



EM CASES SUMMARY

Episode 178 Bronchiolitis Diagnostic Challenges and Management pitfalls

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Clinical assessment and diagnosis of bronchiolitis

Bronchiolitis is a *clinical* diagnosis based on patient age, time of year and clinical presentation. The typical patient with bronchiolitis is a child under 12 months of age who has a URTI prodrome and then develops LRTI symptoms with increased work of breathing, crackles and wheezes. It is important for clinicians and families to understand that acute symptoms generally last for approximately 10 days but can last up to 3 weeks. Neonates may present with apnea and/or cyanosis.

Clinical presentations that should alert us to either an alternative diagnosis or additional diagnosis include:

- Prolonged wheeze (≥ 3 weeks)
- Failure to thrive
- Recurrent feeding issues, choking with feeds
- Previous bacterial pneumonia
- Critically ill

Distinguishing bronchiolitis from asthma with URI, COVID and pneumonia

Multiple wheezing episodes at any age increases the likelihood of asthma. The diagnosis of asthma can be tentatively made in otherwise healthy children as early as 12 months of age.

A presumptive diagnosis of asthma can be made with the following criteria:

- ≥ 2 episodes wheeze OR
- ED presentation needing treatment
- Reversibility of respiratory distress after therapy
- 1st time wheeze with response to therapy
- Atopy is not necessary for diagnosis

The early diagnosis of asthma is important because literature suggests that a subset of these patients will develop abnormal lung function at the age of 5 years and long term lung disease (COPD), and that this can be prevented with use of corticosteroids. It is currently recommended that pre-school children with a presumptive diagnosis of asthma receive not only oral corticosteroids, but 3 months of inhaled corticosteroids following an acute exacerbation. Thankfully, the majority of infants with asthma improve by school age.

***Pearl:** A subset of pre-school children with asthma will develop chronic abnormal lung function and COPD, which can be prevented by treating acute exacerbations not only with oral corticosteroids, but 3 months of inhaled corticosteroids.*

Bacterial pneumonia can be distinguished from bronchiolitis by the following:

- High fever (unusual in children with bronchiolitis)
- Toxic appearance
- Absence of wheeze
- Unilateral chest findings

Note that bacterial pneumonia is unusual under age 12 months. **COVID can cause bronchiolitis, URI and croup** and should be managed similarly.

The definition and pathophysiology of bronchiolitis is variable

Complicating the approach to bronchiolitis further is the fact that the definition of bronchiolitis varies, researchers have discovered at least two different pathophysiologies, and while about 60% of bronchiolitis is caused by RSV, 20% is caused by Rhinovirus which carries a 59% risk of developing asthma.

- **American Academy of Pediatrics definition of bronchiolitis:** 1st episode of respiratory distress, wheeze, <24 months, poor feeding
- **British Thoracic Society definition of bronchiolitis:** 1st episode of respiratory distress, wheeze and/or crackles, <12 months

Indications for CXR in children with presumed bronchiolitis

Bronchiolitis is a clinical diagnosis that does not require a CXR. Routine CXR for bronchiolitis is *not* recommended as this often leads to unnecessary use of antibiotics. One study showed that pediatric EM physicians over-read CXRs at a rate of 5:1 compared to radiologists.

Similar to the above suggestions for when to suspect an alternative or additional diagnosis, CXR should be considered in:

- Atypical presentations- prolonged wheeze 3 weeks or more
- Suspicion of another diagnosis: FTT, recurrent feeding issues, choking with feeds, previous pneumonia
- Critically ill
- Neonate

Which patients with suspected bronchiolitis require viral testing?

As per Choosing Wisely Canada do not routinely test for respiratory viruses except in neonates, immunocompromised patients and those with prolonged fever and those with atypical presentations.

Identification of high risk bronchiolitis for consideration of admission

High risk bronchiolitis

- *HR>180, RR 70-80+, awake persistent saturations <90%*
- Age<2 months
- Prematurity <32 weeks
- Chronic lung disease
- Hemodynamically significant CHD
- Immunodeficiency
- Neuromuscular disease

Considerations for admission to hospital in children with bronchiolitis

In the decision of whether or not to admit a child with bronchiolitis, it is important to understand that 30% hospitalized infants receive no therapies needing hospitalization.

Hospitalization for otherwise healthy children with mild bronchiolitis has been described as “expensive baby-sitting”.

- Age <2 months
- Awake sats <90%, RR>70, nasal flaring, grunting
- Behavioral changes
- Poor hydration
- Co-morbidities
- Social, cultural considerations, impact on caretakers such as time off work

Considerations for ICU admission

Failure of high-flow nasal cannula (HFNC) after failure of standard oxygen therapy is usually an indication for non-invasive ventilation with CPAP and ICU admission.

Management of bronchiolitis: Volume, Oxygenation & Airway Support

Pharmacotherapy is generally ineffective in children with bronchiolitis. There is no compelling evidence that bronchodilators, steroids or epinephrine improves outcomes according to our expert. While nasal suctioning is frequently employed with the goal of improving feeding in the child with nasal obstruction, it's efficacy is unknown. Management should concentrate on 3 things:

1. Maintaining adequate volume status/feeding
2. Oxygenation
3. Airway support

Parental education is paramount:

- Explain the duration of illness, dynamic nature of symptoms
- Explain why drugs are ineffective
- Frequent feeding (q2h) to maintain adequate hydration
- Red flags explanation- poor feeding, behavioral change
- It is reasonable for parents to provide gentle suctioning prior to feeds (efficacy unknown)

Maintaining adequate volume status/feeding

The majority of children with bronchiolitis and volume depletion can be repleted with increasing feeds. Those that have evidence of severe dehydration or require admission to hospital for another reason may require IV or NG volume repletion. The literature suggests equivalent outcomes and safety for IV vs NG fluid administration in children.

Oxygenation in children with bronchiolitis

Many healthy infants exhibit typical transient oxygen saturation dips during sleep. A study of children discharged from the ED with bronchiolitis showed that 62% desaturate during sleep, some with prolonged desaturations and the outcomes were the same regardless of whether desaturations were detected or not. There is in-hospital evidence to suggest that continuous oximetry may prolong length of stay, particularly if staff react to normal transient dips in oxygen saturation or changes in heart and respiratory rates with interventions such as restarting oxygen therapy. The rationale for respiratory monitoring is to detect episodes of apnea requiring intervention; in a study of 691 infants <6 months of age, only 2.7% had documented apnea, and all had risk criteria of either a previous apneic episode or young age (<1 month or <48 weeks post-conception in premature infants). An RCT of 161 bronchiolitis inpatients at 4 U.S. hospitals randomized patients to continuous oximetry vs spot checks with vital signs and found no difference in outcomes. Continuous respiratory monitoring is indicated for high-risk patients in the ED, primarily to detect apneic episodes, but are not necessary for the vast majority of patients with bronchiolitis.

Intermittent monitoring can be routinely implemented in children with mild-moderate bronchiolitis.

Pitfall: Continuous O2 saturation monitoring in stable infants with mild-moderate bronchiolitis is unnecessary and may lead to needless admissions, prolonged length of stay; spot checks are adequate.

High-flow nasal cannula are overused in children with bronchiolitis: Suggested indications for HFNC in bronchiolitis

With the increasing popularity of HFNC for children with bronchiolitis there has been a doubling of ICU care for bronchiolitis in Ontario over the past 20 years (and similar trends in the U.S), independent of age, co-morbidities and hospitalization rates. This increase in ICU admissions corresponds to the surging rate of HFNC use.

While there are no evidence based clear guidelines on the indications for HFNC in bronchiolitis, the current recommended indications according to our expert include:

- Failure of standard low-flow oxygen therapy (awake O2 saturations <90-92%)
- Increasing oxygen requirements above 40%FIO2
- Increasing lethargy
- Persistent severe respiratory distress

The main impetus for HFNC in hospital wards is to offload the ICU and to reduce ICU length of stay however the evidence does not support this outcome. Two RCTs comparing early HFNC to rescue HFNC found the same rate of ICU transfers, that 75% of

patients needed no escalation of care, and that HFNC costs 16 times more than standard nasal cannula. These studies suggest that early HFNC provides costly therapy to many children who will not benefit and that HFNC should be used as rescue therapy for patients failing standard treatment rather than initiated early.

Take home messages for diagnosis and management of bronchiolitis

- Pharmacotherapy for bronchiolitis is generally ineffective and supportive therapy remains the cornerstone of management
- Supportive therapy includes 3 things: oxygenation, volume repletion and airway support
- The majority of children with bronchiolitis require only intermittent 'spot check' oximetry
- Use continuous oximetry selectively: marked respiratory distress, requiring supplemental oxygen
- Interpret oximetry in the clinical context and understand that children normally desaturate during sleep
- There is widespread overuse of HFNC for bronchiolitis; reserve HFNC for those who fail standard oxygen therapy as evidence suggests
- High risk bronchiolitis patients who should be considered for hospital admission include: HR>180, RR 70-80+, awake persistent saturations <90%, age <2 months, prematurity < 32 weeks, chronic lung disease, hemodynamically significant CHD, immunodeficiency,

neuromuscular disease, poor hydration, social considerations

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