



DAYTON CHILDREN'S HOSPITAL
CLINICAL PRACTICE GUIDELINES

DISCLAIMER: This Clinical Practice Guideline (CPG) generally describes a recommended course of treatment for patients with the identified health needs. This CPG is not presented and should not be used as a substitute for the advice of a licensed independent practitioner, as individual patients may require different treatments from those specified, and guidelines cannot address the unique needs of each patient. Dayton Children's shall not be liable for direct, indirect, special, incidental or consequential damages related to the use of this CPG.



Bronchiolitis Clinical Practice Guidelines

Emergency Department Management

- If initial examination demonstrates life threatening symptoms (apnea, cyanosis, Severe retractions, lethargy) implement emergency management.
- Give O₂ if SpO₂ on R.A. is \leq 91-94%. Patients presenting in acute respiratory distress should be placed on oxygen until respiratory status can be stabilized.
- Perform Naso-pharyngeal suction to clear secretions.
- Assess the following: Oxygen dependency, respiratory distress level, ability to feed, hydration status, fever, parent/social situation, pre-existing conditions, exposure to tobacco.

NOTE: If above findings are within normal limits, observation should be continued and discharge preparations considered.

If patient at risk, continue monitoring:

- **Consider:** RSV EIA only if admission is likely. This test should not be ordered on routine patients who are being discharged from the ED. An RSV-EIA may be ordered for a repeat patient or complex patient where the etiology could help determine prognosis.
- Routine ordering of RIPD is also not recommended as it is very expensive and does not typically impact course of treatment.
- Electrolytes, CBC (only if secondary infection suspected)
- CBG/CXR, if patient exhibits significant respiratory distress or at physician discretion in borderline cases.
- Reassess respiratory status, repeat SPO₂ in room air. If patient is being evaluated for discharge or admission with the diagnosis of bronchiolitis, the oxygen saturation goal shall be 91% with oxygen weaning accordingly.

Aerosol Trial: Routine bronchodilator trials are no longer being recommended as very few infants respond. Bronchodilator treatments have been shown to create hypoxemia in infants with bronchiolitis as the medication causes tachycardia (increased cardiac output) and tremors while doing little for improving ventilation. This can result in increased shunting and hypoxemia. Much of the improvement seen with aerosols can be attributed to the suctioning that occurs pre and post treatment and the moisture

from the aerosol. If the physician believes the level of respiratory distress in the infant warrants a trial:

- 0.5 cc (2.5 mg.) albuterol is the medication of choice. Infants with history of wheezing and night time coughing not associated with an URI, or patient's with eczema, atopy or strong family history of asthma are most likely to respond.
- Only one treatment should be ordered to gauge response; if the infant improves, additional aerosols may be ordered.
- Duoneb is not indicated, ipratropium bromide is not effective with viral wheezing.

CONSIDER AEROSOL RESPONSE WHEN DETERMINING CONTINUED CARE, ADMITTING DIAGNOSIS AND ORDERS.

Criteria for Consideration of Hospitalization

- Persistent Respiratory Distress
- Hypoxia
- Need for IV fluid
- Co-morbidity
- Apnea

Patient Placement:

All non- ICU admissions are placed in observation care as the normal length of stay is less than 2 days. If a patient requires a longer length of stay, the attending can change the patient's status to inpatient later in the course of care.

ADMIT ICU (For any of the following criteria)

- Witnessed apnea
- O2 requirement > 40%
- Severe respiratory distress
- High risk co-morbidity (severe BPD, cyanotic CHD)

ED Discharge criteria (All must be met)

- RR < 60
- Adequate PO intake
- Supportive social environment
- Minimal respiratory distress
- SaO2 \geq 91% on room air
- No co-morbidity factors

If applicable, family members should be counseled to not use tobacco products around infant.

Inpatient/Observation Management

Clinical Respiratory Assessment:

- History of upper respiratory symptoms and/or rhinorrhea.
- Respiratory rate, heart rate
- Color/Oxygen saturation
- Degree of wheezing/air entry
- Degree of retractions
- Level of consciousness

These symptoms should be evaluated and the patient assigned a score using the Bronchiolitis scoring system. This allows for an objective evaluation of the patient’s condition that can be compared to later scores, indicating improvement or worsening of the patient’s clinical condition.

BRONCHIOLITIS SCORING SYSTEM

	0 - NORMAL	1 – MILD	2 – MODERATE	3 - SEVERE
Resp Rate	< 40	40-50	50-60	>60
Color O2 Sat on RA Cap Refill	Normal >97% <2 sec.	Normal 94-96% on RA < 2 sec.	Normal 90-93% < 2 sec. On O2 ≤ 30% of HFNC or ≤ 1lpm off the wall	Dusky, Mottled < 90% => 3 sec. On O2 > 30% of HFNC or > 1lpm off the wall
Retractions / WOB	None	Subcostal	Intercostal and Subcostal when Quiet	Supraclavicular Sternal Paradoxical Respiration
Air Entry Wheezing	Breath Sounds Clear/ Good	Good Entry End Exp. Wheeze +/- Rales	Fair Air Entry Insp and Exp Wheeze +/- Rales	Poor/ Grunting Insp and Exp wheeze +/- Rales
LOC	Normal/ Alert	Mild Irritability	Restless When Disturbed- Agitated	Lethargic Hard to Arouse

Other factors used in evaluation of infants with suspected bronchiolitis:

- Signs of dehydration/difficulty feeding.
- Parental ability to provide necessary care for child during acute infection.
- Pre-existing condition contributing to increased possibility of respiratory failure, i.e., prematurity, previous intubation, CHD, cystic fibrosis, etc.

Laboratory and Radiologic Assessments:

Chest X-rays, blood work, and blood gases should be ordered *only* when clinical conditions of patient warrants the test.

Management:

Isolation: All patients in respiratory distress due to viral illness will be placed in “Droplet/Contact” isolation with or without viral confirmation.

Cardio-respiratory monitoring: This should be applied during the acute phase of the disease because of the risk of apnea and bradycardia. Continuous pulse oximetry is not recommended for patients in general care.

Oxygen per protocol: All patients should be placed on Oxygen per protocol upon admission, but will not be actively weaned for first 12 hours. In the protocol the patient will be set up on the appropriate oxygen delivery device with the FiO₂ titrated to maintain an adequate saturation. The patient will be reassessed Q30 minutes until stable then Q4 and PRN until the patients is on room air.

Aerosol Protocol: This allows the patients to be evaluated by a respiratory therapist at a frequency based on their Bronchiolitis severity score. Since aerosols very rarely improve the symptoms in bronchiolitis and have been shown to cause worsening hypoxemia, bronchodilator trials should be limited to those who present with moderate to severe distress.

Aerosol Trial: For patients who score 8 or higher, an aerosol trial should be considered. The respiratory therapist will notify the medical team when a patient scores ≥ 8 and an aerosol is being considered. For the trial, patients will be suctioned if necessary, scored, given aerosol and scored again. A positive response is defined as a decrease of the patient’s post aerosol bronchiolitis score by 2 or more (decrease wheezing, WOB, RR, increased aeration).

- **Normal – Bronchiolitis Score 0-4** Assess Q6
- **Mild Symptoms – Bronchiolitis Score 5-7** Assess Q4
- **Moderate Symptoms – Bronchiolitis Score 8-10**

Consider Albuterol trial X1. If the patient responds continue aerosols Q4 hrs for scores ≥ 8 , if no response to first medication, consider trial with vpponephrine. Continue to assess the patient Q2.

- **Severe Symptoms – Bronchiolitis Score 11-15**

Albuterol trial X1. Evaluate response. Consider trial with vpponephrine. If no response and severity persists, consider PICU transfer.

Hypertonic Saline: Hypertonic saline aerosols may be considered for those infants with documented copious secretions, after the second day of inpatient care. TID would be an appropriate frequency for 3% Saline aerosols.

Airway Clearance: It is recommended that patients be suctioned PRN and prior to therapies and feedings. BBG suctioning may be utilized to clear nasal passages. Nasopharyngeal suctioning is recommended when secretions are obstructive and causing respiratory distress. Chest percussion is contraindicated for patients with bronchiolitis.

Intravenous Fluids: The need for an intravenous line and fluid management should be based on clinical assessment of hydration and the patient's ability to feed orally. Intravenous fluids are recommended for the first day of hospitalization for those with hydration needs.

Nutrition: Nasogastric feeding is recommended for those requiring fluid support on the second day. NG feedings are recommended for infants on HFNC.

Antibiotics: Are not recommended unless patient exhibits indication of bacterial infection.

High Flow Nasal Cannula (HFNC): This high humidity, high flow oxygen therapy should be considered for infants with significant respiratory distress. HFNC therapy can significantly reduce the infant's work of breathing. (See attached protocol.)

Parent Education: Parents should be educated on:

- Bronchiolitis pathophysiology and duration of illness.
- Proper techniques for airway clearance and suctioning.
- Handwashing and infection control.
- When to call their health care provider by explaining the signs of worsening symptoms.
- The value of continuing breastfeeding up to six months of age, when applicable.

Tobacco Counseling:

Clinicians should counsel caregivers/family about exposing the infant to environmental tobacco smoke and offer smoking cessation counseling and information on the Ohio Quit Line. Family at the bedside will be offered free nicotine replacement therapy to reduce nicotine cravings during their infant's hospitalization, assuming no contraindications.

Discharge Criteria:

- Respiratory Rate < 60 breaths per minute.
- Adequate P.O. intake.

- Patient SpO2 adequate on room air or is on supplemental oxygen consistent with previous home therapy.
- Parents are proficient with all necessary therapies for home, especially, secretion clearance using a bulb syringe.

INPATIENT/OBSERVATION MANAGEMENT PROTOCOL

SCORE	<u>Respiratory Treatment</u>	<u>Other Therapy</u>
0-4 NORMAL	Assess Q6	Suction PRN Bulb Syringe suction for home
5-7 MILD	Assess Q4	Oxygen per Protocol Suction PRN
8-10 MODERATE	Aerosol Trial X1 with Albuterol. If the patient responds continue aerosols Q4 hrs. for scores ≥ 8 , If not responsive consider a trial with an alternate bronchodilator. Assess Q2	IV fluids Oxygen per Protocol Consider Chest X-ray Capillary Blood Gas Suction PRN Consider HFNC if meets criteria Place on "watcher" list
11-15 SEVERE	Aerosol Trial X1 with Albuterol. If response is positive, continue aerosol Q2. Call PRT and consider PICU transfer	On "watcher" list IV fluids Oxygen per Protocol Chest X-Ray Capillary Blood Gas HFNC if meets criteria Excessive PCO2/acidosis warrants transfer to PICU



Bronchiolitis Clinical Practice Guideline:

High Flow Nasal Cannula Initiation in Specialty Pediatrics

High flow nasal cannula (HFNC) is an accepted treatment modality in infants with respiratory distress due to viral bronchiolitis.

HFNC therapy helps by:

- Washing out anatomic dead space
- Decreasing inspiratory resistance
- Providing positive pressure during the respiratory cycle
- Decreasing air trapping by stenting swollen airways
- Providing increased humidity to moisten retained secretions

Patients exhibiting significant hypoxemia or respiratory distress can be successfully treated with high flow nasal cannula. HFNC can prevent respiratory failure and the need for more advanced support, such as CPAP, NIV and mechanical ventilation.

Inclusion Criteria:

- Infants with viral bronchiolitis, adequately hydrated (receiving IV or NG fluids if necessary), and respiratory distress (i.e. retractions, tachypnea, coarse breath sounds) that does not improve with conventional therapy (generally a Bronchiolitis score of 8 or higher).

Exclusion Criteria:

- Patient exhibiting signs of respiratory failure (i.e. severe respiratory distress, decreased level of consciousness, lethargy, apnea or bradycardia) should be transferred to the PICU immediately. Patients with cardiac co-morbidities, chronic respiratory disease, history of intubation, and/or history of pulmonary hypertension should also be excluded from this protocol. A PRT should be called for any of these types of patients requiring increased support.

RCP Protocol:

Many of our patients with bronchiolitis are started on HFNC in the ED. Guidelines have been established for disposition decisions on these patients.

Patients placed on HFNC can be managed in PICU or in specialty pediatrics, based on the following criteria:

HFNC patients who will be admitted to the PICU:

- Patients with cardiac co-morbidities
- Patients with history of intubation
- Patients who require HFNC support and are ≤ 8 weeks of age
- Patients 2m -6m requiring 8L and 40% oxygen or greater
- Patients 7m - 12m requiring 10L and 40% oxygen or greater
- Patients >12 m requiring 12L and 40% oxygen or greater
- Patients having apnea and/or bradycardic events

Any patient placed on max HFNC settings for the floor in the ED must be admitted to the PICU. This should help to prevent emergent transfers to the PICU for increased HFNC support.

HFNC patients who may be admitted to specialty pediatrics care on central monitoring:

- Patients 2m-6m old on HFNC requiring < 8 L and 40% oxygen to maintain SpO₂ of 91-94% and show improvement in work of breathing
- Patients 7m-12m old on HFNC requiring < 10 L and $< 40\%$ oxygen to maintain SpO₂ of 91-94% and show improvement in work of breathing
- Patients >12 m old on HFNC requiring < 12 L and $< 40\%$ oxygen to maintain SpO₂ of 91-94% and show improvement in work of breathing
- Max of 2L/kg/min on specialty pediatrics

Patients placed on HFNC in specialty pediatrics who can stay on the specialty pediatrics floors on central monitoring:

- Patients 2m - 6m old on HFNC requiring ≤ 8 L and 40% oxygen to maintain SpO₂ of 91-94% and show improvement in work of breathing
- Patients 7m-12m old on HFNC requiring ≤ 10 L and $\leq 40\%$ oxygen to maintain SpO₂ of 91-94% and show improvement in work of breathing
- Patients >12 m old on HFNC requiring ≤ 12 L and $\leq 40\%$ oxygen to maintain SpO₂ of 91-94% and show improvement in work of breathing

***Patients who require HFNC support and are ≤ 8 weeks of age must go to PICU**

Prior to initiation of HFNC the RCP should consult with the respiratory supervisor and the medical team managing the patient. The hospitalist team should come to the bedside to evaluate the patient.

HFNC initiation –first hour:

- Patient will be set up on Vapotherm Precision Flow up to the maximum settings for the floor:
 - a. For patients 2m -6m maximum settings are 8L and 40% oxygen
 - b. For patients 7m -12m maximum settings are 10L and 40% oxygen
 - c. For patients >12 m maximum settings are 12L and 40% oxygen

*Or a max of 2/L/min whichever comes first

- Oxygen will be adjusted for SpO₂ and increased as needed
- Patient will be continuously monitored for HR, RR and SpO₂
- Patient will be scored prior to initiation of therapy and scored after the first hour of therapy

Call PRT to immediately contact PICU medical staff for:

- Rapidly deteriorating clinical appearance
- Worsening respiratory distress or impending respiratory failure
- Apnea and bradycardia requiring manual ventilation or other interventions

Patients who demonstrate no response will require evaluation by medical staff; call PICU for transfer. Those who improve will remain in specialty pediatrics care.

Patients meeting max high flow settings, and showing no signs of improvement, or signs of worsening should be transferred to the PICU. The decision to transfer a patient should be made with the entire floor team (resident, attending, bedside RN, and RT) during a bedside huddle. The resident team / attending will contact the PICU resident / attending, the bedside RN will contact the unit clinical team leader who will contact the PICU clinical team leader, and the RT will contact the ICU RT regarding the need to transfer a patient.

Specialty Pediatrics: Patient Assessment and Care

- HFNC patients will remain in general care on continuous central monitoring with HR, RR and SpO₂.
- Nursing will assign staffing based on a goal of 1 RN: 3 Patient ratio
- After the first hour of HFNC, respiratory therapy will assess patients Q2 hrs x 2, then Q4, documenting all vital signs and bronchiolitis scores and suctioning.
- All staff will observe for signs of worsening respiratory distress; any worsening of symptoms will be called to the medical team, i.e., ↑WOB, ↑ Respiratory Rate, ↑ HR, decreasing saturations.
- Patient to remain on watcher list until stable. Status will then be changed to high risk until HFNC is discontinued

Feeding on HFNC

- Initial Feed on HFNC to be completed or observed by speech therapist, RN or provider (MD, DO, NP, PA) monitoring for signs of aspiration (coughing, choking, gagging and/ or increased FiO₂ requirement by > 10%, increase in RR > 20 bpm)
- High Flow Nasal Cannula-Routine adjustment of flow/ turning down flow for feeds is not recommended
- Please see separate document for detailed guidelines

Post-acute care:

PICU HFNC transfers to general care for weaning: We are requesting that the PICU send out their HFNC patients on high flow not wall gas, to continue high humidity until the oxygen requirement is gone. Patients 8 weeks old and younger may transfer out of the PICU on HFNC they just cannot be initially admitted to specialty pediatrics. Patients with exclusion criteria for the specialty pediatrics floors initially (i.e. history of intubation, cardiac comorbidities, etc.) can be transferred out of the PICU on HFNC if patient is stable and hospitalist and PICU staff are in agreement.

HFNC transfers to the floor must meet this criteria:

- $O_2 \leq 40\%$
- Stable for >12 hours on current therapy
- Patients will be “HFNC SA” when they leave the PICU until the HFNC is discontinued

General Care HFNC weaning: HFNC weaning should not begin until the patient has shown stability on current settings, generally after 12 hours. Adjustment of flowrate and O₂ should be primarily limited to the RCP. If the RN or provider increases O₂ or flow, they should immediately notify the RCP assigned via Vocera.

- Maintain the established flowrate and wean oxygen to 21% while maintaining target saturations of 91-94%
- After oxygen is 21% wean flow rate watching work of breathing and respiratory rate
- An order is not needed to initiate weaning of flow or FiO₂

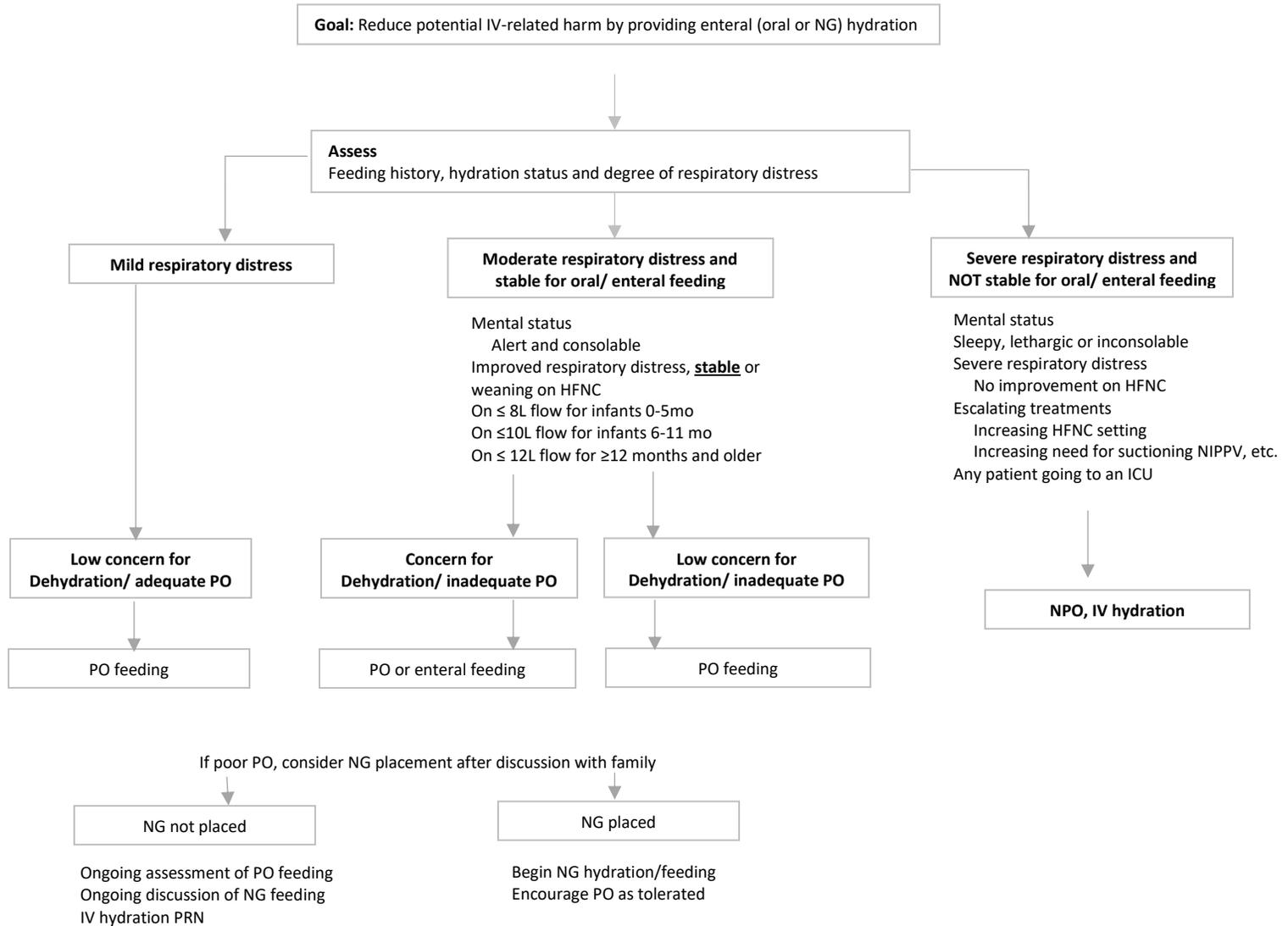
Patients should not need to go to a low flow cannula. If there is a need, give just enough flow to maintain target SpO₂ levels, not the same flow on HFNC.

Any increase in O₂ or flow during the weaning process should be called immediately to the medical team.

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Guidance for Oral or Enteral Feeding in Bronchiolitis Patients



Guidance for Oral or Enteral Feeding in Bronchiolitis Patients

Assess hydration

Low concern
 History of adequate PO feeds
 and/ or good urine output
 Tolerates PO feeding in ED
 No signs of dehydration on exam

Concern
 History of inadequate PO feeds
 and poor urine output
 Unable to tolerate PO feeds in ED
 Signs of dehydration on exam

Maintenance IV fluid rate
4-2-1 Rule

Use patient weight in kg
 4mL/kg/hr for 1st 10 kg +
 2mL/kg/hr for 2nd 10 kg +
 1mL/kg/hr for each kg over 20 kg
 MAX rate 120 mL/hr

Feeding Considerations:

Consult speech therapy for all patients < 6mo on HFNC, early on for patient with complex PMH (prematurity, airway anomalies)
Initial Feed on HFNC to be completed or observed by speech therapist, RN or provider (MD, DO, NP, PA) monitoring for signs of aspiration (coughing, choking, gagging and/ or increased FiO2 requirement by > 10%, increase in RR > 20 bpm)
High Flow Nasal Cannula-Routine adjustment of flow/ turning down flow for feeds is not recommended

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 patient unable to take full oral feeds and for any patient requiring enteral nutrition.

Age	Nutrition choices
0-12 months	Breast milk or home formula
12-24 months	Breast milk, Standard Jr formula or Allergen free Jr formula as indicated
	<p>(“The American Academy of Pediatrics reaffirms its recommendation of exclusive breastfeeding for about 6 months, followed by continued breastfeeding as complementary foods are introduced, with continuation of breastfeeding for 1 year or longer as mutually desired by mother and infant.” Breastfeeding and the Use of Human Milk, SECTION ON BREASTFEEDING, Pediatrics Mar 2012, 129 (3) e827-e841; DOI: 10.1542/peds.2011-3552)</p>