STANDARD TREATMENT GUIDELINES 2022

Bronchiolitis

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Under the Auspices of the IAP Action Plan 2022

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Bronchiolitis

Bronchiolitis is an acute inflammatory condition of the bronchioles that is a result of virus-induced injury.

Respiratory syncytial virus (RSV) is the most common viral agent isolated in about 75% (30–70% in Indian studies).

*Other viruses*: Rhinovirus, parainfluenza, adenovirus, human metapneumovirus, and bocavirus are the other viruses commonly causing the condition. Mycoplasma is more frequently implicated in older children with bronchiolitis.

- Persistent cough, following a prodrome of coryza lasting 1–3 days, with tachypnea with or without chest recessions and wheeze and/or crackles occurring in a child <2 years of age (usually below 1 year of age, with a peak between 3 and 6 months).
- Associated fever, usually below 39°C, in around 30% cases and poor feeding, vomiting usually after 3–5 days of illness.
- Apnea may be the only presenting feature, particularly below 6 weeks of age.
- The chest may appear hyperexpanded and may be hyper-resonant to percussion. Wheezes and fine crackles may be heard throughout the lungs.
Signs of Severe Bronchiolitis

- Persistent tachypnea >60 breaths/minute or respiratory distress in form of grunting, recessions
- Inadequate oral intake, inability to feed, dehydration, and inadequate fluid intake (50–75% of usual volume)
- Oxygen saturation (SpO₂) <92% in room air
- Child appears seriously unwell to the healthcare provider
- Skill and confidence of the caregiver to look after the child at home and distance from the hospital

- Apnea, observed/reported
- Marked respiratory distress (severe grunting/chest indrawing/tachypnea >70/minute)
- Central cyanosis, or SpO₂ below 90% (age > 6 weeks) or below 92% (age < 6 weeks, or any age with underlying health conditions)

Predictors of Severe Bronchiolitis are presented in Table 1.

| A. Host-related risk factors | B. Environmental risk factors | C. Clinical predictors |
|------------------------------|-----------------------------|-----------------------|
| Prematurity, especially <32 weeks of gestation | Having older siblings | Toxic or ill appearance |
| Low birth weight | Passive smoke | Oxygen saturation <95% by pulse oximetry while breathing room air |
| Age <6–12 weeks | Household crowding | Respiratory rate 70 breaths per minute |
| Chronic lung disease including BPD | Child care attendance | Moderate/severe chest retractions |
| Hemodynamically significant congenital heart disease (e.g., moderate-to-severe pulmonary hypertension, cyanotic heart disease, or congenital heart disease that requires medication to control heart failure) | Lower socioeconomic status | Atelectasis on chest radiograph |
| Immunodeficiency | | |
| Neuromuscular disorders | | |
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- *Pneumonia:* Fever >39°C with persistent focal crackles
- *Episodic viral wheeze:* Persistent wheeze without crackles, or recurrent episodes with or without a family history of atopy

### Differential Diagnosis

- Is a clinical diagnosis based on age, seasonal occurrence, typical clinical presentation, and physical examination?
- Blood investigations and radiology is routinely not indicated.
- A pulse oximetry reading helps to identify hypoxia and need for admission.
- Investigations in admitted patients to rule out alternate diagnosis such as bacterial pneumonia, congenital heart disease with failure, or sepsis might occasionally be indicated.
- Admitted babies may need an arterial blood gas (ABG) analysis, complete blood count, C-reactive protein (CRP), serum electrolytes, and chest radiography for managing the more serious patients.
- Measurement of lactate dehydrogenase (LDH) concentration in the nasal-wash fluid has been proposed as an objective indicator of bronchiolitis severity [Table 2].
- Identification of viral agents does not affect management in the majority of patients.

However, in the hospital setting, to avoid antibiotic abuse and prevent nosocomial transmission may be done by:
- Antigen detection, immunofluorescence, polymerase chain reaction (PCR), and culture of respiratory secretions obtained by nasal wash or nasal aspirate.
- New techniques such as real-time PCR, nested PCR, and multiplex PCR have improved the virologic diagnosis of bronchiolitis immensely.

| TABLE 2: Severity of bronchiolitis. |
|-------------------------------------|
| **Mild** | **Moderate** | **Severe** |
| Feeding ability | Normal ability to feed | Appear short of breath during feeding | May be reluctant or unable to feed |
| Respiratory distress | Little or no respiratory distress | Moderate distress with some chest wall retractions and nasal flaring | Severe distress with marked chest wall retractions, nasal flaring and grunting |
| | | | Can have frequent and prolonged apnea |
| Saturation | Saturation >92% | Saturation <92%, correctable with O₂ | Saturation <92%, may or may not be correctable with O₂ |
Management of Bronchiolitis

- Treatment is focused on symptomatic relief and maintaining hydration and oxygenation.
- Fever should be controlled with paracetamol.
- Nose block should be cleared with saline nasal drops and gentle suctioning.
- Child should be made to lie in a propped up or head end elevated positioning.
- Orogastric tube feeding may be indicated in admitted patients. Intravenous (IV) fluids in children with impending respiratory failure or who do not tolerate orogastric/nasogastric (OG/NG) fluids.
- Suctioning of the upper airway in children with apnea, respiratory secretions, and feeding difficulties due to upper airway secretions.
- Supplemental oxygen in children with SpO\textsubscript{2} below 90% (>6 weeks) or below 92% (<6 weeks or with underlying health issues).
- Continuous positive airway pressure (CPAP) in babies with impending respiratory failure (limited low-quality evidence).
- High-flow nasal cannula (HFNC) oxygen may have a role as a rescue therapy to reduce proportion of those requiring intensive care.
- Drugs with questionable value might reduce need for admission or length of hospital stay, but broad consensus is lacking.
  - *Nebulized hypertonic saline*: In children hospitalized for >3 days
  - *Nebulized adrenaline*: 0.1–0.3 mL/kg/dose of 1:1,000 as a potential rescue medication; however inconsistent and short-lived improvement
  - *Beta-agonists*: Optional single trial; may be continued if there is clinical response (a trial of bronchodilator therapy may be initiated, but should be discontinued if there is no objective improvement).
- No role of:
  - Chest physiotherapy
  - Antibiotics
  - Antivirals
  - Montelukast
  - Ipratropium bromide
  - Systemic or inhaled steroids
  - Steam inhalation
  - RSV polyclonal immunoglobulin/palivizumab (no roll in acute management but useful in prophylaxis)
  - Inhaled furosemide/inhaled interferon alfa-2a/inhaled recombinant human deoxyribo-nuclease (DNase)
- Interventions which are possibly effective for most severe cases:
  - CPAP
  - Surfactant
  - Heliox
  - Aerosolized ribavirin
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Criteria for Discharge

- Clinically stable
- Taking adequate oral feeds, at least 75% of usual
- Maintaining $\text{SpO}_2$ above 90% (>6 weeks) and 92% (<6 weeks or with health issues) in room air
- Ability of the caregiver to look after at home and distance from the hospital, and have understood the “red flag” signs

Red flag signs for the caregiver at home:

- Increased work of breathing (e.g., grunting, nasal flaring, and chest retractions)
- Fluid intake <50–75% of normal or no urine for 12 hours
- Apnea or cyanosis
- Exhaustion (i.e., not responding normally to social cues and responds only with prolonged stimulation)

Prevention

- **Breastfeeding:** Three-fold greater risk in non-breastfed infant
- Hand hygiene
- Avoid passive smoking
- **Immune prophylaxis:**
  - **Palivizumab:** Monoclonal antibody, monthly injections during seasonal epidemics
    - **Indications:** Infants <12 months with prematurity <29 weeks; CLD of prematurity; hemodynamically significant heart disease
    - Palivizumab is administered intramuscularly at a dose of 15 mg/kg monthly (every 30 days) during the RSV season. A maximum of five doses is generally sufficient prophylaxis during one season.
  - **Nirsevimab:** On trial; single dose for 5 months
  - **Motavizumab,** a second-generation mAb, and Numax-YTE, a third-generation mAb—under trial
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Complications

- Acute respiratory distress syndrome (ARDS)
- Myocarditis
- Congestive heart failure
- Arrhythmias
- Bronchiolitis obliterans
- Secondary bacterial infection
- Predisposition to childhood asthma

Flowchart 1: Summary of viral bronchiolitis.

Flowchart:

**Viral bronchiolitis**

- **Mild**
  - Normal ability to feed
  - Little/no respiratory distress
  - No hypoxia
  - Does not need investigations
  - Home treatment

- **Moderate**
  - Moderate respiratory distress
  - Mild hypoxemia +/- brief
  - Apnea +/- short of breath
  - Admit
    - Humidified $O_2$ to keep $SpO_2 > 92\%$
    - IV fluids
    - Adrenaline/hypertonic saline trial
    - Observe for deterioration

- **Severe**
  - Severe respiratory distress +/-
  - Apnea +/- hypoxia
  - Looks tired/cannot feed
  - Admit
    - ICU care
    - $O_2$ keep $SpO_2 > 92\%$
    - IV fluid; adrenaline/HS trial
    - Cardiorespiratory monitor
    - ABG/Chest X-ray
    - Assess for ICU/ventilation

**Improvement**

- Decrease $O_2$ guided by $SpO_2$
- Re-establish feeding
- Discharge when feeding well and distress less

**Deterioration**

- Treat as severe bronchiolitis

(ABG: arterial blood gas; ICU: intensive care unit; IV: intravenous; $SpO_2$: oxygen saturation)
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