Prentice, and Dr. Adam Nicholson

OWNING EXPERT IMPROVEMENT TEAM (EIT): Pediatric EIT

MANAGING CLINICAL PRACTICE COUNCIL (CPC): Children's Health CPC

CPC APPROVAL DATE: September 30, 2021

OTHER TEAM(S) IMPACTED: Nursing, respiratory therapy, registered dieticians, speech and language pathology.

OPTIMIZED EPIC ELEMENTS:
- Orderset: Peds Bronchiolitis Admission
- Flow sheet called BRPN respiratory distress score

IMPLEMENTATION DATE: Monday, October 18, 2021

LAST REVISED: September 22, 2022

FOR MORE INFORMATION, CONTACT: Allison Long, MD
Clinical pathway clinical approach:

ED management algorithm:

- Patient arrives to the ED
  - Respiratory Distress Score (RDS) completed by: Physician or Respiratory Therapist

Mild: 0-4
- Interventions:
  - Assess hydration status
  - Consider a period of observation in the Emergency department to determine disposition
  - Consider Suctioning:
    - nares suctioning
    - Consider nasopharyngeal if nares suctioning is not effective.
  - Continue routine care if no intervention performed. See Discharge parent education in box below.

Moderate: 5-7
- Initial intervention if patient not in severe distress:
  - Consider initial suctioning if patient's clinical condition allows.
  - Suctioning:
    - nares suctioning
    - Consider nasopharyngeal if nares suctioning is not effective.
  - Immediately contact Respiratory Therapy

Severe: 8 or above
- Initiate appropriate respiratory support. Options include:
  - Suctioning:
    - nares suctioning
    - Consider nasopharyngeal if nares suctioning is not effective.
  - HFNC
  - NIPPV
  - Intubation
  - Immediately contact Respiratory Therapy

Complete post intervention score

Mild: 0-4
- Discharge with parent education. Highlight needs for:
  - Suctioning
  - Feeding
  - Indications for re-evaluation (avoid standardized follow up time)

Moderate: 5-7
- Consider initiating HFNC
- Assess hydration status. Enteral hydration is preferred.

Severe: 8 or above
- Make patient NPO
- Insert IV
- Provide appropriate respiratory support based on clinical condition:
  - HFNC, NIPPV, or Intubation
  - Consider a trial of nebulized medication with reassessment of clinical response

If improving with intervention, consider reassessment
- Test for COVID-19 when admitting patient, consider influenza testing when seasonally appropriate.

Patient stable on HFNC <= 1.5 L/kg/minute and <=50% FiO2
- YES
  - Admit to floor after discussion with hospitalist
- NO

Avoid routine use of:
- Nebulized and inhaled treatments
- Chest x-rays
- Corticosteroids
- Antibiotics

Diagnostic Testing:
- Routine testing for viral pathogens is not recommended.
- Consider COVID PCR testing for all patients.
- With appropriate symptoms and seasonality, consider influenza testing if it will effect antiviral treatment.
ED Management of Bronchiolitis

Emergency department (ED) management of bronchiolitis involves identification and diagnosis of this clinical condition, assessment of severity of illness, use of supportive interventions (e.g. nasal suctioning, ventilatory support, oxygen therapy, fluid resuscitation), determination of appropriate disposition and appropriate counseling of parents/caretakers. In most cases, the patient will be initially seen and evaluated by a nurse and vital signs will be obtained. A physician and/or APP will then evaluate the patient; once clinical bronchiolitis is determined to be the likely diagnosis, a Respiratory Distress Score (RDS) should be determined. The initial RDS may be determined by the physician/APP or by a respiratory therapist (RT). Interventions, such as but not limited to, nasal or nasopharyngeal suctioning, patient repositioning and/or oxygen therapy, should be considered and performed. After initial interventions are performed, the patient’s follow-up RDS should direct the decision to provide additional respiratory support and patient disposition. In all cases, the patient’s hydration status should also be assessed and appropriate interventions, based on the patient’s clinical condition, should be used. For discharged patients, counseling should be provided to parents/caregivers that addresses home care and indications for emergency department return. For both admitted and discharged patients, routine use of bronchodilators, steroids and antibiotics is not recommended, but may be appropriate in limited cases. Similarly, routinely obtaining chest radiographs and viral studies (e.g. RSV testing) are typically not necessary.

Mild Disease (RDS 0-4)
Patients with RDS 0-4 before or after intervention are considered to have mild bronchiolitis and will likely be safe for discharge home. Prior to discharge, routine counseling about nasal suctioning, feeding tactics and emergency department return indications should be addressed. Certain high-risk criteria (patient age <12 weeks, history of prematurity, cardiopulmonary disease, immunodeficiency or sickle cell) should be considered as potential indications for hospitalization. Additionally, patients that are hypoxic and/or dehydrated likely also require admission. In these cases, admission to the pediatric hospitalist service would be appropriate.

Moderate Disease (RDS 5-7)
After suctioning is performed and other routine interventions are provided, patients with moderate disease should likely be started on high flow nasal cannula (HFNC). The physician/APP should contact the RT to initiate this therapy. RT typically initiates flow with at least 1.5 L/kg/min; if a different flow setting is desired the physician/APP should communicate with the RT. If the patient is considered improved and stable on <\=1.5 L/kg/min and <50% FiO2, hospitalist admission is likely appropriate. If there is concern about the patient’s appropriateness for general floor admission, a request for hospitalist evaluation in the emergency department is appropriate. In some cases, the hospitalist may also choose to evaluate the patient in the emergency department to determine stability prior to admission. If the patient is determined to be unstable for a general pediatric bed, the ED physician/APP should contact the PICU for admission. For patients with moderate disease admitted to the hospitalist service, routine insertion of an IV is unnecessary as enteral hydration/nutrition is preferred. A separate enteral feeding guideline has been created and should be referenced to determine whether a patient may continue with oral feeding or if a nasogastric feeding tube should be inserted. For patients being admitted to the intensive care unit, an IV is preferred and the patient should remain NPO.

Severe Disease (RDS >8)
For patients with severe disease, respiratory support will be required. Clinician decision about whether to trial HFNC or proceed to non-invasive positive pressure ventilation or intubation should be tailored to the
patient’s clinical condition. All patients with severe disease will require admission to the intensive care unit. Patients should remain NPO and IV/IO access should be obtained. For select patients, a trial of bronchodilator therapy may be considered. Additionally, a chest radiograph may also be obtained based on ED physician discretion or may be requested by the intensivist. Routine chest radiographs for intubated patients are appropriate.

**Treatments**

Routine use of bronchodilators, steroids and antibiotics for clinical bronchiolitis are not recommended. In select cases (prior history of wheezing episodes, history of atopy, strong family history of asthma) a trial of albuterol may be appropriate. Antibiotics should only be used for clear cases of bacterial infection.

**Testing**

Routine chest radiographs are not indicated for clinical bronchiolitis, although they may be warranted in select clinical situations. Routine viral testing often does not affect clinical course or treatment; testing for select pathogens (COVID, influenza) may be considered depending on the time of year and potential implications on treatment and co-horting.
Inpatient management algorithm:

Patient accepted for admission

Initiate Ped Bronchiolitis Admission orderset

Respiratory Distress Score (RDS) completed by: Physician or Respiratory Therapist

Mild: 0-4

- Q 4 hour assessments (if <8 weeks, Q2 hour assessments x 24 hours unless specified by physician order)
- Nasopharyngeal suctioning Q 4 hours
- Vital sign frequency and oxygen monitoring per policy: Vital Signs and I&O Monitoring

Moderate: 5-7

- Q 4 hour assessments (if <12 weeks, Q2 hour assessments, unless specified by physician order)
- Nasopharyngeal suctioning Q 4 hours
- Vital sign frequency and oxygen monitoring per policy: Vital Signs and I&O Monitoring
- Continuous cardiorespiratory and pulse oximetry monitoring while on HFNC

Severe: 8 or above

- If patient not currently on HFNC, consider initiation up to 2 L/kg/min and 50% FiO2
- Make patient NPO
- Insert IV

Reassessment of RDS at 1 hour post intervention

Patient improves or remains stable with intervention

- Q 4 hour assessments (if <12 weeks, Q2 hour assessments, unless specified by physician order)
- Nasopharyngeal suctioning Q 4 hours
- Vital sign frequency and oxygen monitoring per policy: Vital Signs and I&O Monitoring

Patient worsening:
- Tachycardia
- Tachypnea
- Unstable on 2L/kg/minute FiO2>50%
- Changing mental status

If no improvement, transfer to ICU

Q 4 hour assessments (if <8 weeks, Q2 hour assessments x 24 hours unless specified by physician order)

Nasopharyngeal suctioning Q 4 hours

Vital sign frequency and oxygen monitoring per policy: Vital Signs and I&O Monitoring

Provide appropriate respiratory support based on clinical condition:
- HFNC
- Trial of nebulated medication with reassessment of clinical response

If improving with intervention, consider reassessment

Admit to ICU

Weaning: send voalte message or call to communicate weaning needs

Weaning/discontinuation of HFNC

RDS 5-6: Wean Conservatively 1L/kg/minute every 4 hours as tolerated

RDS ≥ 7: Do not wean HFNC

Once patient improving, if RDS < 5, HFNC can be discontinued with reassessment in 1 hr. Reinitiate HFNC if RDS increases

If no improvement, transfer to ICU

Has patient been off of supplemental O2 for 12 hours?

Yes

No

Does patient need deep suctioning or frequent wall suctioning?

Yes

No

Is patient eating and drinking enough to stay hydrated?

Yes

No

Discharge education:
- Use dot phrase: Pediatric Bronchiolitis FAQs SH-X22588
- PCP follow-up is not routinely recommended, but can be considered for patient with co-morbid conditions or patients that are less than three months old.
- Routine discharge education (suctioning, eating, when to return)
Inpatient management:

After a patient with bronchiolitis is accepted for admission, initiate Ped Bronchiolitis Admission orderset.

Respiratory Distress Scoring (RDS):
For direct admissions, a respiratory distress score (RDS) will be calculated by RT or physician/APP within 1 hour of admission. RDS will be scored every 4 hours, or every 2 hours if the patient is <8 weeks of age. Patients with scores 0-4 are considered to have mild respiratory distress. Those with scores 5-7 are considered to have moderate respiratory distress. Those with scores 8 or more have severe respiratory distress. RDS Score Table

Therapies:
All patients with bronchiolitis will receive nasal suctioning at least every 4 hours. Supplemental oxygen will be utilized per HDVCH protocol, to maintain pulse oximetry 90% or greater. Bronchodilators, hypertonic saline, chest physiotherapy, deep nasopharyngeal suctioning, corticosteroids and antibiotics are not routinely recommended.

High flow nasal cannula (HFNC):
The occlusive nasal cannula utilized with HFNC is thought to particularly assist young children who primarily breathe through their noses by providing heated, humidified air with the possibility of some positive pressure and recruitment of atelectatic areas of the lung. Though HFNC has been widely adapted in children’s hospitals, either in pediatric intensive care unit (PICU) or general floor settings, there is little high-quality evidence in the pediatric population that it has a measurable effect on outcomes. Furthermore, there are no consistently applied, evidence-based protocols for either the use or discontinuation of HFNC. HFNC should be considered for patients with moderate to severe RDS. This should be titrated to relieve signs of respiratory distress and hypoxia, and FiO2 up to 50%.

A recent study (Betters) suggests that a HFNC “holiday” protocol is a safe and effective way to successfully wean PICU patients off high-flow nasal cannula and “holiday” did not precipitate clinical deterioration. Patients with a RDS 0-4 are eligible for a “holiday” meaning the HFNC is discontinued with re-evaluation of RDS within 1 hour of discontinuation. Patients with RDS 5-6 should undergo traditional weaning by 1 L/min every 4 hours. Those with RDS 7 or greater should not be weaned off HFNC.

Hydration:
Enteral feeding is encouraged for previously healthy patients with bronchiolitis with mild to moderate RDS. Those with dehydration or poor oral intake should have nasogastric (NG) tube placed. Those with exclusive tube feeding diet, malnutrition or inadequate nutrition for 72 hours or more should have a dietician consult. Patients with a concern for safety with oral feeding—including a history of dysphagia, significant cardiac disease requiring medication, airway defect, chronic lung disease, neuromuscular disease or immunodeficiency—should likely have speech language pathology (SLP) consult before oral feeding is initiated. Intravenous (IV) hydration should be utilized for those with severe RDS (8 or more). These patients should be initially nil per os (NPO) while awaiting further evaluation/ intervention.

Discharge criteria:
Patients eligible for discharge to home include those with pulse oximetry 90% or greater, off supplemental oxygen for 12 hours or more, taking adequate oral intake to maintain hydration and those no longer needing wall suction or frequent nasopharyngeal suctioning. Attach the patient education instructions
ICU management algorithm:

- **Patient accepted for admission to ICU**
  - General PICU Admission order set initiated

- **High Flow Nasal Cannula (HFNC)**
  - **Respiratory Distress Score (RDS) completed by Physician or Respiratory Therapist**
  
- **Score in moderate range (moderate: 5-7)**
  - Make patient NPO
  - No enteral feeding until RDS score is stable or improving on follow-up assessment

- **Respiratory Distress Score (RDS) completed by Physician or Respiratory Therapist**
  - **Score in severe range (8 or greater):**
    - Titrate HFNC to 2 L/kg/min or consider trial of NIPPV.
    - No enteral feeding until RDS score is stable or improving on follow-up assessment

- **Noninvasive positive pressure ventilation (NIPPV)**
  - **Score in moderate range (moderate: 5-7)**
    - Make patient NPO
    - No enteral feeding until RDS score is stable or improving on follow-up assessment
  - **Score in severe range (Severe: 8 or greater)**
    - Consider intubation

- **Intubated**
  - Consider respiratory culture on admission or intubation to monitor for secondary pneumonia

- **Evaluate for early initiation of feeding**

- **Blood gas if persistent distress despite appropriate NIPPV settings.**

- **Evaluate need for airway clearance/nebulized treatments.**
  - If no response to nebulized treatments, consider discontinuation.

- **ICU Discharge criteria for extubated patients:**
  - 24 hour post-extubation with no signs of upper airway obstruction or respiratory distress

- **Once enteral feeds established, follow PICU feeding guideline**
  - Once patient improving, if RDS < 5, HFNC can be discontinued with reassessment in 1 hr. Restart HFNC if RDS increases

- **Follow RDS score and consider weaning NIPPV setting or transition to HFNC if score is 5-7**

- **Follow routine care of intubated patient**

- **Consider respiratory culture on admission or intubation to monitor for secondary pneumonia**

- **Evaluate need for airway clearance/nebulized treatments.**
  - If no response to nebulized treatments, consider discontinuation.

- **Weaning**
  - **RDS 5-6: Waive Conservative 1L/minute every 4 hours as tolerated**
  - **RDS > 7: Do not waiv HFNC**

- **Score in severe range (moderate: 5-7)**
  - Make patient NPO
  - No enteral feeding until RDS score is stable or improving on follow-up assessment

- **Score in severe range (Severe: 8 or greater)**
  - Consider intubation

- **ICU discharge criteria**
  - HFNC at 1.5 L/kg/minute or less with three consecutive RDS scores for at least 12 hours (Score should be 6 or less with overall clinical improvement).
  - Off of IV sedation medication

- **Consider respiratory culture on admission or intubation to monitor for secondary pneumonia**

- **Evaluate need for airway clearance/nebulized treatments.**
  - If no response to nebulized treatments, consider discontinuation.

- **ICU Discharge criteria for extubated patients:**
  - 24 hour post-extubation with no signs of upper airway obstruction or respiratory distress

- **Once patient improving, if RDS < 5, HFNC can be discontinued with reassessment in 1 hr. Restart HFNC if RDS increases**

- **Follow RDS score and consider weaning NIPPV setting or transition to HFNC if score is 5-7**

- **Follow routine care of intubated patient**

- **Consider respiratory culture on admission or intubation to monitor for secondary pneumonia**

- **Evaluate need for airway clearance/nebulized treatments.**
  - If no response to nebulized treatments, consider discontinuation.
ICU management:

Patients admitted to the pediatric intensive care unit (PICU) with acute viral bronchiolitis will generally fall into three categories of required respiratory support: high-flow nasal cannula (HFNC), non-invasive positive pressure ventilation (NIPPV), and intubated patients. For all patients admitted to the PICU, the bronchiolitis order set should be used to complete admission orders. Specific considerations for each pathway are listed below.

HFNC:
A respiratory distress score (RDS) should be completed on each patient on admission to the PICU. Patients should be made NPO and IV fluid hydration initiated until stability in respiratory status has been established and RDS is in the moderate range. For those patients with score in moderate range on admission, re-evaluation of RDS should be completed in 4 hours with consideration to wean HFNC by 1 L/kg/min every 4 hours if RDS remains in the moderate range. If RDS is in the mild range (0-4), discontinuation of HFNC should be considered. For those patients with RDS in the severe range (7 or greater) on admission, HFNC should be titrated up to 2 L/kg/min. If there is not clinical improvement at 2 L/kg/min, NIPPV should be considered. Additional considerations for those with scores in the moderate to severe range would include a trial of nebulized treatments (albuterol or hypertonic saline) with a documented RDS pre/post treatment, a chest x-ray if not already completed, and sedation for those children who are unable to tolerate HFNC due to agitation. If there is no response to nebulized treatments, these should not be continued. There is no evidence that chest percussion therapy (CPT) is beneficial in patients with acute viral bronchiolitis and is not recommended as a routine therapy. Once stability of RDS has been established, NG or oral feeds should be considered and the PICU feeding guideline should be used. Transfer out of the PICU to the pediatric floor should be considered for those patients on HFNC 1.5 L/kg/min or less with 3 consecutive RDS ≤6. IV sedation should be weaned off, and if indicated, transitioned to enteral sedation with sedation weaning plan in place prior to transfer.

NIPPV:
A respiratory distress score (RDS) should be completed on each patient on admission to the PICU. Patients should be made NPO and IV fluid hydration initiated until stability in respiratory status has been established and RDS is in the moderate range. Sedation should be considered for patients who have agitation related to tolerance of NIPPV mask. For those patients with score in moderate range on admission, re-evaluation of RDS should be completed in 4 hours with consideration to wean NIPPV settings or transition to HFNC if RDS remains in the moderate range. If RDS is in the mild range (0-4), the patient should be transitioned to HFNC. For those patients with RDS in the severe range (≥8) on admission, NIPPV settings should be titrated appropriately. If RDS remains in the severe range despite appropriate NIPPV settings, intubation should be considered. Additional considerations for those with scores in the moderate to severe range would include a trial of nebulized treatments (albuterol or hypertonic saline) with a documented RDS pre/post treatment, a chest x-ray if not already completed and blood gas analysis. If there is no response to nebulized treatments, these should not be continued. There is no evidence that CPT is beneficial in patients with acute viral bronchiolitis and therefore is not recommended as a routine therapy. Once stability of RDS has been established, NG or NJ feeds should be considered and the PICU feeding guideline should be used. Once the patient has been transitioned from NIPPV to HFNC, transfer out of the PICU to the pediatric floor should be considered for those patients on HFNC 1.5 L/kg/min or less with 3 consecutive RDS ≤6. IV sedation should be weaned off, and if indicated, transitioned to enteral sedation with sedation weaning plan in place prior to transfer.

Intubated:
Routine care for intubated patients should be provided. Early enteral nutrition with NG or NJ feeds should be considered using the PICU feeding guideline. Secondary bacterial pneumonia is common in patients
with severe bronchiolitis requiring intubation, therefore a respiratory culture on admission to the PICU or immediately after intubation should be considered. The need for airway clearance or scheduled nebulized treatments (albuterol or hypertonic saline) should be evaluated for each patient. Nebulized therapies should not be continued if there is no clinical improvement with treatments. For those patients who have been extubated for 24 hours and have no signs of upper airway obstruction or severe respiratory distress, transfer out of the PICU to the pediatric floor should be considered. The patient should be clinically stable on HFNC 1.5 L/kg/min or less with 3 consecutive RDS of ≤6 prior to transfer. IV sedation should be weaned off, and if indicated, transitioned to enteral sedation with sedation weaning plan in place prior to transfer.
HDVCH Enteral Feeding in Bronchiolitis:

**Assess**
Feeding history, hydration status, and degree of respiratory distress

- **Mild/Moderate respiratory distress**
  - RDS 0-4
  - Low concern for dehydration/adequate PO
  - PO feeding

- **Mod/Severe respiratory distress and stable for oral/enteral feeding**
  - RDS 5-7
  - Mental status: alert and consolable
  - Improved respiratory distress, stable on HFNC
  - Weaning on HFNC
  - Low concern for dehydration/adequate PO
  - PO feeding

- **Severe respiratory distress and not stable for oral/enteral feeding**
  - RDS 8 or above
  - Mental status: sleepy, lethargic or inconsolable
  - Severe respiratory distress: no improvement on HFNC
  - Escalating treatment: increasing HFNC setting, increased need for suctioning, NIPPV, etc.
  - Any patient going to an ICU
  - NPO, IV hydration

**Inclusion criteria:**
- Age <2 years
- Prematurity and/or age <12 weeks may be included but expect a more severe course of illness
- Viral upper respiratory symptoms & lower respiratory symptoms that may include; increased work of breathing, cough, feeding difficulty, tachypnea, wheeze, fever

**Exclusion criteria:**
- Cardiac disease requiring baseline medication
- Anatomic airway defects
- Neuromuscular disease
- Dysphagia
- Chronic lung disease
<table>
<thead>
<tr>
<th>Age</th>
<th>Kcal/kg/day</th>
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<tr>
<td>Prematurity or malnutrition</td>
<td>120</td>
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<td>0-2 mos</td>
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<td>3 mos</td>
<td>95</td>
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**NG hydration/feeding tips**

**Fluid bolus needed for rehydration:**
- Bolus with 10 ml/kg of Pedialyte®, may be given via gravity
- Consider slowing feed over 1-2 hours if not tolerating initial gravity feed

**Ongoing hydration/nutrition needed:**
- Consider starting at 0.5 maintenance to ensure tolerance, increase to maintenance as tolerated
- Give continuous or 6-8 bolus feeds per day, based on patient circumstances
  - h/o GERD, vomiting bolus feeds etc.
- Provide breast milk or age-appropriate formula
- Pedialyte may be considered if not tolerating feeds

**Transition to full PO feeding:** Improved PO intake documented and can adequately maintain hydration

**Consult nutrition:** If intolerance occurs or patient is anticipated to require NG feeds > 72 hrs

**Consider speech consult:** If prolonged issues with PO feeding or concerns for safety of PO feeding

**References:**


