

The CHRMC Bronchiolitis Guideline – 2005/06

1. **Supportive care:** Clinical pathways that emphasize minimal intervention have a positive effect on the treatment of patients hospitalized with bronchiolitis (Perlstein et al, 1999; Adcock et al, 1998).
 - Maintain the patient's hydration. If the patient cannot take adequate PO fluids then IV fluids should be considered. If PO feeding is delayed for more than 2 days then one should consider placing an NG tube for enteral feeds. Observe for aspiration with swallowing as children with bronchiolitis are at risk for this (Khoshoo et al, 2001).
 - Nasopharyngeal suctioning is an important part of the supportive care of infants with bronchiolitis.
 - Chest physiotherapy is usually not beneficial but can be considered in select patients who have mucous plugging and atelectasis.
 - No specific medication has been shown to be consistently efficacious in children with bronchiolitis.

2. **Corticosteroids:**
 - There is some evidence from a meta-analysis of 6 randomized controlled trials (Garrison et al, 2000) that parenteral or oral corticosteroids may improve clinical symptoms of bronchiolitis and shorten of the duration of symptoms and length of stay (by approximately 0.4 days).
 - Klassen et al (J Pediatr, 1997) and Boeck et al (J Pediatr, 1997) both found that corticosteroids did not change the clinical course of infants admitted to the hospital with bronchiolitis.
 - Berger et al (Pediatr Pulmonol, 1998) found no benefit of 2 mg/kg/day x 3 days of prednisone in children 1-18 months old presenting to the ED with bronchiolitis. However, Schuh et al (J Pediatr 2002) did find that infants with bronchiolitis treated in the ED with a single dose (1 mg/kg) of dexamethasone had clinical benefit and a decreased rate of hospitalization.
 - Corticosteroids are beneficial in acute asthma, and in older infants and toddlers it is difficult to differentiate between bronchiolitis and respiratory infection-induced exacerbations of asthma.

Recommendations for the use of corticosteroids:

- The routine use of corticosteroids for infants admitted to the hospital with presumed bronchiolitis is not recommended. However, systemic steroids are recommended for infants presenting with recurrent wheezing or who have a strong family history of atopy/asthma, e.g. those patients who might be suffering from asthma exacerbations.
 - Children > 12 months-old who present with bronchiolitis are more likely to have a reactive airways component to their disease, so they are more likely than young infants to benefit from corticosteroids.
 - Treating infants with bronchiolitis while they are in the ED (pre-hospitalization) with corticosteroids is optional and should be considered on a case-to-case basis.
3. **Bronchodilators:** A review of the literature on bronchodilator therapy for infants with bronchiolitis reveals that:
 - There is no conclusive evidence that B₂-agonists are efficacious in infants admitted to the hospital with bronchiolitis (Flores and Horwitz, 1997; Hartling et al, 2003).
 - Bronchodilators, either epinephrine or B₂-agonists, do not decrease length of hospital stay or influence clinical course in hospitalized patients with bronchiolitis. Specific studies are noted below.
 - The meta-analysis by Hartling et al (Arch Pediatr Adolesc Med, 2003) and a systematic review (Kellner et al, 1999) found no change in length of stay with albuterol or epinephrine.
 - A multicenter trial of nebulized epinephrine vs. placebo in 194 infants admitted to the hospital with bronchiolitis found no difference in length of stay or clinical improvement with epinephrine (Wainwright et al, NEJM, 2003).
 - Patel et al (J Pediatr, 2002) evaluated the use of epinephrine vs. albuterol or placebo in 149 infants admitted to the hospital with bronchiolitis. They found no benefit from either albuterol

or epinephrine in shortening length of hospital stay, decreasing the time to normal oxygenation and adequate PO intake, or in decreasing clinical score.

- There is evidence that racemic epinephrine is more effective than albuterol when treating children with bronchiolitis in the emergency department (Kristjansson et al, 1993; Menon et al, 1995; Reijonen et al, 1995). However, more recently Mull et al found no clear benefit of epinephrine over albuterol in children treated in the emergency department (2004), and a Cochran review concluded that there was insufficient evidence to support the use of epinephrine to treat infants hospitalized with bronchiolitis (Hartling et al, 2005).

Recommendations for the use of bronchodilators:

- Bronchodilator use should be discouraged in infants with bronchiolitis.
- However, bronchodilators may be considered in infants presenting with recurrent wheezing or who have a strong family history of atopy/asthma, e.g. those who might be suffering from asthma.
- Children > 12 months-old who present with bronchiolitis are more likely to have a reactive airways component to their disease, so they are more likely than young infants to respond to bronchodilators.
- As there is no definite benefit of epinephrine over albuterol for the treatment of inpatients with bronchiolitis, the bronchodilator of choice should be albuterol due to its longer duration of action and low risk for adverse effects.
- If bronchodilators are tried, then it is important to assess for clinical improvement. This should be done using the CHRMC respiratory score. Bronchodilators can be continued if there is evidence of clinical benefit, e.g. improvement in clinical score. However, bronchodilators should be discontinued if no positive clinical effect is noted.
- Before assessing response to bronchodilators the patient should undergo nasal suctioning to ensure that suctioning alone is not the cause of the patient's clinical improvement.
- Follow the CHRMC bronchodilator treatment protocol whenever possible and appropriate.

4. Supplemental Oxygen:

- Healthy infants < 6 months-old breathing room air can have brief O₂ desaturations to < 90% (Hunt et al, 1999). However, the normal oxygen saturation for infants breathing air at sea level is > 94% (Levesque et al, 2000).

Recommendations for the use of supplemental oxygen:

- Supplemental oxygen should be used if the patient's SaO₂ is consistently < 90%. Supplemental oxygen can be provided in the form of a hood box or facemask, but it is most commonly delivered via nasal cannula. The flow rate can range from 0.1 lpm to 2.0 lpm. Use the lowest flow rate possible that maintains SaO₂ ≥ 90%.
- The patient's oxygen saturations while breathing room air should consistently be ≥ 90% for at least 12 hours before hospital discharge.

5. Respiratory status assessment:

- Clinical scoring is useful in the assessment and monitoring of children with bronchiolitis. The CHRMC respiratory clinical score should be used routinely for longitudinal assessment of clinical change. (Liu et al, Pediatric Pulmonology 2004). It should also be used to objectively assess the clinical effect of interventions such as nasopharyngeal suctioning and bronchodilator administration.

6. Risk of bacterial infection:

- The risk of serious bacterial infection in infants with bronchiolitis is low, approximately 1% (Antonow et al, 1998; Greenes et al, 1999; Davies et al, 1996, Purcell and Fergie, 2002).

Recommendations for the use of antibiotics:

- Antibiotics should not be routinely used in patients with viral bronchiolitis.

7. Use of chest radiography:

- A randomized controlled trial found no improvement in clinical outcome of infants with acute lower respiratory infections who received chest x-rays compared to those who did not (Swingler et al, 1998). In addition, the routine use of chest radiography resulted in more antibiotic use.
- The risk of bacterial pneumonia is low in bronchiolitis.
- Indications for obtaining a CXR include a persistently asymmetric chest exam and an illness that is not following the expected course, e.g. no improvement after 2-3 days, high supplemental oxygen requirement, or fever for more than 2 days.

Recommendations for the use of chest radiographs:

- Chest radiographs should not be routinely ordered on patients with bronchiolitis. However, there are times when a CXR may be indicated.

8. Respiratory viral studies:

- Respiratory viral panels are not necessary in all patients presenting with bronchiolitis during the bronchiolitis season (Nov/Dec-March/April).

Recommendations

- Potential indications for ordering a respiratory viral panel are to identify etiologic agents with confidence, for epidemiological tracking, and for aid in cohorting patients with the same infection.
- If the provider is uncertain that the diagnosis is viral bronchiolitis, a respiratory viral panel should be done before pursuing further diagnosis testing, e.g. chest radiographs, and before starting antibiotics.
- Also consider ordering a respiratory viral panel if the infant does not present with typical bronchiolitis, presents with clinical evidence of bronchiolitis outside of the typical bronchiolitis season, or if the patient is to going to be placed into a multi-bed room, e.g. cohorted.

9. Discharge Planning and Education: Most infants with bronchiolitis should not be prescribed bronchodilators for home use. All parents should be offered the bronchiolitis class and NOT the asthma class. The education plan should include:

- Recognizing the signs/symptoms of respiratory distress
- Use of nasal bulb syringe and proper feeding technique
- Discussion on passive smoke exposure
- Review of discharge medications and follow-up appointments

10. Tracking measures (metrics):

- Readmission to the hospital
- Length of stay
- Percentage of patients prescribed bronchodilators (albuterol and/or epinephrine)
- Percentage of patients who had a chest x-rays
- Percentage of patients treated with antibiotics (parenteral and PO)
- Percentage of patients prescribed corticosteroids

References for the CHMRC Bronchiolitis Guideline

1. Adcock PM, Sanders CL, Marshall GS. Standardizing the care of bronchiolitis. *Arch Pediatr Adolesc Med* 1998; 152:739-744.
2. Antonow JA, Hansen K, McKinstry CA, Byington CL. Sepsis evaluation in hospitalized infants with bronchiolitis. *Pediatr Infect Dis J* 1998; 17:231-236.
3. Berger I, Argaman Z, Schwartz S, Segal E, Kiderman A, Branski D, Kerem E. Efficacy of corticosteroids in acute bronchiolitis: short-term and long-term follow-up. *Pediatr Pulmonol* 1998; 26:162-168.
4. De Boeck K, Van der Aa N, Van Lierde S, Corbeel L, Eeckels R. Respiratory syncytial virus bronchiolitis: a double-blind Dexamethasone efficacy study. *J Pediatr* 1997;131:919-921.
5. Davies HD, Matlow A, Petric M, Glazier R, Wang EEL. Prospective comparative study of viral, bacterial and atypical organisms identified in pneumonia and bronchiolitis in hospitalized Canadian infants. *Pediatr Infect Dis J* 1996; 15:371-375.
6. Flores G, Horwitz RI. Efficacy of B2-agonists in bronchiolitis: a reappraisal and meta-analysis. *Pediatrics* 1997; 100:233-239.
7. Garrison MM, Christalds DA, Harvey E, Cummings P, Davis RL. Systemic corticosteroids in infant bronchiolitis: A meta-analysis. *Pediatrics* 2000; 105 (4):e 44.
8. Greenes DS, Harper MB. Low risk of bacteremia in febrile children with recognizable viral syndromes. *Pediatr Infect Dis J* 1999; 18:258-261.
9. Hartling L, Wiebe N, Math M, Russell K, Patel H, Klassen T. A meta-analysis of randomized controlled trials evaluating the efficacy of epinephrine for the treatment of acute viral bronchiolitis. *Arch Pediatr Adolesc Med*. 2003;157:957-964.
10. Hartling L, Wiebe N, Russell K, Patel H, Klassen T. Epinephrine for bronchiolitis. *Cochrane Database of Systematic Reviews* 2004; CD003123.
11. Hunt CE et al. Longitudinal assessment of hemoglobin oxygen saturation in healthy infants during the first 6 months of age. *J Pediatr* 1999; 134:580-586.
12. Kellner JD, Ohiosson A, Gadmosli AM, Wang EEL. Bronchodilator therapy in bronchiolitis. *Cochrane Library* 1999.
13. Klassen T, Sutcliffe T, Watters L, Wells G, Allen U, Li M. Dexamethasone in salbutamol-treated inpatients with acute bronchiolitis: a randomized, controlled trial. *J Pediatr* 1997;130:191-196.
14. Khoshoo V, Ross G, Kelly B, Edell D, Brown S. Benefits of thickened feeds in previously healthy infants with respiratory syncytial viral bronchiolitis. *Pediatric Pulmonology* 2001; 31:301-2.
15. Kristiansson S, Carlsen KCL, Wennergren G, Strannegard IL, Carlsen KH. Nebulized racemic adrenaline in the treatment of acute bronchiolitis in infants and toddlers. *Archives of Dis Child* 1993; 69:650-654.
16. Levesque B, Pollack P, Griffin B, Nielsen H. Pulse oximetry: what's normal in the newborn nursery? *Pediatr Pulmonol* 2000; 30:406-412.
17. Liu L, Gallaher M, Davis R, et al. Use of a Respiratory Clinical Score Among Different Providers. *Pediatr Pulmonol* 2004; 37:243-8.
18. Menon K, Sutcliffe T, Klassen T. A randomized trial comparing the efficacy of epinephrine with salbutamol in the treatment of acute bronchiolitis. *J Pediatr* 1995; 126:1004-7.
19. Mull C, Scarfone R, Ferri L, et al. A randomized trial of nebulized epinephrine vs albuterol in the emergency department treatment of bronchiolitis. *Arch Pediatr Adolesc Med* 2004;158:113-118.
20. Patel H, Platt RW, Pেকেles GS, Ducharme FM. A randomized, controlled trial of the effectiveness of nebulized albuterol with epinephrine compared with albuterol and saline in infants hospitalized for acute viral bronchiolitis. *J Pediatr* 2002; 141:818-24.
21. Perlstein PH, Kotagal UR, Boiling C et al. Evaluation of an evidence-based guideline for bronchiolitis. *Pediatrics* 1999; 104:1334-1341.
22. Purcell K, Fergie J. Concurrent serious bacterial infections in 2396 infants and children hospitalized with respiratory syncytial virus lower respiratory tract infections. *Arch Pediatr Adolesc Med* 2002; 156:322-4.
23. Reijonen T, Korppi M, Pitkakangas S, Tenhola S, Remes K. The clinical efficacy of nebulized racemic epinephrine and albuterol in acute bronchiolitis. *Arch Pediatr Adolesc Med* 1995; 149:686-692.
24. Swingler GH, Hussey GD, Zwarenstein M. Randomized controlled trial of clinical outcome after chest radiograph in ambulatory acute lower respiratory infection in children. *Lancet* 1998; 351: 404-408.
25. Schuh S, Coates A, Binnie R, Allin T, Goia C, Corey M, Dick P. Efficacy of oral dexamethasone in outpatients with acute bronchiolitis. *J Pediatr* 2002;140:27-32.
26. Wainwright C, Altamirano L, Medico-Cirujano, Cheney M, Cheney J, Barber, Scott, Price D et al. A multicenter, randomized, double-blind, controlled trial of nebulized epinephrine in infants with acute bronchiolitis. *N Engl J Med* 2003; 349:27-35.