# Bronchiolitis v.1: Criteria and Respiratory Score

Executive Summary

Test your knowledge

Epidemiology, Pathophysiology & Natural History

Explanation of Evidence Ratings

Summary of Version Changes

## Inclusion Criteria

- Age <2 years (peak age 3-6 mo.)
- Viral symptoms associated with increased work of breathing & lower respiratory tract symptoms that may include: increased work of breathing, persistent cough , feeding difficulty, +/- wheeze, rapid shallow respiration, +/- fever
- Prematurity and/or age < 12 weeks: Expect a more severe course of illness

## Exclusion Criteria

- Hemodynamically significant cardiac disease
- Anatomic airway defects
- Neurologic disease
- Immunodeficiency
- Chronic lung disease

## RESPIRATORY SCORE (RS)

| Variable | 0 points | 1 points | 2 points | 3 points |
|---|---|---|---|---|
| **RR** | | | | |
| ≤ 2 mo | | ≤ 60 | 61-69 | ≥ 70 |
| 2-12 mo | | ≤ 50 | 51-59 | ≥ 60 |
| 1-2 yr | | ≤ 40 | 41-44 | ≥ 45 |
| **Retractions** | None | Subcostal or intercostal | 2 of the following: subcostal, intercostal, substernal, OR nasal flaring (infant) | 3 of the following: subcostal, intercostal, substernal, suprasternal, supraclavicular OR nasal flaring / head bobbing (infant) |
| **Dyspnea** | | | | |
| 0-2 years | Normal feeding, vocalizations and activity | 1 of the following: difficulty feeding, decreased vocalization or agitated | 2 of the following: difficulty feeding, decreased vocalization or agitated | Stops feeding, no vocalization or drowsy and confused |
| **Auscultation** | Normal breathing, no wheezing present | End-expiratory wheeze only | Expiratory wheeze only (greater than end-expiratory wheeze) | Inspiratory and expiratory wheeze OR diminished breath sounds OR both |



For questions concerning this pathway,
contact: Bronchiolitis@seattlechildrens.org

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# Bronchiolitis v.1: ED Management

## PHASE I ( E.D.)

**Therapies NOT Recommended**

- Albuterol
- Racemic Epinephrine
- Hypertonic Saline
- Combination Medications
- Corticosteroids
- Chest Physiotherapy
- Singulair

**Initial Assessment**

- Place in respiratory isolation
- Obtain vital signs and oxygen saturation
- Respiratory score (SCORE, SUCTION, SCORE)

**O2 Requirement?**

Yes → **Provide supplemental O2 to keep saturation > 90% (>88% if asleep)**

No → **Reassess Respiratory Status and Score**

**Evaluate for Trial on Asthma Pathway:**

- Consider if:
  - History of recurrent wheezing?
  - Strong family history of atopy or asthma?
  - > 12 months old?

→ **Off Pathway**

**Assess need for IV Fluids**

- Poor oral intake
- Poor urine output
- RS 9-12
- Respiratory Rate >60

Assess admit criteria

**Admit Criteria**

**Admit to Medical Unit (any of the following)**

- Respiratory score 9-12 (SCORE, SUCTION, SCORE)
- Consider admission for those with resp score 5-8
- Hypoxemia (O2 saturation < 90% awake, 88% asleep)
- Apnea
- Dehydration/inability to eat requiring ongoing IV fluids.

**Admit to Intensive Care Unit (any of the following)**

- Apnea with bradycardia and cyanosis
- Toxic appearance
- Respiratory failure
- Consider if history of severe chronic lung or cardiac disease

Needs admission → **Phase Change**

Able to discharge → **Discharge**
Discharge home with albuterol if improved with trial

! **Routine testing for viral pathogens NOT recommended**

! **Chest X-rays NOT routinely recommended**

! **Antibiotics NOT routinely recommended**

! **For patients < 12 kgs; do NOT use D5 ¼ NS at greater than maintenance rates**


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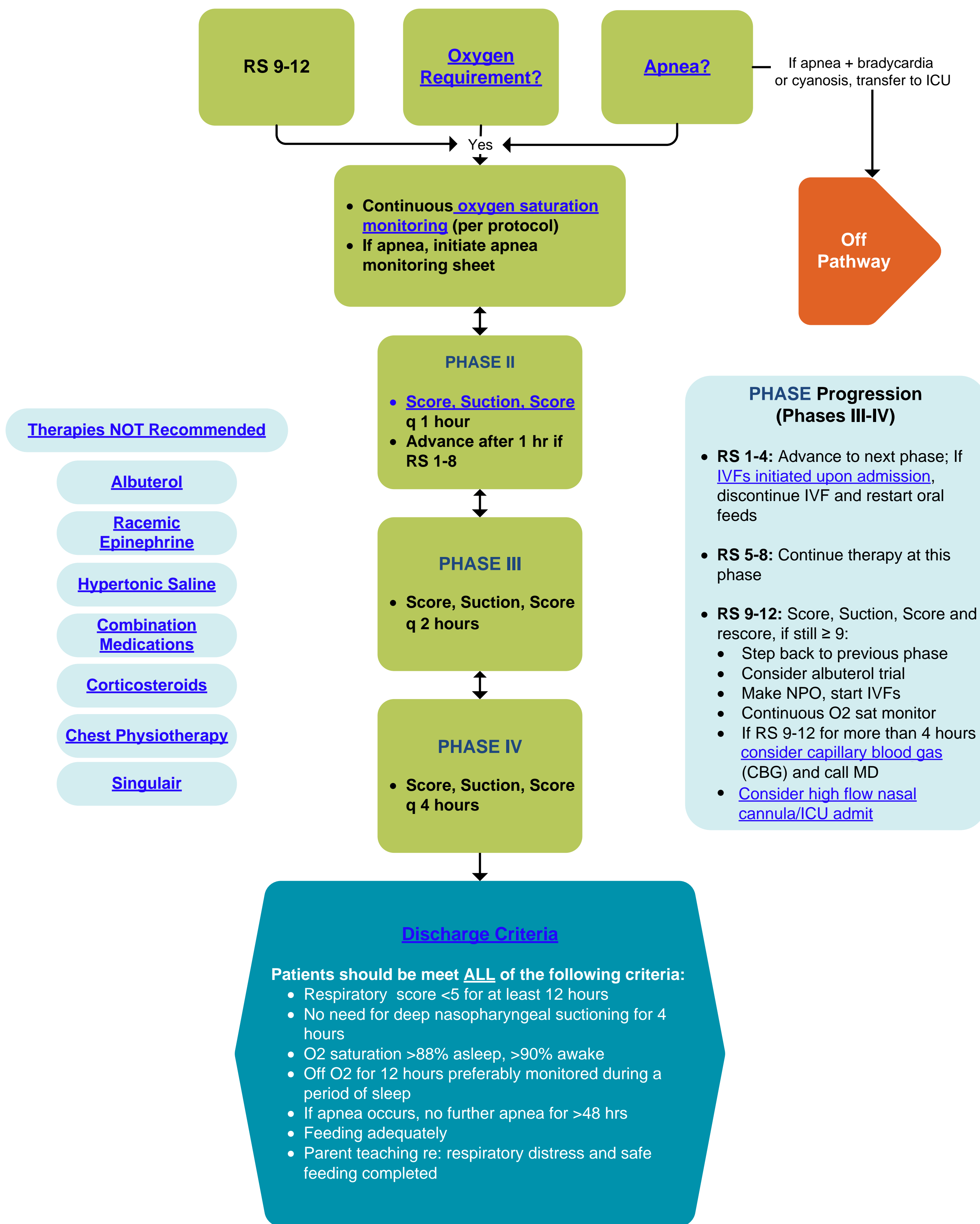
# Bronchiolitis v.1: Inpatient Management



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## Objective 1-Scope of the problem

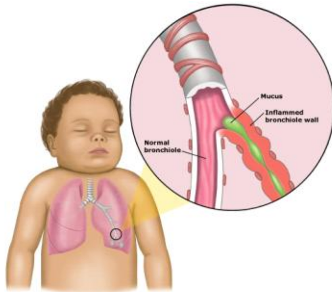
Bronchiolitis is the leading cause of infant hospitalization in the U.S.

- 7% of all pediatric discharges are due to bronchiolitis.
- RSV infection leads to > 90,000 annual hospitalizations
- 3-7% of all children are hospitalized with bronchiolitis at some point in their lives
- Annual mid-winter epidemics for bronchiolitis lead to
  - 7-million patient days
  - A 239% increase in hospitalizations in children <6 months

The cost of hospitalizing children < 1 year of age for bronchiolitis is > $700 million annually.

National Hospital discharge Survey 2006,
AAP guidelines 2006, Zorc 2010

## Objective 2-Definition




**Bronchiolitis is an acute infectious inflammation of the bronchioles resulting in obstructive airway disease**

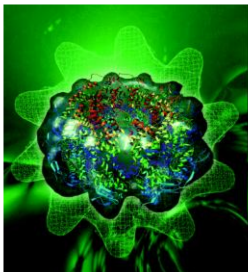
- Age <2 years (often < 12 months)
- Viral symptoms associated with increased work of breathing & lower respiratory tract symptoms that may include:
  - Increased work of breathing, persistent cough , feeding difficulty, +/- wheeze , rapid shallow respiration , +/- fever
- Symptoms are caused by small airway edema and sloughing of epithelial cells → mucus production, bronchospasm, hyperinflation

http://www.healthuse.com/tag/cough; AAP guidelines 2006

Go to Pg 2

Return to Criteria and Respiratory Score

## Objective 3-Common Causes



Viral:

- Respiratory Syncytial Virus (50-80%)
- Other viruses
  - Parainfluenza
  - Influenza
  - Human Metapneumovirus
  - Rhinovirus
  - Adenovirus

Bacterial:

- Occasionally associated with Mycoplasma

Coinfection possible, with rates of multiple pathogens noted at 6-30% in some studies

http://jvi.asm.org/content/vol81/issue17/images/medium/coverfig.gif, AAP guidelines 2006, Zorc 2010

## Objective 4-Natural history

Epidemiology

- Highest incidence December-March
- >90% infected with RSV by 3 years of age

Transmission

- Via direct contact with patient or secretions
- Young children shed up to 1 month

Course of symptoms

- Begins with a URI, progresses in 3-6days to LRI
- Variable and dynamic course
- Lasts ~2-4 weeks
- Self-limited unless co-morbidities present

Reinfection is common

AAP guidelines 2006, Zorc 2010, http://www.consumerreports.org/health/resources/images/conditions/bronchiolitis-baby-crying_default.jpg

Back

Go to Pg 3

Return to Criteria and Respiratory Score

## Natural history: Complications

Respiratory

- Apnea (~3%)
  - Higher risk if premature
- Respiratory failure

Bacterial complications are generally uncommon

- Otitis media most common
- Other bacterial complications rare
  - When present, most likely UTI
  - Pneumonia uncommon

Mortality

- Fewer than 400 deaths annually
- Most deaths in those 6 months of age and younger

http://earinfectionantibiotics.com/images/ear_infection_antibiotics_2.jpg, AAP guidelines 2006, Zorc 2010

## Objective 5-Diagnosis

*The diagnosis of bronchiolitis is clinical and based on the history & physical exam. Evidence does not support routine ordering of labs or radiologic studies. [LOE: O, S, NC] (AAP 2006, Zorc 2010)*

http://www.healthcare-information-guide.com/images/at-pediatrician-office.jpg

## Diagnosis: Symptoms

Upper airway respiratory symptoms
- Rhinorrhea, nasal congestion, cough

Lower airway respiratory symptoms
- Airway obstruction
  - Tachypnea, wheezing, intermittent crackles, respiratory distress=grunting, flaring, retractions

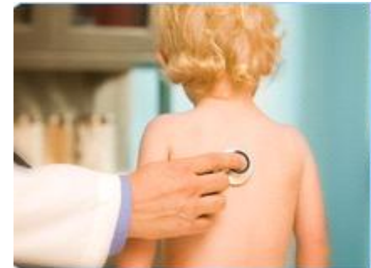
Other symptoms
- Feeding difficulty, post-tussive emesis, low grade fever

http://s3.amazonaws.com/readers/2009/10/27/sickchase_1.jpg, AAP guidelines 2006

## Diagnosis: Physical Exam

Inspection
- Tachypnea
- Respiratory Distress
  - Grunting, Flaring, Retractions

Auscultation
- Prolonged expiratory phase
- Wheezes
- Crackles



Note: The exam may change quickly/often due to varying clearance of obstruction

AAP guidelines 2006, Zorc 2010

http://www.google.com/imgres?imgurl=http://www.consumerreports.org/health/resources/images/essentials -header/essentials_bronchiolitis.jpg&imgrefurl=http://www.consumerreports.org/health/conditions -and-treatments/bronchiolitis/what-will-happen.htm&usg=__umIJkHesmyZ-El1Cj-bOfa7qYLE=&h=160&w=216&sz=26&hl=en&start=62&itbs=1&tbnid=n2sWpbGaL1AWBM:&tbnh=79&tbnw=107&prev=/images%3Fq%3Dbronchiolitis%26start%3D60%26hl%3Den%26sa%3DN%26tbo%3D1%26ndsp%3D20%26tbs%3Disch:1

Back

Go to Pg 5

Return to Criteria and Respiratory Score

## Diagnosis: Differential Diagnosis

Consider especially for the child with severe respiratory distress, lack of viral symptoms, or frequent/recurrent episodes

- Viral-triggered asthma
- Infection
  - Pneumonia
  - Pertussis
- Irritant
  - Gastro-esophageal reflux
  - Aspiration
- Anatomic
  - Foreign body aspiration
  - Congenital airway anomaly
- Congestive heart failure

## Objective 10-Prevention

RSV can persists on fomites for hours and has been identified in the air up to 22 feet from the patient's bed.

The following considerations are key in prevention

- Viral isolation is the standard for inpatients at SCH
  - *Strict handwashing/alcohol-based rubs, gown, gloves, mask*
    - *Wash hands or gel before and after patient contact, after contact with inanimate objects directly near the patient, and after glove removal*
  - *Limits to visitation by young children*
- *Family education re: hand hygiene.*

*[LOE: O via NC, LC] (AAP 2006)*

- *Consideration of RSV monoclonal antibody (monthly Synagis) for at-risk infants [LOE A via NC,LC] (AAP 2006)*

AAP guidelines 2006, **http://www.thepeculiarpalette.com/.a/6a0120a54b5b61970b012876ed9b95970c-320wi**

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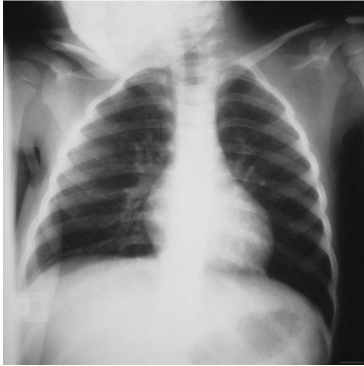
**Back**

**Return to Criteria and Respiratory Score**

# Diagnosis: Imaging



*There is no evidence to support the routine use of chest x-rays in bronchiolitis.*

- *The risk of bacterial pneumonia is low.*
- *Chest x-ray findings do not correlate with disease severity.*
- *Chest x-rays lead to unnecessary antibiotic use.*

*[LOE: M] (AAP 2006, Zorc 2010)*

- Obtaining a chest x-ray could be considered if the child has > 2 days of fever, an asymmetric chest exam, does not demonstrate improvement, or has an unusually high O2 need [LOE: LC]

http://www.allposters.com/-sp/Normal-Chest-X-Ray-3-Year-Old-Child-Posters_i4257610_.htm,

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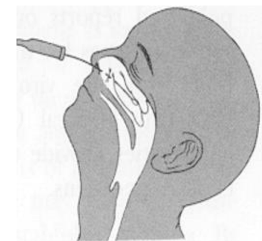
## Diagnosis: Identification of pathogen

*Identification of a pathogen is not recommended routinely [LOE: NC] (AAP 2006).*

- Although it may be useful in cohorting patients, it is not a requirement for admission. [LOE: LC]
- Diagnostic testing may be considered in the following cases: uncertain clinical diagnosis, possible diagnosis of influenza (treatment available), or age < 2 months [LOE: LC]
- Pathogen identification IS recommended for any patient with hospital acquired infection or in high risk patients (immune-compromised, chronic lung/heart disease) [LOE: LC]

- Respiratory FA
  - Sensitive, specific, but generally slow
  - Detects multiple pathogens
- Rapid RSV antigen testing
  - Generally high sensitivity & specificity
  - Most useful during peak season due to high prior probability of positive test (risk of increased false positives during off-season).



http://www.cdhb.govt.nz/measles/images/throat-swab.jpg, AAP guidelines 2006, Zorc 2010

Back to ED Management

## Objective 6-Identify patients appropriate for the bronchiolitis pathway

*Patients who meet these criteria should be placed on the bronchiolitis pathway via use of the bronchiolitis ordersets [LOE: LC, NC] (AAP 2006).*

### Inclusion Criteria

- Age < 2 years and with respiratory distress and a clinical picture fitting bronchiolitis

### Exclusion Criteria

- Chronic lung disease or other significant lung disease (eg cystic fibrosis)
- Hemodynamically significant cardiac disease
- Anatomic airway defects
- Neurologic disease
- Immunodeficiency

Note: Ex-premature infants and those < 12 weeks of age are not excluded from the pathway, but providers should be aware that these children may have a more severe course of illness

Return to Criteria and Respiratory Score

## Objective 7-Defining Admission Criteria

Patients should be admitted if they meet ANY of the following criteria:

- Moderate/severe respiratory distress
  - Admit patients with respiratory score 9-12 after suctioning
  - Consider admission case-by-case for those with respiratory score 5-8
- Hypoxemia (O2 saturation < 90% awake, 88% asleep)
- Apnea
- Dehydration requiring ongoing IV fluids.

Consider admission for adherence risk as defined by inability to maintain hydration status, lack of reliable caregiver at home, inability to follow recommended care plan, risk for loss to follow-up.

Obtain ICU consult for apnea with bradycardia and cyanosis, toxic appearance, respiratory failure; consider for history of severe chronic lung or cardiac disease.

[LOE: LC]

Back to ED Management

# Respiratory Scoring Tool—adapted from SCH asthma pathway

## How do I use the respiratory scoring tool?

The respiratory scoring tool consists of 4 elements that make up the respiratory assessment of the patient in distress.

You assess each component distinctly and add them to make a total between 1-12.
• A patient's RR is 1-3 whereas all other categories are scored 0-3.

(1-3) **Respiratory rate:** assessed over 60 seconds
(0-3) **Retractions:** work of breathing
(0-3) **Dyspnea:** shortness of breath
(0-3) **Auscultation:** wheezing on lung exam
Total: (1-12)

*The SCH respiratory scoring tool has been validated by comparing the assessment amongst various types of providers. [LOE: C] (see SCH asthma pathway for references)*

*There are other scoring tools that have been validated such as the pulmonary score (PS), pediatric asthma severity score (PASS) and pediatric respiratory assessment measure (PRAM) but no single tool that has been adopted universally. [LOE: NC] (see SCH asthma pathway for references)*

The respiratory scoring tool is displayed on the next page and is always included with the pathway for convenience.

# Respiratory Scoring Tool

Note: This is the same respiratory score as used for asthma; no validated score for bronchiolitis alone is available.

| Variable | 0 points | 1 points | 2 points | 3 points |
|---|---|---|---|---|
| RR | | | | |
| <2 mo | | ≤60 | 61-69 | ≥70 |
| 2-12 mo | | ≤50 | 51-59 | ≥60 |
| 1-2 yr | | ≤40 | 41-44 | ≥45 |
| 2-3 yr | | ≤34 | 35-39 | ≥40 |
| 4-5 yr | | ≤30 | 31-35 | ≥36 |
| 6-12 yr | | ≤26 | 27-30 | ≥31 |
| >12 yr | | ≤23 | 24-27 | ≥28 |
| Retractions | None | Subcostal or intercostal | 2 of the following: subcostal, intercostal, substernal, OR nasal flaring (infant) | 3 of the following: subcostal, intercostal, substernal, suprasternal, supraclavicular OR nasal flaring / head bobbing (infant) |
| Dyspnea | | | | |
| 0-2 years | Normal feeding, vocalizations and activity | 1 of the following: difficulty feeding, decreased vocalization or agitated | 2 of the following: difficulty feeding, decreased vocalization or agitated | Stops feeding, no vocalization, drowsy or confused |
| 2-4 years | Normal feeding, vocalizations and play | 1 of the following: decreased appetite, increased coughing after play, hyperactivity | 2 of the following: decreased appetite, increased coughing after play, hyperactivity | Stops eating or drinking, stops playing, OR drowsy and confused |
| >4 years | Counts to ≥10 in one breath | Counts to 7-9 in one breath | Counts to 4-6 in one breath | Counts to ≤3 in one breath |
| Auscultation | Normal breathing, no wheezing present | End-expiratory wheeze only | Expiratory wheeze only (greater than end-expiratory wheeze) | Inspiratory and expiratory wheeze OR diminished breath sounds OR both |

Return to Criteria and Respiratory Score

## Objective 7-Defining Discharge Criteria

Patients should be discharged when they meet ALL of the following criteria:

- Respiratory distress only mild/moderate (respiratory score 1-4)
- No need for NP suctioning x 4H
- O2 sats >88% asleep, 90 awake
- Off O2 for a minimum of 12 hours including sleep time
- No apnea (>48 hrs if has a history of apnea)
- Feeding adequately
- Parent teaching re: respiratory distress and safe feeding completed

[LOE: LC]

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## Treatment: Suctioning

Suctioning is not discussed often in the literature but is generally considered an important part of the supportive care of infants with bronchiolitis

- Used to clear secretions from the nares/airway that the child is unable to clear himself/herself.
- Generally thought to reduce work of breathing and improve oral intake.

- Olive tip and bulb suctioning are considered equivalent and should be tried prior to any attempt at nasopharyngeal suctioning.
- Nasopharyngeal suctioning should only be attempted if bulb/olive tip suction does not improve the child's clinical status (as evidenced by an improvement in respiratory score).
- **The response to suctioning should be DOCUMENTED, with a respiratory score recorded before and after all types of suctioning.**
- The child's family should be trained on how and when to use bulb suction at home.

[LOE: LC]

Infantnasalaspirator.com

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Back to Inpatient Management

## Treatment: Supplemental oxygen

*Supplemental oxygen should be provided if a previously healthy child with bronchiolitis has an SpO2 (oxyhemoglobin saturation) that falls persistently below 90%. The goal is to provide oxygen to maintain $SpO_2$ at or above 90%. [LOE: LC, NC] (AAP 2006).*

- Supplemental oxygen is usually supplied via nasal cannula, using the lowest flow rate possible.
- SpO2 drops to 88% is acceptable during sleep.
- <20sec drops in SpO2 to the 80s while the child is sleeping does not require supplemental oxygen

Back to ED Management

Back to Inpatient Management

## Treatment: IV fluids

*IV fluid administration should be considered if the patient is not eating, is not allowed to eat due to respiratory distress, has poor urine output, or has other signs/symptoms of dehydration [LOE: LC, NC] (AAP 2006).*

- *Infants with respiratory distress are at increased risk of aspiration [LOE: C] (Khoshoo 1999); thus, the child should not be allowed to eat if his/her respiratory score is 9-12 or RR is consistently > 60 [LOE: LC]*
- If the patient is receiving IV fluids, discontinue IV fluids and restart oral feeding if  2 respiratory scores are 1-4.
- If the resp score worsens >2 points or the child  has clinical evidence of aspiration (choking, coughing, O2 requirement, or apnea) during or after a feed, the **patient should be made** NPO **again.**
- Consider a nasogastric tube for feeding is oral feeding is delayed for more than 2 days

## Treatment: IV fluids

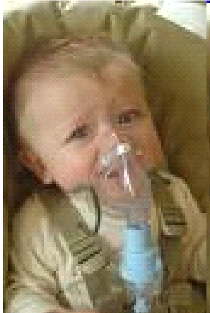
- By Local Expert Consensus, the initial starting intravenous fluid (IVF) in the inpatient setting is dextrose 5% with 0.45% normal saline (D5 1/2NS)

- If hyponatremic fluids, such as dextrose 5% with 0.225% normal saline (D5 1/4NS) are used, they should **not** be run at greater than maintenance rates, Use of these fluids in manner increases the risk of iatrogenic seizures due to inadvertent iatrogenically induced hyponatremia

Back to ED Management

Back to Inpatient Management

## Treatment: Therapies NOT routinely recommended



Randomized controlled trials do not demonstrate benefit as an inpatient for:

- Bronchodilators
  - Including racemic epinephrine
- Corticosteroids
- Chest physiotherapy
- Antibiotics
- Leukotriene receptor antagonists

http://www.google.com/imgres?imgurl=http://energetic.files.wordpress.com/2008/05/darn-bronchiolitis-by-crisbp-flickr.jpg&imgrefurl=http://thepriceoflove.net/2008/05/26/chapter-15-part-6/&usg=__hzO4IKWwicxnQ3asp5vSIROWgwl=&h=500&w=333&sz=20&hl=en&start=45&itbs=1&tbnid=3C2fJttu9MVtoM:&tbnh=130&tbnw=87&prev=/images%3Fq%3Dbronchiolitis%26start%3D40%26hl%3Den%26sa%3DN%26tbo%3D1%26ndsp%3D20%26tbs%3Disch:1

## Objective 8- Treatment: Therapies that work

### Current best practice is FEWER interventions

Therapy is primarily supportive

- Suctioning
- Supplemental oxygen
- IVF if dehydrated

Back to ED Management

Back to Inpatient Management

# Treatment: Bronchodilators

*There is NO consistent improvement in duration of illness or length of hospitalization due to bronchodilators, and, as with any medication, there are side effects and financial burdens (cost of medication, labor, etc); albuterol should NOT be used in a routine child with bronchiolitis [LOE: M] (AAP 2006, Gadomski 2010)*

- *As albuterol may improve short-term respiratory scores in some children, it may be tried to determine if a particular patient benefits, as evidenced by an improvement in their respiratory score [LOE: M] (AAP 2006, Gadomski 2010)*
  - Should only be tried in those with risk factors for RAD (> 12 months with wheeze, history of recurrent wheeze, strong fam hx atopy or asthma) or respiratory score 9-12 AFTER suctioning
  - Continue (***PRN*** only) if there is a significant improvement in respiratory score (2 or more point improvement in respiratory score) after albuterol administration
  - The initial trial usually happens in ED; should not be trialed more than once after admitted.
  - ***DOCUMENT RESPONSE*** (pre /post respiratory score)
  - If not effective, higher doses are not better
  - MDI is the preferred delivery method (see asthma WBT).

http://blogs.babycenter.com/wp-content/uploads/2009/10/inhaler.jpg

Back to ED Management

Back to Inpatient Management

## Treatment: Racemic epinephrine

*Racemic epinephrine has no definite benefit over albuterol for the treatment of inpatients with bronchiolitis and should not be used routinely [LOE: M] (Hartling 2011).*

- Though there is some evidence to show it may help in the outpatient setting, there is no evidence to support its use in inpatients with bronchiolitis.
- The bronchodilator of choice, if a child is to have a trial, should be albuterol (due to its longer duration of action, low risk for adverse effects, and common use in other settings) [LOE: LC]

Back to ED Management

Back to Inpatient Management

## Treatment: Corticosteroids

*Corticosteroids do not improve length of stay in the hospital, length of illness, or clinical score, and they should not be used routinely [LOE: M] (AAP 2006, Fernandes 2010)*

- May be considered in older infants (> 12 months) who may have a RAD component (eg strong family or personal history of atopy and respond to albuterol)
- May also be considered in those with chronic lung disease who are EXCLUDED from the pathway (+/- in consultation with pulmonary medicine)

Back to ED Management

Back to Inpatient Management

# Treatment: Chest physiotherapy

Thought to assist in clearance of secretions and decrease ventilatory effort.

*Chest physiotherapy does not improve respiratory score, length of stay, or O2 requirement, and is not recommended for routine use in bronchiolitis [LOE: M] (1, Perotta 2008)*

Back to ED Management

Back to Inpatient Management

## Treatment: Antibiotics

*As mentioned before, the risk of serious bacterial infection in infants with bronchiolitis is low, and antibiotics do not improve length of stay in the hospital for patients with bronchiolitis. Antibiotics should not be used routinely, and they should only be used in patients with evidence of specific secondary bacterial infections. [LOE: M] (AAP 2006, Spurling 2011)*

Back to ED Management

Back to Inpatient Management

## Treatment: Montelukast

*There is no evidence for improvement with montelukast and it is not recommended for use in bronchiolitis [LOE: B] (Amirav 2008)*

**Back to ED Management**

**Back to Inpatient Management**

## Treatment: Combination medications

One recent study (Plint at al 2009) found that combined epinephrine and dexamethasone significantly reduced hospitalizations compared to placebo and dexamethasone, placebo and epinephrine, or placebo alone; however

- Study authors did not anticipate this result
- The result was not statistically significant after adjustment for multiple comparisons

Thus, despite this study, given the overwhelming other evidence that neither racemic epinephrine nor steroids significantly help in routine bronchiolitis, routine use of combination medications is not recommended [LOE: LC].

Back to ED Management

Back to Inpatient Management

## Treatment: Hypertonic saline

- Hypertonic saline is thought to increases mucociliary clearance and is hypothesized to help with clearing of secretions.
  - Has been known to induce bronchospasm in older children
- Although some evidence exists that hypertonic saline may improve outcomes (reduced LOS, lower post-inhalation score), questions remain:
  - Which patients benefit most?
  - How best to administer it?
  - What is the true burden of risks and costs?

*There is currently insufficient evidence regarding the true benefits vs costs of hypertonic saline in routine bronchiolitis [LOE: M] (Zhang 2011). Thus, hypertonic saline is not recommended for routine use in inpatients with bronchiolitis [LOE: LC].*

- It may be considered in patients with severe respiratory distress (resp score 9-12 AFTER suctioning).
- If given, it should be given with a bronchodilator.

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Back to ED Management

Back to Inpatient Management

## Treatment: Supplemental oxygen/air via high flow nasal cannula

*High flow nasal cannula has only been studied in infants in intensive care unit settings [LOE: B] (McKiernan 2010, Schibler 2011) .*

Per SCH policy, no child in acute respiratory distress may be started on high flow nasal cannula oxygen/air without transfer to the ICU [LOE: LC].

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## Objective 9-Monitoring: Continuous pulse oximetry

- *Monitoring oxygen saturation is recommended for patients with bronchiolitis [LOE: LC, NC] (AAP 2006).*
  - SpO2 monitoring is recommended for children per the Seattle Children's Hospital oximetry protocol [LOE: LC].

Back to ED Management

Back to Inpatient Management

# Objective 9-Monitoring: Blood gas monitoring

Consider checking a CBG if resp score 9-12 on 4 continuous checks or for other signs of clinical deterioration or lack of improvement (such as increasing O2 requirement or lethargy) [LOE: LC]

- Capillary blood gas is sufficient.
- Consider i-stat lab measurement if stat lab values are needed quickly.

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# Objective 9-Monitoring: Apnea

Initiate ABC (apnea/bradycardia/cyanosis) monitoring sheet if patient has an episode of apnea while inpatient or a significant history of apnea.

Consider ICU consult/transfer for persistent episodes of apnea or for apnea with bradycardia and/or cyanosis.

[LOE: LC].

Note: pertussis PCR is recommended for infants with apnea.

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Clinical Effectiveness Program

# Bronchiolitis Best Practice Recommendations
# Project Executive Summary

## Current situation:

Bronchiolitis is a commonly seen condition, mostly during the winter months. The cost of hospitalization for bronchiolitis in children less than 1 year old is estimated to be more than $700 million per year nationally (AAP). Care of patients with bronchiolitis is currently varied throughout the hospital, across sites and across providers.

## Objective

To standardize care of otherwise healthy children with bronchiolitis in the ED, inpatient, and outpatient realm.

## Recommendations:

- New emphasis is placed on documentation before and after all interventions.
- Diagnostic testing known not to work will be discouraged
    - Chest x-rays should not be routinely ordered
    - Viral pathogen identification may be useful in cohorting patient but is not a requirement for admission. It may be considered in special cases.
- Treatments known to work will be standardized
    - IV fluid initiation and discontinuation will be standardized, with respiratory score used to help determine when a child is safe to eat by mouth.
    - Suctioning will be encouraged, with emphasis on documentation of response, with a respiratory score recorded before and after all types of suctioning.
    - Standards for initiation and discontinuation of supplemental O2 will continue to be emphasized.
- Treatments not routinely indicated will be discouraged
    - Albuterol will be used less frequently, with emphasis on
        - ONE-TIME trials as opposed to PRN trials
        - Documentation of respiratory score before and after a trial
    - Racemic epinephrine, steroids, antibiotics, and montelukast will not be routinely offered
- Treatments still under investigation remain under investigation
    - Hypertonic saline will not be routinely offered.
        - A systematic review was conducted by the committee
            - Despite some evidence that nebulized hypertonic saline may reduce length of stay and improve clinical score in inpatients and outpatients, there is currently insufficient evidence for the routine use of hypertonic saline in the otherwise healthy patient with bronchiolitis.
            - As more evidence becomes available, this recommendation, along with others, may be revised.
            - Potential side effects, such as bronchospasm, remain a concern.
                - If given, bronchodilator should be given prior to hypertonic saline treatment
    - Combination medications (eg steroids plus racemic epinephrine) will not be offered.
        - Despite evidence in one study (Plint 2009) that the above combination may be beneficial, pending further investigation, routine use of combination medications is not recommended.
- Admission criteria will be more specific
    - Moderate/severe respiratory distress (respiratory score 9-12 after suctioning)
    - Hypoxemia (O2 saturation < 90% awake, 88% asleep)
    - Apnea
    - Dehydration requiring ongoing IV fluids.
- Discharge criteria will be more specific
    - Respiratory distress only mild/moderate (respiratory score 1-4)
    - No need for NP suctioning x 4H
    - O2 saturation >88% asleep, 90 awake
    - Off O2 for a minimum of 12 hours including sleep time

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  - No apnea (>48 hrs if has a history of apnea)
  - Feeding adequately
  - Parent teaching re: respiratory distress and safe feeding completed
- Apnea is addressed
  - Apnea monitoring sheets are to be initiated if there is concern for apnea
  - Pertussis testing is recommended if the patient has (a history of ) apnea
- Escalation of care is addressed
  - The respiratory score is used to provide guidance re: obtaining a blood gas.
  - An ICU consult/transfer is suggested for certain scenarios:
    - Persistent apnea, apnea with cyanosis or bradycardia, or persistently high respiratory scores
  - High flow nasal cannula oxygen/air is addressed
    - HFNC is not an option outside the ICU

## Rationale: How will the guideline improve the quality of care for patients with bronchiolitis?

- Reduce costs by decreasing variation in management of fluids and respiratory interventions.
  - Decrease unnecessary use of interventions known not to work.
- Improve patient flow and collaboration between providers and sites of care.
- Improve education for providers at SCH and for patients and families.
- Decrease preventable adverse outcomes
- Increase patient/family and provider satisfaction

## Evidence – need to highlight/summarize, not list. Could be brief bullet points

- The majority of our recommendations came from the American Academy of Pediatrics Subcommittee on Diagnosis and Management of Bronchiolitis recommendations (*Pediatrics* 2006 Oct;118(4):1774-93. http://aappolicy.aappublications.org/cgi/reprint/pediatrics;118/4/1774.pdf)
- Recommendations on hypertonic saline were based mostly on findings from the Cochrane review by Zhang et al: "Nebulized hypertonic saline solution for acute bronchiolitis in infants", March 2011.
- The reference for Plint et al, cited above, is the following: "Epinephrine and Dexamethasone in Children with Bronchiolitis, *NEJM* 2009; 360:2079 – 2089.
- For other references, please see the references page on the bronchiolitis web-based-training

## Implementation Tools:

- New nursing scoring flowsheet and future integration with ClinDoc
- Educational tools for physicians, nurses, respiratory therapists, unit coordinators
  a. Nursing guideline of care
  b. Executive summary (this document)
  c. New WBT training module
  d. Resident noon conference
- New ED and inpatient order sets

## Metrics Plan

- Medication use: albuterol, racemic epinephrine, steroids, hypertonic saline
- Diagnostic tool use: chest x-ray, viral testing
- Orderset use
- Chest physiotherapy use
- Length of stay: ED and inpatient
- Readmit rate: ED and inpatient
- Patient safety incidents

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### PDCA Plan

The CSW owner and committee will follow metrics, continue to review medical literature, and make alterations to the pathway as needed.

Back

Return to Home

# Self-Assessment

- **If you are taking this self-assessment as a part of required departmental training, you will need to logon to the Learning Center to receive credit. Completion also qualifies you for 1 hour of Category II CME credit.**

1) Which of the following are criteria for admission?
   a. Oxygen saturation of 91%
   b. Parental anxiety
   c. Respiratory score of 9, just suctioned
   d. Respiratory score of 10, not yet suctioned
   e. Prematurity
   f. a and e
   g. all of the above

2) You diagnosed an 8 month old boy child with bronchiolitis. It's 2 weeks later, and the family is back, concerned that he still has a cough and intermittent retractions/tachypnea. He is afebrile and his exam is reassuring.
True or false: The child should get a CXR to look for evidence of pneumonia given his persistent symptoms.
   a. True
   b. False

3) Which of the following children is NOT at higher risk for hospitalization for bronchiolitis
   a. 3 month old term infant born at 2450g (<5%ile)
   b. 3 month old former 35 week premature infant who was hospitalized for 10 days and had no complications of prematurity
   c. 6 month old with a small ventricular septal defect
   d. 5 month old with microcephaly and developmental delay

4) A 7 month old girl has a fever of 104F, wet crackles, wheezing, nasal flaring, subcostal retractions, and symmetric breath sounds. Her exam is otherwise reassuring.
Which of the following tests is most likely to yield a positive result that would change management?
   a. CXR
   b. Urinalysis
   c. Lumbar puncture
   d. Blood culture
   e.Viral FA

5) A 6 month old boy has a father with childhood asthma, but no personal history of eczema, wheezing, or allergies. He presents with tachypnea, wheezing, and retractions in the setting of an upper respiratory infection, and after an albuterol treatment he shows no improvement. What do you do next?
   a. Give steroids
   b. Immediately start him on a one-hour continuous albuterol nebulizer treatment
   c. Wait 30 minutes, then give a one-hour continuous albuterol nebulizer treatment
   d. Score, suction, then rescore
   e. Administer a trial of racemic epinephrine.
   f. Do nothing

6) It is February, in the midst of bronchiolitis season, and a new mother has questions on how to prevent bronchiolitis in her 6 week old infant.
Which of the following is LEAST likely to prevent an infection?
   a. Don't allow other children to touch the baby
   b. Don't take the infant to the mall to go shopping
   c. Avoid family gatherings
   d. Ask visitors to use Alcohol Hand-Gel before touching the baby

7) In which of the following cases should viral testing be considered?
   a. 14 month old with wheeze and cough whose grandfather has the flu
   b. 5 week old with fever and runny nose
   c. 10 month old with large VSD and tachypnea
   d. 4 month old hospitalized with infant ALL with new rhinorrhea
   e. c and d
   f. all of the above

Go to Page 2 | Return to Home

# Self-Assessment

- **If you are taking this self-assessment as a part of required departmental training, you will need to logon to the Learning Center to receive credit. Completion also qualifies you for 1 hour of Category II CME credit.**

8) Which of the following are discharge criteria?
   a. Documented apnea but no apnea for 12hours
   b. No olive tip suction need for 4 hours
   c. No supplemental oxygen for 8 hours
   d. SpO2 of 89% asleep, 92% awake
   e. Respiratory score of 6 awake, 4 asleep.
   f. Parents taught how to appropriately NP suction at home.
   g. a and d
   h. all of the above

9) Which of the following is a new recommendation for healthy patients on the bronchiolitis pathway?
   a. Q shift albuterol trials to assess for possible response
   b. Routine rapid RSV testing rather than respiratory FA for all patients admitted to the medical unit
   c. Hypertonic saline Q4hours for all infants with length of stay > 48hours.
   d. B and C
   e. All of the above
   f. None of the above

Back | Return to Home | View Answers

# Answer Key

1) The correct answer is (c).
2) The correct answer is (b) (false); mild symptoms of bronchiolitis can last for weeks.
3) The correct answer is (c): Low birth weight, prematurity, and neurologic disease all put children at higher risk. While hemodynamically significant cardiac disease puts children at higher risk, a lesion such as a small VSD that is not hemodynamically significant will not put the child at higher risk for hospitalization.
4) The correct answer is (b); chest x-ray, lumbar puncture, and blood culture are low-yield in this patient, and viral FA would not change management.
5) The correct answer is (d). Ideally he should have received suctioning even before the albuterol treatment.
6) The correct answer is (b).
7) The correct answer is (f), all of the above.
8) The correct answer is (d) . Children must have no apnea for 48 hours (if has a history of apnea), no supplemental oxygen for 12 hours, respiratory score < 5 to be discharged home. Olive tip suction is irrelevant to discharge. Parents should be taught to bulb, not NP, suction.
9) The correct answer is (f).

Return to Home

# Evidence Ratings

**KEY TO LEVELS OF EVIDENCE**

M =Meta-analysis or Systematic Review
A =Randomized controlled trial: large sample
B =Randomized controlled trial: small sample
C=Prospective trial or large case series
D= Retrospective analysis
O= Other evidence
S=Review article
LC =Expert opinion or consensus
NC = National consensus
F =Basic Laboratory Research
X= No evidence

This will appear in the text as [LOE: M]

Return to Home

To Bibliography

# Summary of Version Changes

- **Version 1 (10/10/2011):** Go live

Return to Home

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Return to Home

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Return to Home