Guideline Summary NGC-8674

Guideline Title

Evidence-based care guideline for management of first time episode bronchiolitis in infants less than 1 year of age.

Bibliographic Source(s)

Cincinnati Children's Hospital Medical Center. Evidence-based care guideline for management of first time episode bronchiolitis in infants less than 1 year of age. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2010 Nov 16. 16 p. [142 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of bronchiolitis in infants less than 1 year of age presenting with a first time episode. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 May. 13 p.

Scope

Disease/Condition(s)

Bronchiolitis

Guideline Category

Diagnosis

Evaluation

Management

Prevention

Treatment

Clinical Specialty

Emergency Medicine

Family Practice

Pediatrics

Pulmonary Medicine

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Nurses

Patients

Physician Assistants

Physicians

Respiratory Care Practitioners

Guideline Objective(s)

In children age less than 1 year and presenting for the first time with bronchiolitis typical in presentation and clinical course, the objectives of this guideline are to:

- Avoid the use of unnecessary diagnostic studies
- Decrease the use of medications and respiratory therapy without observed improvement
- Improve the rate of appropriate admission
- Decrease the rate of nosocomial infection
- Improve the use of appropriate monitoring activities
- Maintain or improve the length of stay

Target Population

These guidelines are intended primarily for use in children age less than 1 year and presenting for the first time with bronchiolitis typical in presentation and clinical course.

Note: These guidelines are not intended for use in children:

- With a history of cystic fibrosis (CF)
- With a history of bronchopulmonary dysplasia (BPD)
- With immunodeficiencies
- Admitted to an intensive care unit (ICU)
- Requiring ventilator care
- With other severe comorbid conditions complicating care

Interventions and Practices Considered

Prevention

1. Review of preventive measures with parents of newborns
2. Respiratory and contact isolation precautions for patients with documented bronchiolitis

Diagnosis/Evaluation

1. Clinical history and physical examination
2. Individual assessment of admission status (consideration of respiratory status, nutritional status, social factors)

Note: Laboratory and radiological studies (i.e., respiratory syncytial virus [RSV] swab, chest x-rays, cultures of blood or urine, capillary or arterial blood gases, rapid influenza or other rapid viral studies, pulse oximetry) are considered but not recommended for routine use.

Management

1. Oxygen therapy
2. Epinephrine or albuterol
   - No routine scheduled or serial use of albuterol aerosol therapies
   - Single administration trial inhalation using epinephrine or albuterol in selected patients
   - Repeated or continued use only if improvement is documented Respiratory care therapies
   - Suctioning before feeds as needed (PRN) and prior to each inhalation therapy
   - Normal saline drops prior to suctioning
3. Monitoring of clinical status
   - Repeated clinical assessments
   - Cardiac and respiratory rate monitoring during acute stage
   - Spot checks of pulse oximetry
4. Discharge planning
5. Parent education
   - Basic pathophysiology and expected clinical course of bronchiolitis
   - Proper techniques for suctioning the nose and making breathing easier
   - When to call primary care provider with signs of worsening clinical status
   - Topics regarding prevention of respiratory infection

Note: Chest physiotherapy; aerosol therapy with saline; antibiotics (in the absence of an identified bacterial focus); routine use of antihistamines, oral decongestants, and nasal vasoconstrictors; corticosteroid therapy given as inhalations, intravenously (IV), orally (PO), or intramuscularly (IM); inhalation therapies; hypertonic saline inhalations; antibodies; montelukast, recombinant human deoxyribonucleic acid, and inhaled furosemide were considered but not recommended.

Major Outcomes Considered

- Clinical improvement
- Hospitalization rates
- Length of stay

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

To select evidence for critical appraisal by the group for the guideline, the Medline, EmBase and the Cochrane databases were searched for dates of May, 2005 to May, 2010 to generate an unrefined, "combined evidence" database using a search strategy focused on answering clinical questions relevant to bronchiolitis and employing a combination of Boolean searching on human-indexed thesaurus terms (Medical Subject Heading [MeSH] headings using an OVID Medline interface) and "natural language" searching on words in the title, abstract, and indexing terms. The citations were reduced by: eliminating duplicates, review articles, non-English articles, and adult articles. The resulting abstracts were reviewed by a methodologist to eliminate low quality and irrelevant citations. During the course of the guideline development, additional clinical questions were generated and subjected to the search process, and some relevant review articles were identified. May, 2006 was the last date for which literature was reviewed for the previous version of the guideline. The details of that review strategy are filed electronically. All previous citations were reviewed for appropriateness to this revision. Experience with the implementation of earlier publications of the guideline has provided learnings which have been incorporated into this revision.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5a or 5b	Other: General review, expert opinion, case report, consensus report, or guideline
5	Local Consensus

†a = good quality study; b = lesser quality study

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The process by which this guideline was developed is documented in the Guideline Development Process Manual. The recommendations contained in this guideline were formulated by an interdisciplinary working group which performed systematic search and critical appraisal of the literature, using the Table of Evidence Levels described in the "Rating Scheme for the Strength of the Evidence" field, and examined current local clinical practices.

Recommendations have been formulated by a consensus process directed by best evidence, patient and family preference and clinical expertise. During formulation of these recommendations, the team members have remained cognizant of controversies and disagreements over the management of these patients. They have tried to resolve controversial issues by consensus where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.

Rating Scheme for the Strength of the Recommendations

Table of Recommendation Strength

Strength	Definition
"Strongly recommended"	There is consensus that benefits clearly outweigh risks and burdens (or vice-versa for negative recommendations).
"Recommended"	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is a lack of consensus to direct development of a recommendation.
Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that	

Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the body of evidence
2. Safety/harm
3. Health benefit to the patients (direct benefit)
4. Burden to patient of adherence to recommendation (cost, hassle, discomfort, pain, motivation, ability to adhere, time)
5. Cost-effectiveness to healthcare system (balance of cost/savings of resources, staff time, and supplies based on published studies or onsite analysis)
6. Directness (the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome])
7. Impact on morbidity/mortality or quality of life

Cost Analysis

Published cost-analyses were reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

The guideline has been reviewed and approved by clinical experts not involved in the development process, distributed to senior management, and other parties as appropriate to their intended purposes.

Recommendations

Major Recommendations

The strength of the recommendation (strongly recommended, recommended, or no recommendation) and the quality of evidence (1a-5b) are defined at the end of the "Major Recommendations" field.

Prevention

Prevention of hospitalization and significant morbidity is a high priority in the management of this lower respiratory tract infection. Infants less than three months of age, premature infants (<35 weeks gestation), and infants with chronic lung disease, congenital heart disease, or immune deficiency syndromes who are diagnosed with bronchiolitis may be at particular risk for hospitalization and significant morbidity (Koehoorn et al., 2008 [4a]; Shay et al., 2001 [4a]; Boyce et al., 2000 [4a]; Church et al., 1984 [4a]).

Prevention Measures

Community

1. It is recommended that measures to prevent acute bronchiolitis be reviewed with parents of newborns prior to discharge from the hospital and at follow-up visits in the first years of life. These specific measures include:

   - An emphasis on hand washing in all settings (Luby et al., 2005 [2a]; Hall, 2007 [3a]; American Academy of Pediatrics (AAP) Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a])
   - Eliminating exposure to environmental tobacco smoke or pollution exposure (Bradley et al., 2005 [3a]; Karr et al., 2009 [4a]; Koehoorn et al., 2008 [4a]; Karr et al., 2007 [4a]; Mahabee-Gittens, 2002 [4a]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a])
   - Limiting exposure to contagious settings and siblings (e.g., daycare centers) (Celedon et al., 1999 [3a]; Wald, Guerra, & Byers, 1991 [3a]; Koehoorn et al., 2008 [4a])
   - Protective benefits of breastfeeding for 6 months (Dornelles, Piva, & Marostica, 2007 [3a]; Koehoorn et al., 2008 [4a]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a])
   - Preventive medical therapies such as palivizumab (Synagis®, MedImmune); may be considered for selected high-risk patients (Robinson et al., 2010 [1a]; "Palivizumab," 1998 [2a]; Romero, 2003 [5a]).

   Note: Although palivizumab (Synagis®, MedImmune) has been shown to reduce rates of hospitalization while remaining safe ("Palivizumab," 1998 [2a]; Chang & Chen, 2010 [4a]; Mitchell et al., 2006 [4a]), its use has not demonstrated cost-effectiveness for all infants due to the high cost of the medication and persistently low mortality rates associated with respiratory syncytial virus (RSV) bronchiolitis and warrants further review (Rackham, Thorburn, & Kerr, 2005 [1a]; Yount & Mahle, 2004 [1a]; Joffe et al., 1999 [2a]; Wegner et al., 2004 [3a]; Heikkinen et al., 2005 [4a]).

Hospital

2. It is recommended, in patients with documented bronchiolitis, that respiratory-contact isolation policies be observed for protection of all patients from nosocomial infections (Hall, 2007 [3a]; Langley et al., 1997 [3a]; Cincinnati Children's Hospital Medical Hospital [CCHMC] Infection Control Manual [ICRM]-735, 2005 [Local Consensus]):

   Note: Airborne droplets were not the major mode of transmission of nosocomial infection during respiratory season on one infants' ward, suggesting that effective infection control depends on infection control policy compliance and awareness of the risks of nosocomial infection for both patients and personnel (Hall, 2007 [3a]).

Emergency Department/Inpatient Management

Emergency Department/Inpatient Management

Assessment and Diagnosis

The diagnosis of bronchiolitis and its severity is rooted in the clinician's interpretation of the constellation of characteristic findings and is not dependent on any specific clinical finding or diagnostic test (Bordley et al., 2004 [1a]). Infants with acute bronchiolitis may present with a wide range of clinical symptoms and severity, from mild upper respiratory infections to impending respiratory failure.

3. It is recommended that the clinical history and physical examination be the basis for a diagnosis of bronchiolitis (AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]).

Diagnostic criteria for bronchiolitis include, but are not limited to, the following:

- Preceding upper respiratory illness and/or rhinorrhea
- Exposure to persons with viral upper respiratory infection
- Signs of respiratory illness which may include the following common respiratory symptoms:
  - Tachypnea
  - Color change
  - Retractions
  - Nasal flaring
  - Shortness of breath
  - Wheezing
  - Low O_2 saturation

General

The basic management of typical bronchiolitis is anchored in the provision of therapies that assures the patient is clinically stable, well oxygenated, and well hydrated. The main benefits of hospitalization of infants with acute bronchiolitis are (Klassen, 1997 [1b]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]; Lugo & Nahata, 1993 [5a]; Panitch, Callahan, & Schidlow, 1993 [5a]; Nicolai & Pohl, 1990 [5a]; Local Consensus [5a]):

- The careful monitoring of clinical status
- Maintenance of a patent airway (through positioning, suctioning, and mucus clearance)
- Maintenance of adequate hydration
- Parental education

Monitoring

4. It is recommended that repeated **clinical** assessment be conducted, as this is the most important aspect of monitoring for deteriorating respiratory status (Local Consensus [5a]).

5. It is recommended to consider cardiac and respiratory rate monitoring in hospitalized patients during the acute stage of bronchiolitis when the risk of apnea and/or bradycardia is greatest (Anas et al., 1982 [3b]; Church et al., 1984 [4a]).

Note 1: Premature infants, infants with underlying chronic conditions predisposing to apnea, infants with a witnessed episode of apnea, and infants less than three months of age who contract RSV are at particular risk of severe complications such as apnea and mechanical ventilation (Wang, Law, & Stephens, 1995 [3a]; Anas et al., 1982 [3b]; Willwerth, Harper, & Greenes, 2006 [4a]; Church et al., 1984 [4a]; Krasinski, 1985 [4b]). There is not enough available data to precisely quantify other risks of apnea attributable to RSV infection (Ralston & Hill, 2009 [1a]).

Note 2: Several studies have reported more severe progression of disease in children with bronchiolitis who present with low initial oxygen saturations (Wang, Law, & Stephens, 1995 [3a]; Shaw, Bell, & Sherman, 1991 [3a]; Mulholland, Olinsky, & Shann, 1990 [3b]).

Oxygen and Medications

6. It is recommended to administer supplemental oxygen when the saturation remains less than 91% and consider weaning oxygen when saturation remains higher than 94% (National Asthma Education and Prevention Program [NAEPP], 2007 [5a]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]; Local Consensus [5a]).

Note: There is not enough evidence to determine which of the non-invasive delivery methods available are best to be used in the treatment of hypoxemia in children with lower respiratory tract infections. Factors to consider when choosing an oxygen delivery method include (Rojas-Reyes, Granados Rugeles, & Charry-Anzola, 2009 [1a]; Sung et al., 2008 [4b]):

- Efficacy
- Patient safety
- Patient tolerability
- Fit
- Availability
- Cost

7. It is recommended that a single *trial* inhalation using epinephrine or albuterol be considered on an individual basis, such as when there is a family history of allergy, asthma, or atopy (Hartling et al., 2004 [1a]; Klassen, 1997 [1b]; Modl et al., 2005 [3b]; Numa, Williams, & Dakin, 2001 [3b]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]) (see Attachment 'Aerosolized Drugs and Dosages for Trial Inhalation' in the original guideline document).

Note 1: It is expected if a trial inhalation is used that a measured clinical improvement be demonstrated for this

Note 1: It is expected if a trial inhalation is used that a measured clinical improvement be demonstrated for this therapy to be continued. In one study, inhalation therapies were continued on average, 50% of the time (Emergency Department and inpatient) despite documented non-response to the therapy, exposing the patient to unnecessary therapy and cost (Lugo et al., 1998 [4b]).

Note 2: **Nebulized racemic epinephrine** demonstrates better short-term improvement in pulmonary physiology and clinical scores compared with albuterol or placebo (Hartling et al., 2003 [1a]; Walsh et al., 2008 [2a]; Wainwright et al., 2003 [2a]; Langley et al., 2005 [2b]; Numa, Williams, & Dakin, 2001 [3b])

Respiratory Care Therapy

8. It is recommended the infant be **suctioned**, when clinically indicated (Local Consensus [5a]):
   - Before feedings
   - As needed (PRN)
   - Prior to each inhalation therapy

Note 1: In order to appropriately measure improvement in clinical status due to the therapeutic effects of the medication, the following reasons for suctioning are considered:

- Suctioning itself may improve respiratory status such that inhalation therapy is not necessary. Thus, it is important to document the pre-and post-suction clinical score prior to treatment.
- Suctioning may improve the delivery of the inhalation treatment (Local Consensus [5a]).
- Suctioning of the nares may provide relief of nasal congestion (AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]).

Note 2: Normal saline nose drops may be used prior to suctioning (Local Consensus [5a]).

9. It is recommended that spot checks of pulse oximetry be conducted in infants with bronchiolitis as clinically indicated (Local Consensus [5a]).

Note 1: At Cincinnati Children's Hospital Medical Center, a spot check is performed at any point a clinical need is assessed, before and after suctioning, and before and after any inhalation to determine consistent oxygen level, or any improvement from therapies (Local Consensus [5a]).

Note 2: Continuous oximetry measurement has been associated with mean increased length of stay (Unger & Cunningham, 2008 [4a]) of 1.6 days (95% confidence interval [CI] 1.1 to 2.0) (Schroeder et al., 2004 [4b]).

Note 3: Wide variability has been demonstrated in the manner in which clinicians use and interpret pulse oximetry readings in children with bronchiolitis. This variability results in increased preferences for hospital admission and increased length of stay for children admitted with bronchiolitis (Mallory et al., 2003 [2a]; Unger & Cunningham, 2008 [4a]; Schroeder et al., 2004 [4b]).

Note 4: Transient oxygen desaturation episodes have been documented in studies of healthy, term infants and determined to be representative of normal breathing and oxygenation behavior (Poets, Urschitz, & Poets, 2009 [2a]; Hunt et al., 1999 [3b]).

Education

10. It is recommended that the family be educated on the following topics regarding the **care** of a child with bronchiolitis:
    - To call their primary care provider if the following signs of worsening clinical status are observed (Local Consensus [5a]):
      - Increasing respiratory rate and/or work of breathing as indicated by use of accessory muscle
      - Inability to maintain adequate hydration
      - Worsening general appearance
    - Basic pathophysiology and expected clinical course of bronchiolitis including lingering symptoms which may continue to disrupt child and family routines (Robbins et al., 2006 [3a]).

Note: The median duration of illness for children <1 year of age with bronchiolitis has been shown to be 12 days (Petruzella & Gorelick, 2010 [3b]). After 21 days approximately 18% to 28% will remain ill (Robbins et al., 2006 [3a]; Swingler, Hussey, & Zwarenstein, 2000 [3a]; Petruzella & Gorelick, 2010 [3b]).

- Proper techniques for suctioning the nose and making breathing easier (Local Consensus [5a]).
- Screening over-the-counter (OTC) drug labels to avoid misuse of drugs not recommended for use in this age group (Carr, 2006 [5a]) (see Recommendation #18 below).

11. It is recommended that the family be educated on the following topics regarding **prevention** of respiratory infection in infants:
    - Eliminating exposure to environmental tobacco smoke (Mahabee-Gittens, 2002 [4a])
    - Limiting exposure to contagious settings and siblings (e.g., daycare centers) (Celedon et al., 1999 [3a])
    - An emphasis on hand washing in all settings (Hall et al., 1981 [3b])

Admission Criteria

12. It is recommended that every patient be individually assessed for admission status as there have been no findings from physical examination that have been consistently associated with outcomes of bronchiolitis (AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]; Local Consensus [5a]). Admission criteria remain a clinical judgment weighing numerous factors rather than applying a discrete set of criteria (Local Consensus [5a]). The following includes factors to consider:

Respiratory Status

- Respiratory distress, apnea, respirations greater than 70 per minute and/or clinical evidence of increased work of breathing

- Patient requires oxygen supplementation
- Patient requires continuous clinical assessment of airway clearance and maintenance using bulb suctioning

Nutritional Status

- Patient is dehydrated
- Patient is unable to maintain oral feedings at a level to prevent dehydration

Social

- Parent or guardian is not prepared to provide care at home
- Family education is not complete
- Home resources are inadequate to support the use of any necessary home therapies

Discharge Criteria

13. It is recommended that individualized discharge planning begin on admission. Although studied, there is no clear evidence as to what constitutes risk for readmission following a bronchiolitis visit/hospitalization (Mansbach et al., 2008 [3a]; Kemper et al., 2005 [4a]), therefore discharge criteria remain a clinical judgment weighing numerous factors rather than applying a discrete set of criteria. The following includes factors to consider individually and are intended to prepare the family for a timely and safe discharge (Local Consensus [5a]):

Respiratory Status

- Respirations less than 70 per minute and/or no clinical evidence of increased work of breathing or distress
- Parent can clear the infant's airway using bulb suctioning
- Patient's oxygen saturation remains >91 % on room air

Nutritional Status

- The patient is on oral feedings at a level to prevent dehydration

Social

- Home resources are adequate to support the use of any necessary home therapies
- Parent or guardian is confident they can provide care at home
- Family education complete

Follow Up

- When indicated, home care and durable medical supply (DMS) agencies have been notified and arrangements for visits finalized
- Primary care provider identified, notified, and agrees with discharge decision
- Follow-up appointments have been scheduled

Therapies NOT Routinely Recommended

Inhalations

14. It is recommended that scheduled or serial inhalation therapies not be used routinely nor repeated if there is no measured improvement in clinical outcome after a *trial* inhalation. In the majority of cases the use of inhalation and other therapies will not be efficacious for treating the airway edema typical of bronchiolitis (Gadomski & Bhasale, 2009 [1a]; King et al., 2004 [1a]; Gupta et al., 2008 [2a]; Patel, Gouin, & Platt, 2003 [2a]; Wainwright et al., 2003 [2a]; Beck et al., 2007 [2b]; Ralston et al., 2005 [2b]; Conway et al., 2004 [3a]; Lenney & Milner, 1978 [3b]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]).

Note 1: Some cases of bronchiolitis may be a prelude to asthma (Sigurs, 2004 [3a]; Sigurs, 2002 [3a]; Martinez et al., 1995 [3a]; Stark & Busse, 1991 [5a]) and several studies using bronchodilators in children with bronchiolitis have demonstrated an improvement of clinical scores; however, decrease in hospitalization rates or length of stay (LOS) have not been shown (Gadomski & Bhasale, 2009 [1a]; Hartling et al., 2004 [1a]; Flores & Horwitz, 1997 [1a]; Klassen, 1997 [1b]; Karadag et al., 2008 [2b]; Langley et al., 2005 [2b]) and improvement results are not consistent.

Note 2: Deterioration and desaturation have been associated with inhalation therapies (Dobson et al., 1998 [2b]; Ho et al., 1991 [2b]; Numa, Williams, & Dakin, 2001 [3b]).

Hypertonic Saline Inhalations

15. It is recommended that hypertonic saline inhalations **not** be given for the routine treatment of bronchiolitis due to inconsistent evidence regarding its effectiveness.

Note 1: Studies exploring the use of hypertonic saline in children with bronchiolitis have not been homogeneous enough to validate this therapy.

No Improvement: (Anil et al., 2010 [2a]; Grewal et al., 2009 [2b])

Improvement: (Zhang et al., 2008 [1a])

Note 2: Given the difficulty in distinguishing between asthma and viral bronchiolitis in infants, the possibility of acute bronchospasm induced by the use of hypertonic saline alone in potential asthmatics remains a concern and deserves continued attention (Zhang et al., 2008 [1a]). One study looking at the use of 3% saline solution without adjunctive bronchodilators had a low overall adverse event rate of 1% (95% CI: 0.3%, 2.8%). Event rate for bronchospasm was 0.3% (95% CI: 0.01%, 1.6%). Additional clinical trials are warranted (Ralston, Hill, & Martinez, 2010 [4a]).

Corticosteroids

16. It is recommended that steroid therapy **not** be given (as inhalations, intravenously, orally, or intramuscularly) as one time or repeated treatment (Fernandes et al., 2010 [1a]; King et al., 2004 [1a]; Panickar et al., 2009 [2a];

Panickar, 2008 [5a]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]).

Note 1: When comparing glucocorticoids to placebo, a recent systematic review found no differences for either hospital admissions, length of stay, or benefit in other health outcomes. Exploratory results from one large high-quality trial suggest that combined treatment of systemic glucocorticoids (dexamethasone) and bronchodilators (epinephrine) may significantly reduce hospital admissions (Fernandes et al., 2010 [1a]; Plint et al., 2009 [2a]). No relevant short-term adverse effects due to steroids were seen; however, long-term safety was not assessed. One large randomized economic analysis demonstrated dexamethasone with epinephrine resulted in a societal cost savings when compared to placebo or either component alone (Sumner et al., 2010 [2a]). Efficacy, safety and applicability of this approach have not been established (Fernandes et al., 2010 [1a]).

Note 2: No effect on prevention of postbronchiolitic wheezing was found when inhaled corticosteroids were given during the acute phase of bronchiolitis (Blom et al., 2009 [1a]).

Antibiotics

17. It is recommended that antibiotics **not** be used in the absence of an identified bacterial focus (Spurling et al., 2009 [1b]; Kabir et al., 2009 [2a]; Friis et al., 1984 [2a]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]).

Note: Previously healthy, febrile children 24 months or younger with bronchiolitis evaluated as outpatients are unlikely to have bacteremia; risk of urinary tract infection is also small (<2%) (Kuppermann et al., 1997 [3a]; Purcell & Fergie, 2004 [4a]; Purcell & Fergie, 2002 [4a]; Liebelt, Qi, & Harvey, 1999 [4a]; Antonow et al., 1998 [4a]). If antibiotics are used, exercise caution and consider potential side effects, cost to the patient and the community, and increasing bacterial resistance to antibiotics (Spurling et al., 2009 [1b]).

Other Medications

18. It is recommended that the following drugs **not** be used in the treatment of bronchiolitis at this time. There has not been sufficient or consistent proven benefit over supportive therapies necessitating further studies:

- Antibodies (immunoglobulins) (Fuller & Del Mar, 2009 [1a])
- Montelukast (Singulair®)

[No Improvement (Amirav et al., 2008 [2b])]

[Improvement (Zedan et al., 2010 [2b])]

- Recombinant human deoxyribonuclease (rhDNase)

[No Improvement (Boogaard et al., 2007 [1a])]

- Inhaled furosemide

[No Improvement (Bar et al., 2008 [2b])]

Over-the-Counter Remedies

19. It is recommended that antihistamines, oral decongestants, and nasal vasoconstrictors **not** be used for routine therapy due to potentially life threatening side effects (Vassilev et al., 2009 [4a]; Kernan et al., 2000 [4a]; Food and Drug Administration [FDA], 2008 [5a]) and lack of demonstrated efficacy (Smith, 2010 [1a]; Ralston & Roohi, 2008 [2b]; "Use of codeine," 1997 [5a]; Gadomski & Horton, 1992 [5b]).

Note 1: On January 17, 2008 the FDA issued a public health advisory titled: FDA Recommends that Over-the-Counter Cough and Cold Products not be used for Children under Two-Years-of-Age because serious and potentially life-threatening side effects can occur (FDA, 2008 [5a]).

Note 2: A survey of parents and physicians in a Midwest community found that despite safety warnings and noted lack of efficacy of these medications to reduce cough or congestion in infants with upper and lower respiratory tract infections, parents are still giving their young children OTC cough and cold medications. This may be due to a lack of awareness of the FDA recommendations (Yaghmai et al., 2010 [4a]) or label confusion (Lokker et al., 2009 [4a]) and may contribute to childhood morbidity and mortality (Yaghmai et al., 2010 [4a]).

Note 3: Parent education may include information about drugs in OTC cold and cough remedies which are not recommended for this age population (Smith, 2010 [1a]; FDA, 2008 [5a]; Carr, 2006 [5a]):

- Diphenhydramine
- Pseudoephedrine
- Brompheniramine
- Phenylephrine
- Chlorpheniramine
- Guaifenesin
- Dextromethorphan

Other Respiratory Support Therapies

20. It is recommended that other respiratory care therapies **not** be used routinely, as they have not been found to be helpful (AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]). These include:

- Aerosol therapy with saline (Gadomski et al., 1994 [2a]; Chowdhury et al., 1995 [2b]; Ho et al., 1991 [2b])
- Chest physiotherapy (CPT) (Perrotta, Ortiz, & Roque, 2007 [1a]; Panickar & Eisenhut, 2008 [5a])

Note: Although rare, a correlation between CPT and rib fracture in infants 4 weeks to 2 years of age with bronchiolitis or pneumonia (1:1000) was found in one study (Chalumeau et al., 2002 [4a]).

Diagnostic Studies

21. It is recommended that diagnostic studies (RSV swab, chest X-rays, cultures, capillary or arterial blood gases, rapid influenza or other rapid viral studies) **not** be performed routinely to determine viral infection status or to rule out serious bacterial infections. Such studies are not generally helpful and may result in increased rates of

unnecessary admission, further testing, and unnecessary therapies (Bordley et al., 2004 [1a]; Swingler, Hussey, & Zwarenstein, 1998 [2a]; Kuppermann et al., 1997 [3a]; Henrickson & Hall, 2007 [4a]; Liebelt, Qi, & Harvey, 1999 [4a]; Antonow et al., 1998 [4a]; AAP Subcommittee on Diagnosis and Management of Bronchiolitis, 2006 [5a]).

Note 1: For infants with typical bronchiolitis omitting radiography is cost-saving without compromising diagnostic accuracy of alternate diagnoses and of associated pneumonia (Yong et al., 2009 [3a]). Chest X- rays may be obtained as clinically indicated when the diagnosis of bronchiolitis is not clear (Bordley et al., 2004 [1a]; Swingler, Hussey, & Zwarenstein, 1998 [2a]; Schuh et al., 2007 [3a]; El-Radhi, Barry, & Patel, 1999 [3a]).

Note 2: In selected very young infants, establishing a source through rapid viral testing may prevent unnecessary additional workup (Bordley et al., 2004 [1a]; Liebelt, Qi, & Harvey, 1999 [4a]).

Definitions:

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
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†a = good quality study; b = lesser quality study

Table of Recommendation Strength

Strength	Definition
"Strongly recommended"	There is consensus that benefits clearly outweigh risks and burdens (or vice-versa for negative recommendations).
"Recommended"	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is a lack of consensus to direct development of a recommendation.
Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.	

1. Grade of the body of evidence
2. Safety/harm
3. Health benefit to the patients (direct benefit)
4. Burden to patient of adherence to recommendation (cost, hassle, discomfort, pain, motivation, ability to adhere, time)
5. Cost-effectiveness to healthcare system (balance of cost/savings of resources, staff time, and supplies based on published studies or onsite analysis)
6. Directness (the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome])
7. Impact on morbidity/mortality or quality of life

Clinical Algorithm(s)

An algorithm for the medical management of bronchiolitis in infants less than 1 year of age presenting with a first time episode is provided in the original guideline document.

Evidence Supporting the Recommendations

References Supporting the Recommendations

American Academy of Pediatrics Subcommittee on Diagnosis and Management of Bronchiolitis. Diagnosis and management of bronchiolitis. Pediatrics. 2006 Oct;118(4):1774-93. [166 references] PubMed

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Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Avoidance of unnecessary diagnostic studies
- Decreased use of medications and respiratory therapy without observed improvement
- Improved rate of appropriate admission
- Decreased rate of nosocomial infection
- Improved use of appropriate monitoring activities
- Maintained or improved length of stay

Potential Harms

Wide variability has been demonstrated in the manner in which clinicians use and interpret pulse oximetry readings in children with bronchiolitis. This variability results in increased preferences for hospital admission and increased length of stay for children admitted with bronchiolitis.

Qualifying Statements

Qualifying Statements

These recommendations result from review of literature and practices current at the time of their formulations. This guideline does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this guideline is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Clinical Algorithm

Foreign Language Translations

Patient Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Cincinnati Children's Hospital Medical Center. Evidence-based care guideline for management of first time episode bronchiolitis in infants less than 1 year of age. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2010 Nov 16. 16 p. [142 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1996 (revised 2010 Nov 16)

Guideline Developer(s)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

Source(s) of Funding

The guideline was developed without external funding.

Guideline Committee

Bronchiolitis Team

Composition of Group That Authored the Guideline

Bronchiolitis Team Members 2010

Community Physician: *Chris Bolling, MD (*Chair*), Community Physician

Cincinnati Children's Hospital Medical Center Physicians: *Scott Reeves, MD, Emergency Medicine; Grant Mussman, MD, General Pediatrics; Lauren Solan, MD, Chief Resident; Mary Carol Burkhardt, MD, Chief Resident

Pharmacy: Michelle Caruso, PharmD, BCPS, Emergency Medicine

Nursing/Patient Services: Karen Tucker, MSN, RN, Clinical Director A6S Medical

Respiratory Therapy: *Scott M. Pettinichi, MEd, RRT, RCP (Clinical Director, Respiratory Care); Rachel Keller, RRT (Certified Asthma Educator)

James M. Anderson Center for Health Services Excellence (AC): Patrick Conway, MD, General Pediatrics, Med. Dir., AC; Wendy Engstrom Gerhardt, RN, Program Administrator; Deborah Hacker, RN, Medical Reviewer; *Kate Rich, Analyst

Ad hoc Advisors: *Richard Ruddy, MD, Emergency Medicine, Director; Gary McPhail, MD, Pulmonology

*Member of previous Bronchiolitis Team

Financial Disclosures/Conflicts of Interest

All Team Members and support staff listed have declared whether they have any conflict of interest and none were identified.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for medical management of bronchiolitis in infants less than 1 year of age presenting with a first time episode. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 May. 13 p.

Guideline Availability

Electronic copies: Available from the Cincinnati Children's Hospital Medical Center Web site.

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center Health James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

Availability of Companion Documents

The following are available:

- Judging the strength of a recommendation. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2008 Jan. 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site.
- Grading a body of evidence to answer a clinical question. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site.
- Table of evidence levels. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2008 Feb 29. 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site.

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center Health James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

Patient Resources

The following Health Topics are available:

- Bronchiolitis -- essential facts. Cincinnati (OH): Cincinnati Children's Hospital Medical Center, 2010 Jan. Available from the Cincinnati Children's Hospital Medical Center Web site.
- Bronquiolitis. Spanish. Cincinnati (OH): Cincinnati Children's Hospital Medical Center. 2010 Jan. Available from the Cincinnati Children's Hospital Medical Center Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

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