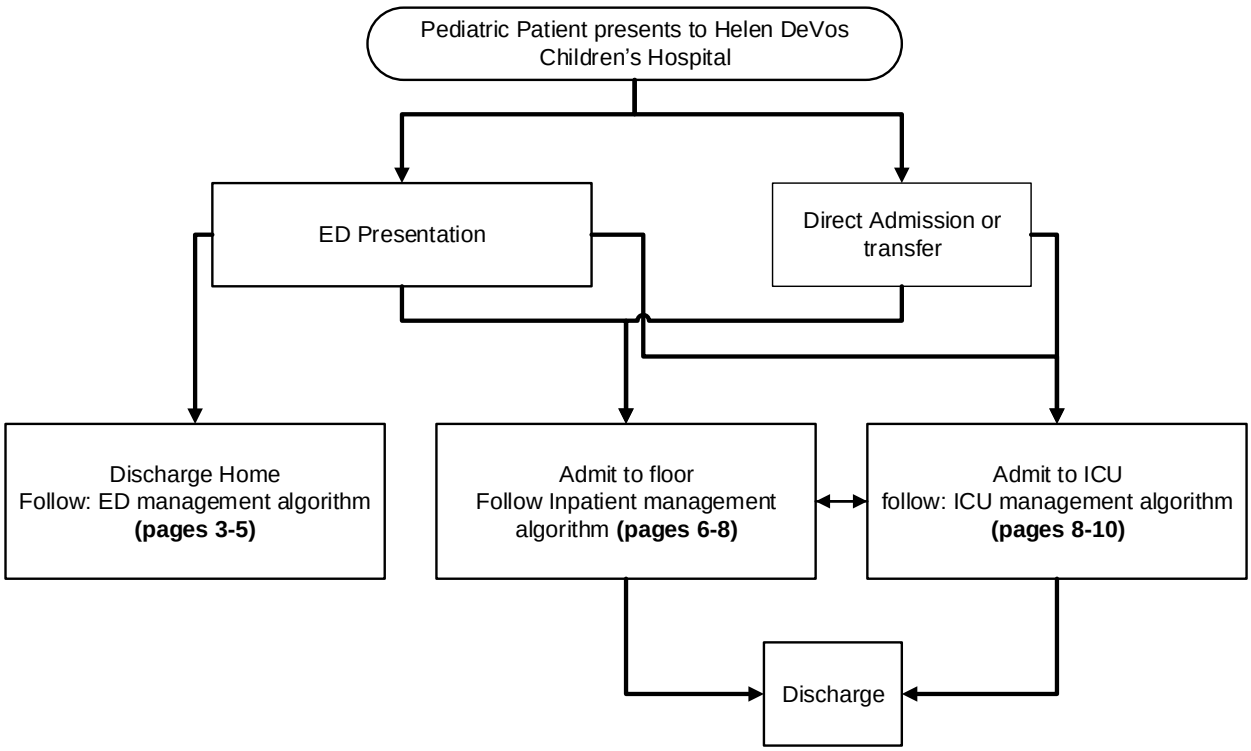
# Clinical Pathway: Pediatric Bronchiolitis, Inpatient

Last updated: 11/4/2021

## 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

medicine physicians, pediatric hospitalists, resident physicians, nurse practitioners and physician assistants who care for these children in the emergency department, inpatient, and pediatric intensive care unit settings. This pathway does not apply to children with immunodeficiencies, underlying respiratory disease such as chronic lung disease, neuromuscular disease, or hemodynamically significant congenital heart disease.

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

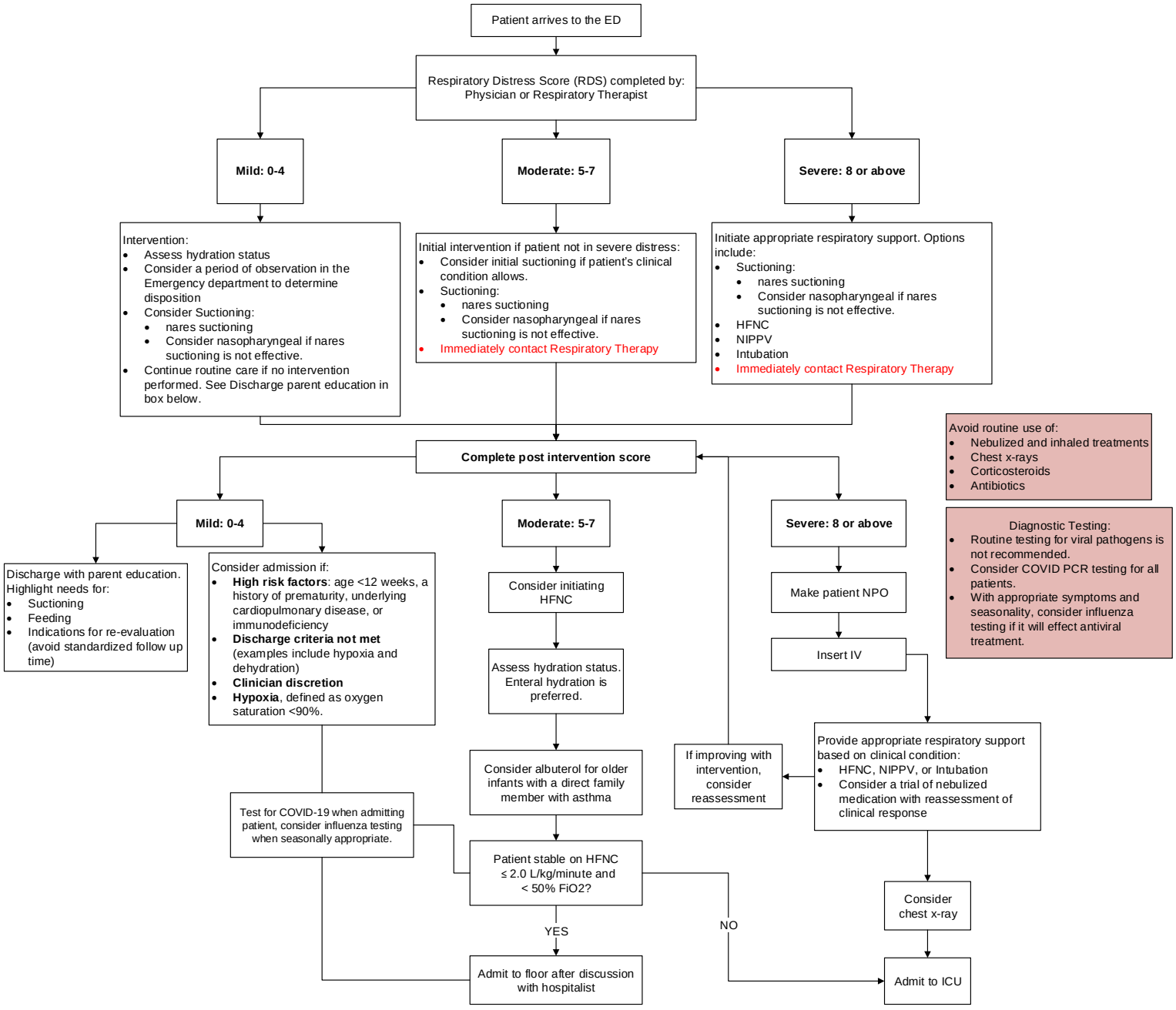
**IMPLEMENTATION DATE:** Monday, October 18, 2021

**LAST REVISED:** October 8, 2021

**FOR MORE INFORMATION, CONTACT:** Allison Long, MD

# Clinical pathway clinical approach:

## ED management algorithm:



**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 <2 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.

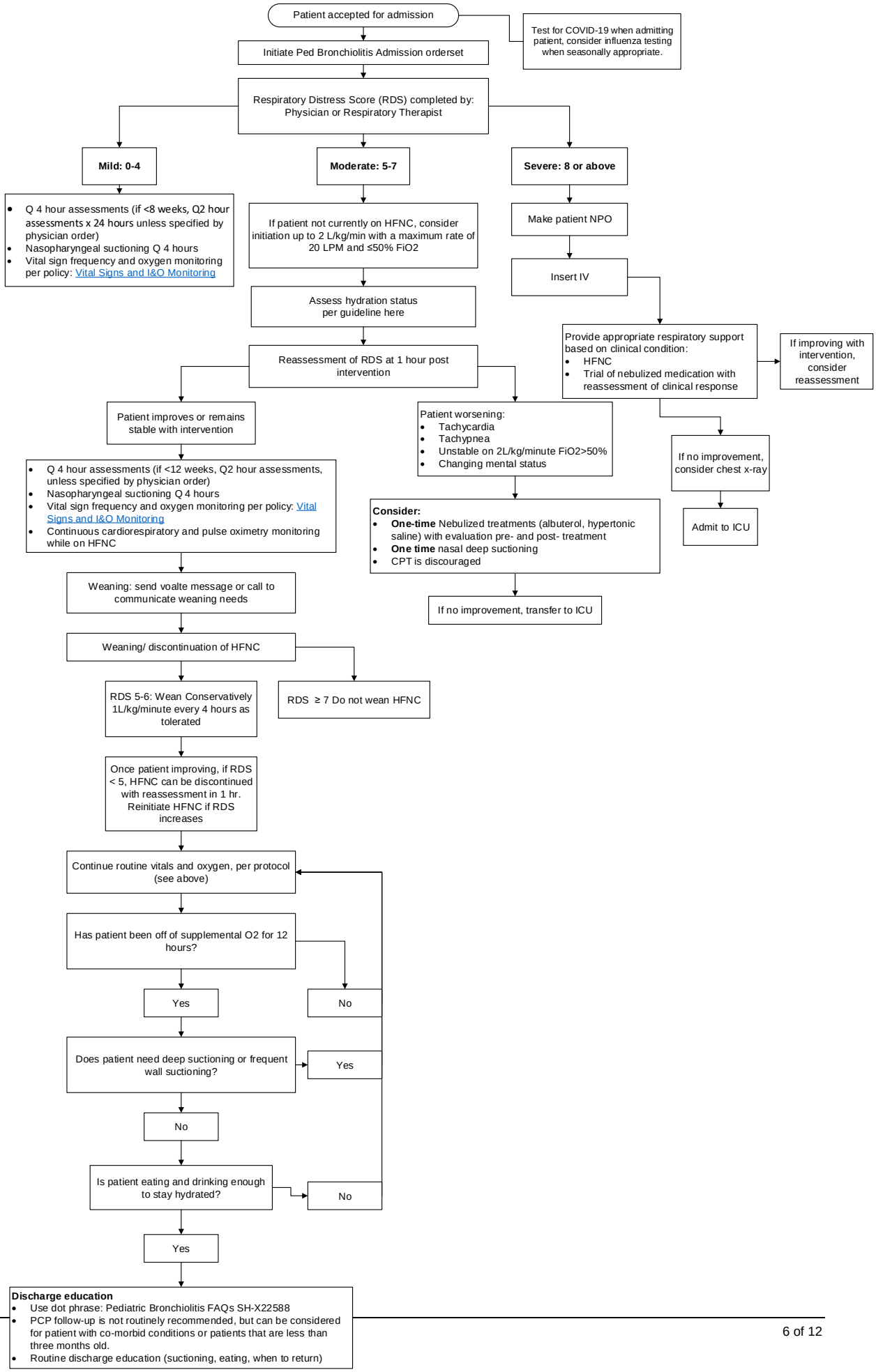
**Severe Disease (RDS ≥8)**
For patients with severe disease, respiratory support will be required. Clinician decision about whether to trial HFNC or proceed to non-invasive positive pressure ventilation or intubation should be tailored to the patient's clinical condition. All patients with severe disease 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:



## 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.

**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, with a maximum rate of 2 L/kg/min up to 20 LPM and FiO2 up to 50%.

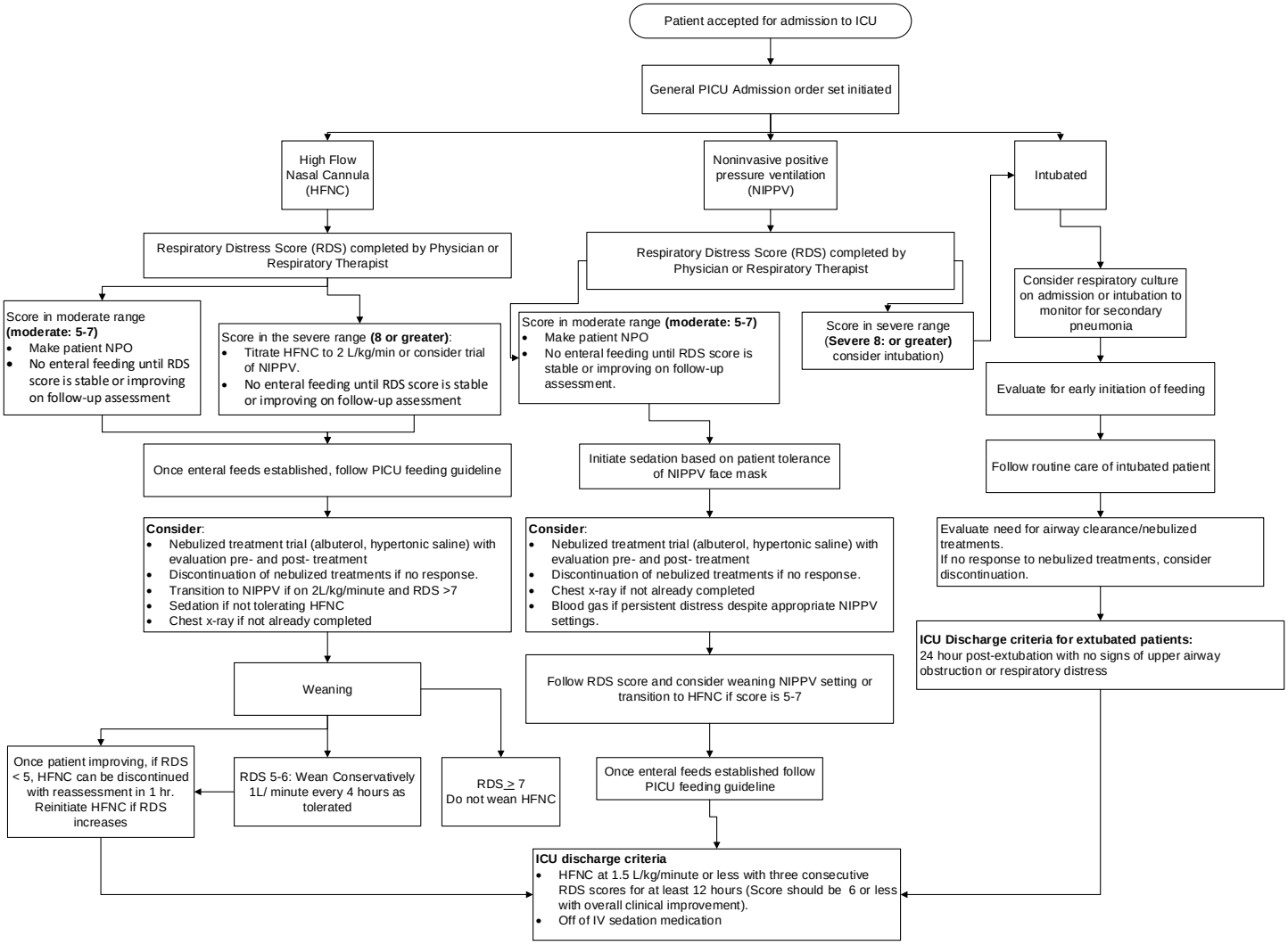
A recent study (Betters) suggests that a HFNC "holiday" protocol is a safe and effective way to successfully wean PICU patients off high-flow nasal cannula and "holiday" did not precipitate clinical deterioration. Patients with a RDS 0-4 are eligible for a "holiday" meaning the HFNC is discontinued with 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

titled “Pediatric Bronchiolitis FAQs SH-X22588” at discharge. Primary care physician (PCP) follow up should be established for patients <3 months old or those with co-morbidities.

## ICU management algorithm:



## 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:**

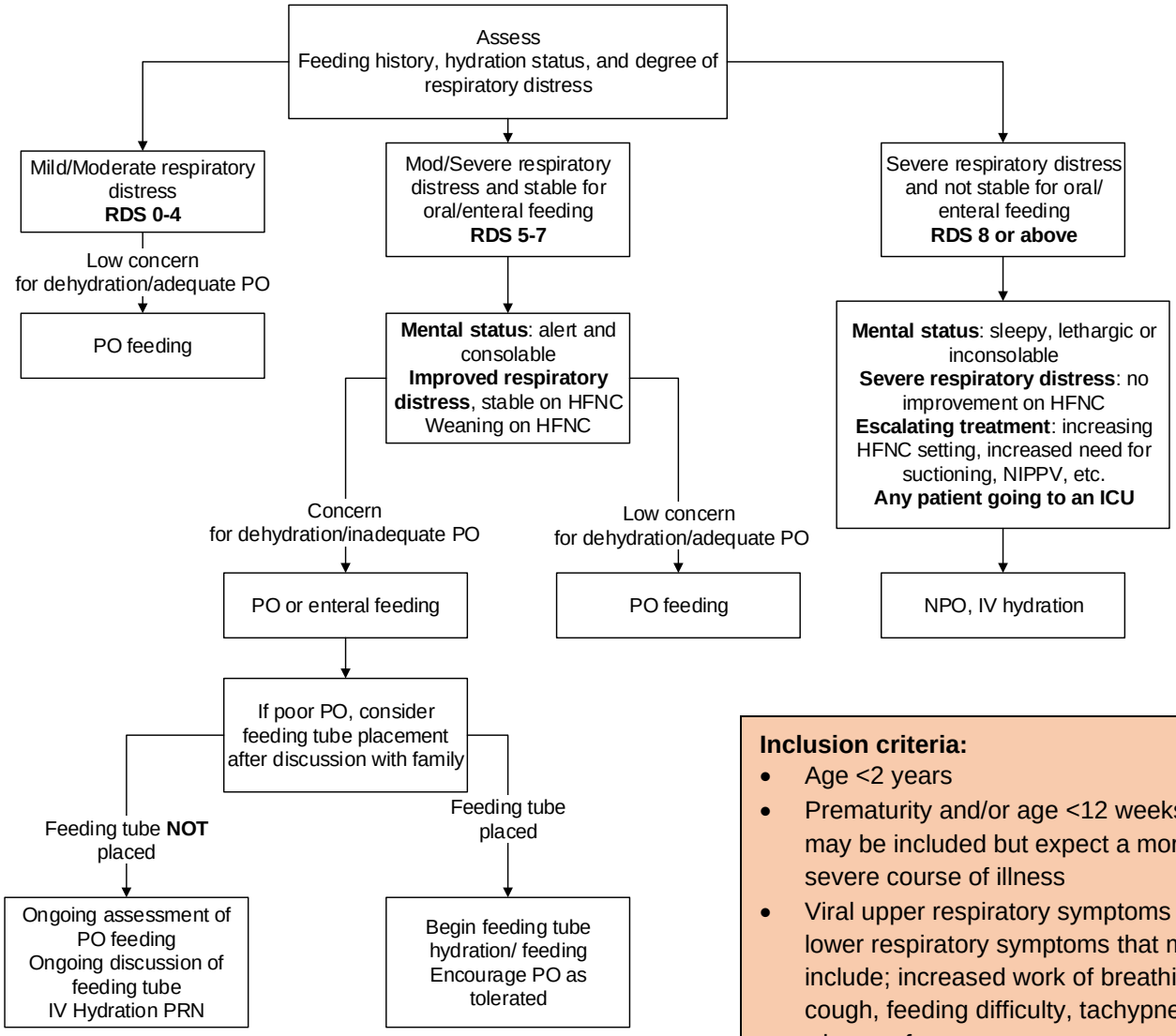
A respiratory distress score (RDS) should be completed on each patient on admission to the PICU. Patients should be made NPO and IV fluid hydration initiated until stability in respiratory status has been established and RDS is in the moderate range. Sedation should be considered for patients who have 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 of ≤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:




**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

**Caloric Goals**

| Age | Kcal/kg/day |
|---|---|
| Prematurity or malnutrition | 120 |
| 0-2 mos | 105 |
| 3 mos | 95 |
| 4 mos – 2 yrs | 82 |

**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 feeding9

# References:


1. Babl FE, Franklin D, Schlapbach LJ, Oakley E, Dalziel S, Whitty JA, Neutze J, Furyk J, Craig S, Fraser JF, Jones M, Schibler A; Paediatric Research in Emergency Departments International Collaborative and Pediatric Critical Care Research Group. Enteral hydration in high-flow therapy for infants with bronchiolitis: Secondary analysis of a randomised trial. J Paediatr Child Health. 2020 Jun;56(6):950-955. doi: 10.1111/jpc.14799. Epub 2020 Feb 11. PMID: 32043304.

2. Slain KN, Martinez-Schlurmann N, Shein SL, Stormorken A. Nutrition and High-Flow Nasal Cannula Respiratory Support in Children with Bronchiolitis. Hosp Pediatr. 2017 May;7(5):256-262. doi: 10.1542/hpeds.2016-0194. PMID: 28424243.

3. Sochet AA, McGee JA, October TW. Oral Nutrition in Children with Bronchiolitis on High-Flow Nasal Cannula Is Well Tolerated. Hosp Pediatr. 2017 May;7(5):249-255. doi: 10.1542/hpeds.2016-0131. PMID: 28424245.

4. Betters KA, Hebbar KB, Mccracken C, Heitz D, Sparacino S, Petrillo T. A Novel Weaning Protocol for High-Flow Nasal Cannula in the PICU. Pediatr Crit Care Med. 2017;18(7):e274-e280.