

What are hospital admission criteria for infants with bronchiolitis?

Isabel Lind, MD, John H. Gill, MD

Waco Family Medicine Residency Program, Waco, Tex

Nancy Calabretta, MS, MEd

UMDNJ Camden Campus Library at Cooper, Cooper University Hospital, Camden, NJ

EVIDENCE-BASED ANSWER

Clinical judgment remains the gold standard for hospital admission of infants with bronchiolitis, and it cannot be replaced by objective criteria (strength of recommendation [SOR]: **B**, based on prospective and retrospective cohort and retrospective case-control studies). Oxygen

saturation (SaO_2) is the most consistent clinical predictor of deterioration, though different investigators vary cutoffs from 90% to 95% SaO_2 and the vast majority of infants with saturations in this range do well (SOR: **B**, based upon prospective cohort studies).

CLINICAL COMMENTARY

The key is being able to identify a “sick” child

As a medical student I was taught that one of the most important skills I could develop is the ability to look at a child and know whether he or she is “really sick” or “not so sick.” In determining which patients with bronchiolitis I admit to the hospital, I look at findings such as age (<3 months), medical history, oxygen saturation, and respiratory rate and effort. I also evaluate less tangible data, including the parents’ level of comfort taking their child home, and the number of visits they have

already made to the emergency department or clinic for this same problem. For me, a pulse oximetry reading of 93% (or any other individual finding) does not mandate admission. Although one might hope for more objective evidence upon which to base decisions, those of us who are comfortable using this type of gestalt will find the results of this inquiry reassuring.

Mike Polizzotto, MD

Rockford Family Medicine Residency Program, Rockford, Ill

■ Evidence summary

Bronchiolitis is the most common diagnosis among hospitalized infants aged <1 year in the US.¹ It is usually mild with a self-limited course. A 1997 study following 1113 healthy full-term infants through 20 consecutive winter seasons showed a 5% hospitalization rate of all infants with a positive respiratory syncytial virus (RSV) culture (hospitalization rates with other pathogens were not reported), confirming the mild nature of most cases of bronchiolitis.² RSV accounts for 50% to 80% of

bronchiolitis, along with other pathogens such as parainfluenza virus, influenza virus, and human metapneumovirus. A recent analysis of Centers for Disease Control and Prevention data from 1979 to 1997 showed that an average of 95 children died annually in the US from bronchiolitis, and 77% of these were aged <1 year (median age at death was 3 months).³

When discrete measures such as vital signs and scoring scales for respiratory distress are compared, infants who have

TABLE

Risk factors for deterioration in infants with bronchiolitis

Initial presentation	1. Tachypnea (respiratory rate >60–80) or retractions 2. Hypoxia: cutoffs ranging from SaO ₂ <90% to <95% 3. Difficulty feeding or dehydration
Age	Age <12 months The lower the age, the higher the risk
Comorbidities	Bronchopulmonary dysplasia Cystic fibrosis Congenital heart disease
Prematurity	Gestational age at birth <36 weeks
Other	Lower annual family income ⁴

FAST TRACK

SaO₂ is the most consistent clinical predictor of deterioration in infants with bronchiolitis, but physician judgment remains the gold standard

mild disease courses are very similar to those who subsequently have a more severe illness. This, combined with the low incidence of serious illness, lowers the predictive value of any single clinical criteria for hospital admission (including oxygen saturation, respiratory rate, apparent respiratory distress, and day of illness) to the degree that no objective criteria are useful to make a decision for or against hospitalization.^{4,5}

In 2 good-quality retrospective case-control studies, which enrolled infants with milder disease discharged from emergency departments, no infants returned with illness severe enough to require admission to an intensive care unit (ICU).^{5,6} No criteria were found that could predict subsequent severe course and need for admission.

One good-quality prospective study that enrolled 213 infants, younger than 13 months and presenting with bronchiolitis as outpatients found that physician impression of appearance was a better predictor of severe illness than numeric scoring systems such as the Yale Observation Scale or the Clinical Asthma Score.⁷ Pulse oximetry (<95%), prematurity (<34 weeks gestational age), respiratory rate >70/minute, atelectasis, “ill” or

“toxic” appearance, and age <3 months were associated with more severe illness (defined as inability to remain alert and active or well hydrated throughout their illness). Oxygen saturation (SaO₂) <95% was the most objective predictor of severity (positive predictive value = 87%; negative predictive value = 73%). The study population was more ill than what is typical in outpatient settings (42% required admission and 11% required mechanical ventilation); therefore the positive predictive value would be lower in a milder, more typical outpatient population.

In a retrospective case-control study of 542 otherwise healthy full-term infants aged <1 year admitted for bronchiolitis with positive RSV tests, tachypnea (rate >80) and hypoxia (SaO₂ <85%) were predictive of the need for pediatric ICU-level care (the specificity for predicting deterioration was 97%, but the sensitivity was only 30%).⁴ The authors concluded that the use of any specific variable for a single patient is limited because of its low sensitivity for detecting the risk of an adverse outcome.

Several studies have attempted to define admission criteria or decision-making tools for admission of these infants, but all used the clinical opinion of the attending pediatrician as their gold standard and many excluded infants discharged within 24 hours, thus limiting their applicability to an outpatient population.^{4,7–10} Common criteria in these studies were an SaO₂ ≤93% or history of complicating illness such as congenital heart disease, prematurity, or lung disease, plus the clinical impression of the attending physician.

Recommendations from others

The American Academy of Pediatrics does not have a guideline addressing this issue. The only guideline listed at the National Guidelines Clearinghouse was a 2005 Cincinnati Children’s Hospital Medical Center guideline for managing

CONTINUED ON PAGE 69

infants with bronchiolitis; it is grounded in assuring good patient oxygenation and hydration.¹¹ This guideline does not give specific criteria for admission but leaves this decision to the judgment of the physician. It also notes that the benefits of hospitalization center on the ability to closely monitor clinical status (including airway maintenance and hydration) and educating parents. The guideline recommends starting supplemental oxygen when SaO₂ is consistently less than 91% and weaning when higher than 94%.

REFERENCES

1. Leader S, Kohlhasse MS. Recent trends in severe respiratory syncytial virus (RSV) among US infants, 1997 to 2000. *J Pediatr* 2003; 143:S127-S132.
2. Fisher RG, Gruber WC, Edwards KM, et al. Twenty years of outpatient respiratory syncytial virus infection: a framework for vaccine efficacy trials. *Pediatrics* 1997; 99(2):E7.
3. Shay DK, Holman RC, Roosevelt GE, Clarke MJ, Anderson LJ. Bronchiolitis-associated mortality and estimates of respiratory syncytial virus-associated deaths among US children, 1979-1997. *J Infect Dis* 2001; 183:16-22.
4. Brooks AM, McBride JT, McConnochie KM, Aviram M, Long C, Hall CB. Predicting deterioration in previously healthy infants hospitalized with respiratory syncytial virus infection. *Pediatrics* 1999; 104:463-467.
5. Roback MG, Baskin MN. Failure of oxygen saturation and clinical assessment to predict which patients with bronchiolitis discharged from the emergency department will return requiring admission. *Pediatr Emerg Care* 1997; 13:9-11.
6. Johnson DW, Adair C, Brant R, Holmwood J, Mitchell I. Differences in admission rates of children with bronchiolitis by pediatric and general emergency departments. *Pediatrics* 2002; 110:E49.
7. Shaw KN, Bell LM, Sherman NH. Outpatient assessment of infants with bronchiolitis. *Am J Dis Child* 1991; 145:151-155.
8. Mulholland EK, Olinsky A, Shann FA. Clinical findings and severity of acute bronchiolitis. *Lancet* 1990; 335:1259-1261.
9. Mai TV, Selby AM, Simpson JM, Isaacs D. Use of simple clinical parameters to assess severity of bronchiolitis. *J Paediatr Child Health* 1995; 31:465-468.
10. Walsh P, Rothenberg SJ, O'Doherty S, Hoey H, Healy R. A validated clinical model to predict the need for admission and length of stay in children with acute bronchiolitis. *Eur J Emerg Med* 2004; 11:265-272.
11. Cincinnati Children's Hospital Medical Center website. Evidence-based clinical practice guideline: Bronchiolitis in infants less than 1 year of age presenting with a first time episode. Last updated 2005. Available at: www.cincinnatichildrens.org/NR/rdonlyres/06A32FA0-503A-461E-BD71216097583923/0/BronchGL.pdf. Accessed on December 7, 2005