PEDIATRIC VIRAL BRONCHIOLITIS

ALGORITHM: Emergency Department Bronchiolitis Management

Triage/Bedside RN: Vital signs, pulse oximetry, blood pressure, weight. Suction as needed beginning with bulb or nasal aspirator, advancing to deep/mechanical suction as needed for persistent respiratory distress.

Provider: History and physical exam, evaluate for red flags and comorbidities

Inclusion criteria:
- Age 1 mo to < 2 yrs
- Principle diagnosis: uncomplicated bronchiolitis

Exclusion criteria:
- Patients requiring PICU admission
- Patients with underlying respiratory illnesses
- Recurrent wheezing
- Immunodeficiency

Previously healthy patient age 1-23 months presenting to ED/UC with viral bronchiolitis

Assess patient and assign severity
(Table 1)

Moderate

Severe

Moderate

Severe

Assess qualification for Home O2 (see protocol)

Meet floor criteria?

Admit to floor

Admit to ICU

Mild

Assess WOB and O2 requirement

No

Yes

Bulb suction or NoseFrida teaching
Anticipatory guidance
DC home

Mildly increased WOB
- O2 req. <= 0.5L
- Symptoms manageable with bulb suction only (or nose Frida if available)

Mildly increased WOB
- O2 req. > 0.5L
- Symptoms not manageable with bulb suction only (or nose Frida if available)

Noninvasive suctioning (bulb/nasal aspirator) PRN: advance to deep suctioning for respiratory distress unrelieved by noninvasive
- O2 PRN if SpO2 <88%
- Antipyretics PRN
- Consider PO Trial

Reassess (Table 1)

No

Yes

Give patient rest/saline
Drops if having bloody secretions from deep suctioning

Admit to floor

Severe

Treat ABCs
- Deep Suction
- Consider alternative diagnosis

Reassess (Table 1)

Moderate

Adjust O2 flow PRN for SpO2<88%; consider NIPPV as needed
ALGORITHM: Inpatient Bronchiolitis Management

Begin Family Teaching
- Signs of respiratory distress
- How to suction (bulb or nasal aspirator)
- When to suction (prior to feeding or if in increased distress)

Assess patient and assign severity score (Table 1)

Patient Admitted

Mild Severity
- Suction using bulb/nasal aspirator (non-invasive) as needed
- Supplemental oxygen for RA sats less than 88%
- No continuous pulse oximetry
- Discontinue IV/NG fluids, if started, and encourage feeding
- Reassess minimum of every 4 hours
- Assess for discharge readiness

Moderate Severity
- Bulb/nasal aspirator (non-invasive) suctioning; proceed with deep suctioning only if persistent respiratory distress or if requiring suctioning >q4 hr
- Supplemental oxygen for RA sats less than 88%
- No continuous pulse oximetry unless on greater than 1 lpm O2 by NC or face mask equivalent
- Reassess minimum of every 4 hours

Severe Severity
- Bulb/nasal aspirator (non-invasive) suctioning; proceed with deep suctioning only if persistent respiratory distress due to nasal obstruction not relieved by non-invasive
- Supplemental oxygen
- Consider IV/NG fluids and safety of oral feeds
- Consider:
  - Trial of HHFNC
  - Blood gas
  - CXR
  - Bacterial superinfection and other etiologies
- Reassess minimum of every 1 hour
- Transfer to ICU if not improving within 1 hour

Signs of Deterioration:
- Lethargy
- Inappropriately low respiratory rate
- Apnea
- Poor perfusion
- Severe respiratory distress
CALL RRT or Code

Inclusion Criteria:
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Give patient rest/saline Drops if having bloody secretions from deep suctioning

Clinical Titration of Oxygen for Stable Infants over 3 Months of Age
1. If bronchiolitis symptoms are MILD, wean oxygen flow in increments of 0.125 to 0.5 Lpm. Assess for titration of oxygen at least every 4 hours.
2. If bronchiolitis symptoms are MODERATE or SEVERE, increase oxygen incrementally. Consider continuous pulse oximetry if oxygen flow is greater than 1 Lpm for infants 3 to 6 months of age or greater than 2 Lpm for children greater than 6 months of age, in consultation with medical staff.
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TARGET POPULATION

Inclusion Criteria
  • Principle diagnosis: uncomplicated bronchiolitis (acute respiratory illness associated with nasal congestion, cough and diffuse wheezing, crackles, tachypnea, and /or retractions)
  • Age: 1 month to less than 2 years
  • Time: year-round

Exclusion Criteria
  • Severe bronchiolitis requiring PICU admission or deteriorating patients requiring RRT evaluation for possible PICU transfer
  • Children with underlying respiratory illnesses [including cystic fibrosis (CF), bronchopulmonary dysplasia (BPD), neuromuscular disease, chronic cough, asthma, and recurrent wheezing]
  • Immunodeficiency (including HIV infection, solid organ transplant, and hematopoietic stem cell transplants)
  • Children with a hemodynamically significant congenital heart disease
  • Serious bacterial infections (SBI), toxic appearance
CLINICAL MANAGEMENT

Prevention

- Droplet precautions for all care settings
- Compliance with hand hygiene recommendations in all settings
- Protect high-risk patients from exposure
- Eliminate child’s exposure to smoke
- Preventive medical therapies (RSV-IVIG or Palivizumab) may be considered for high-risk patients. See Palivizumab guideline.

Telephone Triage

- **Activate EMS (911):** Severe difficulty breathing (struggling for breath, grunting noises with each breath, unable to speak or cry because of difficulty breathing). Blue lips. Child passed out.
- **ED/UC, or primary care office visit immediately:** Underlying heart or pulmonary disease, breathing heard across room, poor fluid intake, fever above 105°F, or age less than 3 months
  - Age less than 1 year: respiratory rate (RR) above 60, unable to drink or sleep
  - Age greater than 1 year: RR persistently above 40, difficulty breathing, not interactive
- **Phone contact with PCP:** Chronic or underlying illness, parental request
- **Office visit, see within 24 hours:** Worsening cough, rhinorrhea, and/or low-grade fever

Emergency Department | Urgent Care (ED Algorithm)

Consider alternative diagnosis if:

- Persistent tachycardia
- Hepatomegaly
- Heart Murmur
- Poor perfusion
- History of apnea
- Severe dehydration
- Fever in child less than 60 days
- Severe atopy

Admission Criteria:

- O2 requirement greater than 0.5L
- Poor feeding
- Tachypnea for age
- Ill appearance
- Witnessed apnea
ICU Admission Criteria

- Respiratory failure requiring intubation, non-invasive positive pressure ventilation, or heated high flow nasal cannula (HHFNC) exceeding approved limits for non-ICU usage
- Recurrent apnea

CLINICAL ASSESSMENT

- Clinicians should diagnose bronchiolitis and assess severity by history and physical exam. Use Table 1 to classify severity. Patients should be classified as mild, moderate, or severe for each of the 5 categories including: respiratory rate, work of breathing, breath sounds, feeding/hydration, general appearance/mental status. A patient’s overall severity is defined by the most severe classification across all 5 categories.
  - Avoid radiographic studies
  - Avoid laboratory studies
- Risk factors for severe disease:
  - Age less than 12 weeks
  - History of prematurity
- Evaluate hydration status

Table 1. Bronchiolitis Severity Classification

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>Less than 60</td>
<td>61-70</td>
<td>Greater than 70</td>
</tr>
<tr>
<td>0-6 months</td>
<td>Less than 50</td>
<td>51-60</td>
<td>Greater than 60</td>
</tr>
<tr>
<td>6-12 months</td>
<td>Less than 40</td>
<td>41-50</td>
<td>Greater than 50</td>
</tr>
<tr>
<td>13-24 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work of Breathing*</td>
<td>None to mild retractions (1 area)</td>
<td>Moderate retractions (more than 2 areas, not severe)</td>
<td>Severe retractions, paradoxical breathing, grunting, head-bobbing</td>
</tr>
<tr>
<td>Breath Sounds/Air Exchange</td>
<td>Minimal wheeze/rales, Good aeration</td>
<td>Decreased or moderate aeration</td>
<td>Diminished breath sounds with severely impaired aeration</td>
</tr>
<tr>
<td>Feeding/Hydration Status (per caregiver report)</td>
<td>Normal</td>
<td>Minimal difficulty feeding OR mildly decreased urine output</td>
<td>Moderate to severe difficulty feeding OR significantly decreased urine output</td>
</tr>
<tr>
<td>General Appearance/ Mental Status</td>
<td>Well to mildly ill, Playing but less active than usual</td>
<td>Moderately ill, Alert but tired appearing, Pale, Fussy but consolable</td>
<td>Severely ill, toxic, cyanotic, inconsolable, lethargic, poor perfusion (cap refill more than 2 sec), or altered mental status</td>
</tr>
</tbody>
</table>

*aAreas of Retractions: suprasternal, subcostal, intercostal, Nasal Flaring
MONITORING FOR INPATIENT CARE

Clinical Severity Reassessment Schedule

- Mild = at least every 4 hour assessments, consider discharge
- Moderate = at least every 2 hour assessments
- Severe = at least every 1 hour assessments

Electronic monitoring

- Check pulse oximetry with vital signs or with a change in clinical condition
- Reserve consideration of continuous pulse oximetry for the following conditions:
  - Infants under 3 months of age
  - Infants 3-6 months of age and on greater than 1 LPM of oxygen
  - Children greater than 6 months of age and on greater than 2 LPM of oxygen
  - Unstable patients (Severe Disease Classification)
  - Patients that have a history of apnea
- Goal saturations should be:
  - At or above 90% for all patients on supplemental oxygen
  - At or above 88% for stable patients older than 3 months of age and on room air

LABORATORY STUDIES | IMAGING

The following diagnostic tests are NOT routinely indicated. Use only if they will potentially change care management.

- If concerned about influenza, consider influenza virus PCR (Flu A&B testing only)
- CBC, blood or urine cultures
- Blood gas
- Chest X-ray

THERAPEUTICS

Evaluating Clinical Status & Response to Treatment

1. On initial assessment, determine severity classification
2. Decide on intervention based on care algorithm (Inpatient Algorithm)
3. Repeat severity classification to determine if intervention was helpful

Be objective – Don’t be confused by upper-airway noise!

Routinely Indicated:

Supportive Care

- Supplemental oxygen:
  - To minimize increased work of breathing
  - If room air SpO₂ is less than 88%, oxygen to achieve SpO₂ at or above 90%
Titrated per table below

- Fluids: PO / NG / IV as needed
- Suction upper airway (use saline PRN) beginning with bulb or nasal aspirator (non-invasive suctioning):
  - Consider scheduled bulb or nasal aspirator suctioning greater than or equal to q4 hours for the first 24 hours of admission and as needed thereafter. Proceed with deep suctioning only if persistent respiratory distress due to nasal obstruction not relieved by bulb or nasal aspirator suctioning.
  - Consider withholding suctioning if evidence of nasal trauma (e.g., bleeding) or if unnecessary based on your clinical judgment.
  - Prior to feeding if upper airway obstruction is interfering with feeding
  - For evidence of upper airway obstruction causing respiratory distress

### Clinical Titration of Oxygen for Stable Infants over 3 Months of Age

1. If bronchiolitis symptoms are MILD, wean oxygen flow in increments of 0.125 to 0.5 Lpm. Assess for titration of oxygen at least every 4 hours.
2. If bronchiolitis symptoms are MODERATE or SEVERE, increase oxygen incrementally. Consider continuous pulse oximetry if oxygen flow is greater than 1 Lpm for infants 3 to 6 months of age or greater than 2 Lpm for children greater than 6 months of age, in consultation with medical staff.

**Not routinely indicated:**

- Antibiotics unless evidence of secondary bacterial infection / sepsis
- Albuterol or inhaled racemic epinephrine
- Inhaled or systemic steroid therapy
- Positive pressure therapy (EZPAP)
- Chest physiotherapy (CPT)

### DISCHARGE CRITERIA

(Begin Discharge Planning on Admission)

- SpO₂ at or above 88% on room air OR
- May consider discharge on oxygen if SpO₂ is at least 90% on no more than 0.5 Lpm after 8 hours of observation including sleeping and feeding (Inpatient Algorithm).
- Parent/caregivers able to clear patient’s airway using home suction device
- Patient maintaining hydration orally.
- Parents/caregivers are proficient with post discharge care
- Home resources are adequate to support the use of any necessary home therapies
- Parents/Caregivers aware of smoke exposure hazards and provided with information/resources to quit smoking
Algorithm: Home Oxygen from the Emergency Department (ED) in Patients with Bronchiolitis (after 8 Hours of Observation)

**Home O₂ Eligibility Criteria**
- First episode of wheezing
- History and physical exam consistent with bronchiolitis and hypoxemia less than or equal to 88% on room air
- Age 3 months post conceptual age – less than 2 years
- Has a primary care provider
- 24 hour follow-up with PCP (or in ED if PCP unavailable) is possible
- Lives at altitude of 8000 feet or less or arrangements have been made for an immediate medical evaluation upon returning to higher elevation
- No observed apnea

**8 Hour Observation Period in the ED on Oxygen**
- Pulse oximetry greater than or equal to 90% on less than or equal to 0.5 LPM oxygen
- Maintaining hydration without need for frequent suctioning
- No signs of deterioration and bronchiolitis score remains 8 or less
- Caregiver and provider comfortable with discharge home
- Caregivers demonstrate proper use of O₂ tank

**Discharged Home with O₂ Tank**
Home delivery of prolonged use oxygen supply pre-arranged

If the initial guidelines are met, the eligible patient is observed for approximately eight hours on O₂ in the ED. Patients who remain stable on less than or equal to 0.5LPM O₂ may be discharged home on O₂.

**FOLLOW-UP**
- PCP notified of discharge plan
- PCP follow-up within 24 hours when possible
- Home care agencies notified and arrangements made when necessary (i.e. home oxygen)

**PATIENT | CAREGIVER EDUCATION**
- Expected clinical course of bronchiolitis and treatment
- Proper techniques for suctioning and airway maintenance
- Signs of worsening clinical status and when to call their PCP
- Proper hand hygiene¹
- Smoking Cessation Counseling¹:
  - Determine patient’s exposure to smoke: when, where, who?
  - Explain the hazard of smoke exposure and its relationship to current illness
Emphasize minimizing future exposure to smoke
Refer family members to smoking cessation resources as appropriate:
  - Quit line: 1 (800) 630-QUIT
  - Quitnet: www.co.quitnet.org
  - Provide parent/caregiver with Education Materials

Links to Patient | Caregiver Education

- Bronchiolitis (English)
- Bronchiolitis (Spanish)
- RSV (English)
- RSV (Spanish)
- Tobacco Smoke (English)
- Tobacco Smoke (Spanish)
- Home Oxygen Therapy (English)
- Home Oxygen Therapy (Spanish)
APPENDIX A: HEATED HIGH FLOW NASAL CANNULA WEANING ALGORITHM

Bronchiolitis patient placed on Heated High Flow Nasal Cannula (HHFNC)

Regular assessments:
- RN: Q4
- RT: Q3-Q4
- Provider: Per routine

Ready to Wean?*
- Continue to assess

Be the Weaner!**
- Communicate
  - Confirm with RT if wean has been initiated &/or confirm timing on the last wean

Tolerating wean?*
- Continue to assess every 1-2 hours for readiness to continue weaning steps

*Ready to wean & tolerating wean considerations
- HR, RR normal for age as documented in Epic, SpO2 greater than or equal to 90%
- Absence of severe work of breathing (severe retractions, paradoxical breathing, head bobbing, grunting)

**Weaning Steps:
1. If FiO2 greater than 50%, start with FiO2 wean to 50%
2. Once FiO2 at 50%
   -wean flow by at least 1 LPM or FiO2 by 5-10% every 1-2 hours or faster if tolerated by patient
3. Transition to low flow when criteria met

Person who weaned assess patient 1 hour after for tolerance or coordinate re-assessment with RT

Weaning lead:
- RT

Roles & Responsibilities

Communicate & Document
- RT: Communicate wean with RN & document
- RN: Communicate wean with RT, & document
- Provider: Communicate wean with RT

Inclusion criteria:
- Age 1 mo to < 2 yrs
- Principle diagnosis: uncomplicated bronchiolitis

Exclusion criteria:
- Patients with preexisting underlying respiratory condition
- Immunodeficiency
- Patients in the PICU

Communicate to team
- Communicate & Document
  - RN & RT: Communicate wean with RN & document
  - Provider: Communicate wean with RT

Communicate
- RN & RT: Communicate wean with RN & document
- Provider: Communicate with RT & coordinate re-evaluation

Consider other diagnoses if consistently unable to wean

Wean until patient meets low flow O2 transition criteria
- FiO2: 30%
- Flow: 3 LPM

Disconnect from HHFNC, transition to low flow oxygen, and transition to spot check pulse-ox monitoring. Notify RT of HHFNC discontinuation time.
REFERENCES


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