

BRONCHIOLITIS - An overview

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Learning Objectives



- Wheeze
- Common Causes of Wheezing
- Bronchiolitis important features
- Differential Diagnosis of Bronchiolitis
- Management of Bronchiolitis

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INTRODUCTION



- Bronchiolitis is common cause of viral illness in young infants and children
- Common cause of hospitalization in young children
- Associated with chronic respiratory symptoms in adulthood
- May be associated with significant morbidity or mortality

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DIAGNOSIS

- Acute infectious inflammation of the bronchioles resulting in wheezing and airways obstruction in children less than 2 years old

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MICROBIOLOGY



- Typically caused by viruses
 - RSV-most common
 - Parainfluenza
 - Human Metapneumovirus
 - Influenza
 - Rhinovirus
 - Coronavirus
 - Human bocavirus
- Occasionally associated with Mycoplasma pneumonia infection

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RESPIRATORY SYNCYTIAL VIRUS

- Ubiquitous throughout the world
- Seasonal outbreaks
 - Temperate Northern hemisphere:
November to April, peak January or February
 - Temperate Southern hemisphere: May to September, peak May, June or July
 - Tropical Climates: rainy season

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PARAINFLUENZA



- Usually type 3, but may also be caused by types 1 or 2
- Epidemics in the early spring and fall

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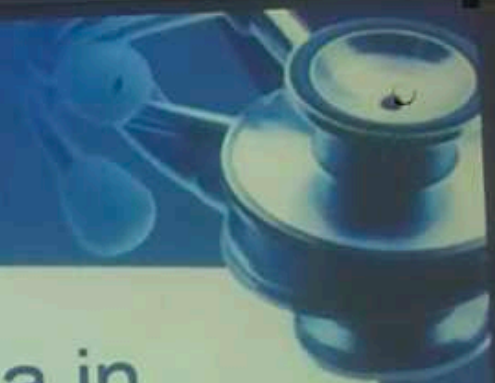
INFLUENZA

- Very similar to RSV or Parainfluenza in symptoms
- Seasonal with similar distribution to RSV
- Usually epidemic in the Northern hemisphere January through April

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HUMAN BOCAVIRUS



- Discovered in 2005
- Usually an issue in fall and winter
- May cause bronchiolitis and pertussis-like illness

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EPIDEMIOLOGY



- Typically less than 2 years with peak incidence 2 to 6 months
- May still cause disease up to 5 years
- Leading cause of hospitalizations in infants and young children
- Accounts for 60% of all lower respiratory tract illness in the first year of life

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RISK FACTORS OF SEVERITY



- Prematurity
- Low birth weight
- Age less than 6-12 weeks
- Chronic pulmonary disease
- Hemodynamically significant cardiac disease ¹²⁰
- Immunodeficiency
- Neurologic disease
- Anatomical defects of the airways

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ENVIRONMENTAL RISK FACTORS

- Older siblings
- Concurrent birth siblings
- Passive smoke exposure
- Household crowding
- Child care attendance
- High altitude

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PATHOGENESIS

- Viruses penetrate terminal bronchiolar cells-- directly damaging and inflaming
- Pathologic changes begin 18-24 hours after infection
- Bronchiolar cell necrosis, ciliary disruption, peribronchial lymphocytic infiltration
- Edema, excessive mucus, sloughed epithelium lead to airway obstruction and atelectasis

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CLINICAL FEATURES



- Begin with upper respiratory tract symptoms: nasal congestion, rhinorrhea, mild cough, low-grade fever
- Progress in 3-6 days to rapid respirations, chest retractions, wheezing

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EXAMINATION

- Tachypnea
 - 60-80 in infants
 - 30-50 in older children
- Prolonged expiratory phase, rhonchi, wheezes and crackles throughout
- Possible dehydration
- Possible conjunctivitis or otitis media
- Possible cyanosis or apnea

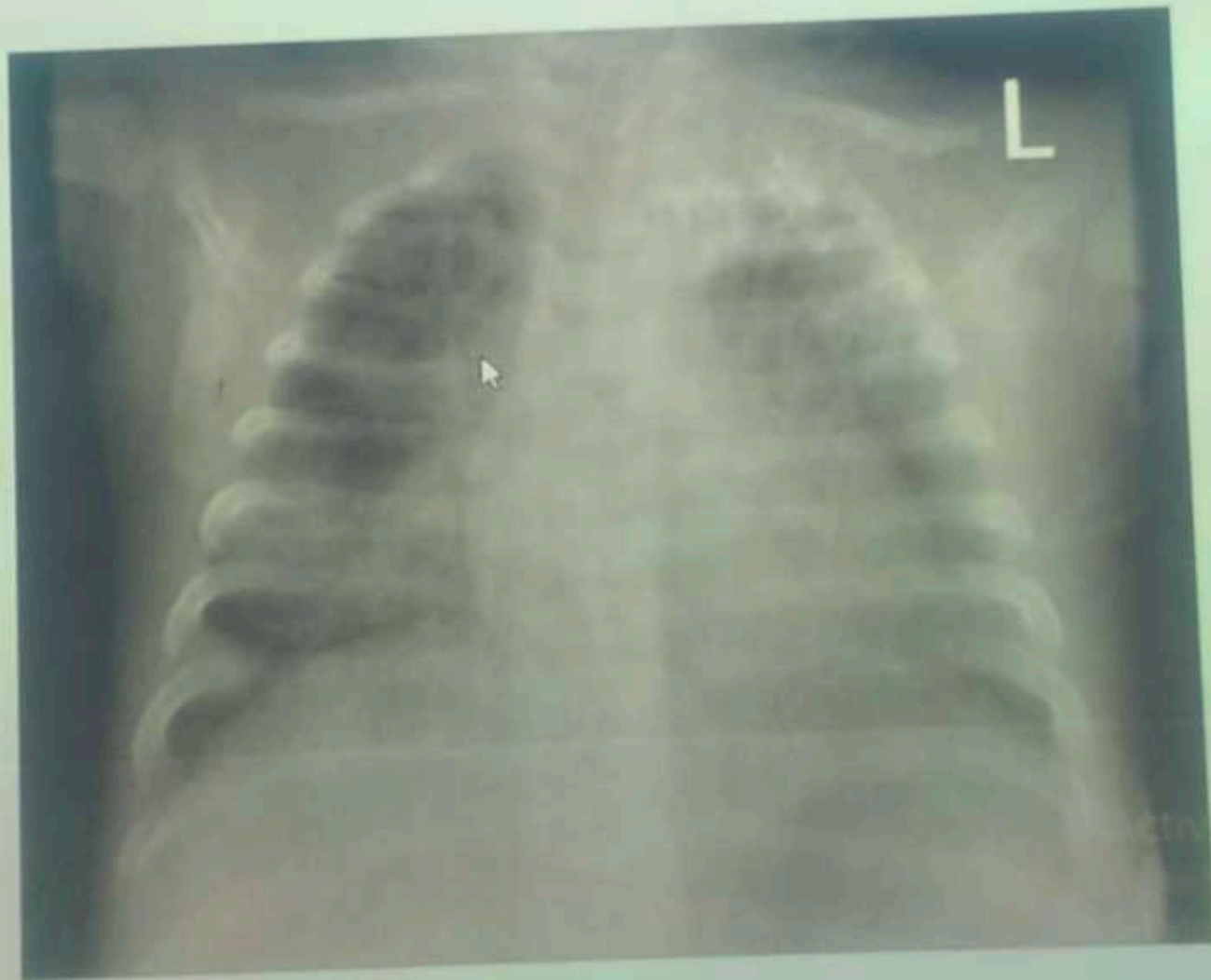
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DIAGNOSIS

- Clinical diagnosis based on history and physical exam
- Supported by CXR: hyperinflation, flattened diaphragms, air bronchograms, peribronchial cuffing, patchy infiltrates, atelectasis

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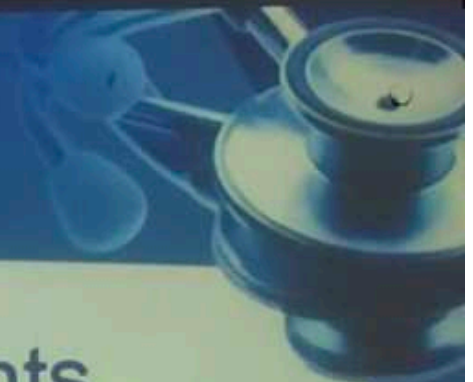


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VIRAL IDENTIFICATION



- Generally not warranted in outpatients and rarely alters treatment or outcomes
- May decrease antibiotic use
- May help with isolation, prevention of transmission
- May help guide antiviral therapy

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VIRAL IDENTIFICATION



- Nasal wash or aspirate
- Rapid antigen detection for RSV, parainfluenza, influenza, adenovirus (sensitivity 80-90%)
- Direct and indirect immunofluorescence tests
- Culture and PCR

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DIFFERENTIAL DIAGNOSIS

- Viral-triggered asthma
- Bronchitis or pneumonia
- Chronic lung disease
- Foreign body aspiration
- Gastroesophageal reflux or dysphagia leading to aspiration
- Congenital heart disease or heart failure
- Vascular rings, bronchomalacia, complete tracheal rings or other anatomical abnormalities

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ASTHMA vs BRONCHIOLITIS



Asthma

- Age - > 2 years
- Fever - usually normal
- Family Hx - positive
- Hx of allergies - positive
- Response to bronchodilators - positive

Bronchiolitis

- Age - < 2 years
- Fever - positive
- Family Hx - negative
- Hx of allergies - ¹²⁰ negative
- Response to bronchodilators - negative

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COURSE



- Depends on co-morbidities
- Usually self-limited
- Symptoms may last for weeks but generally back to baseline by 28 days
- In infants > 6 months, average hospitalization stays are 3-4 days, symptoms improve over 2-5 days but wheezing often persists for over a week
- Disruption in feeding and sleeping patterns may persist for 2-4 weeks

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SEVERITY ASSESSMENT



- AAP defines severe disease as “signs and symptoms associated with poor feeding and respiratory distress characterized by tachypnea, nasal flaring, and hypoxemia”.
- High likelihood of requiring IV hydration, supplemental oxygen and/or mechanical ventilation

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RISK FOR SEVERE DISEASE

- SpO₂ <93% in any amount oxygen
- SpO₂ <76% in any amount oxygen (CHD)
- Persistent tachypnoea
- RR>70 under 6 months old, RR>60 in 6 to 12 months old, RR >40 in 1 to 5 years old
- Apnoea +/- bradycardia
- Severe respiratory distress
- Any child whose condition is worrying

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ADMISSION CRITERIA

A blue stethoscope is positioned in the top right corner of the slide, partially overlapping the dark blue header.

- Apnoea
- Requiring oxygen to maintain SpO₂ >92%
- Requiring support with
- hydration/nutrition

- **Lower Threshold**

- Pre-existing lung disease, congenital heart disease, neuromuscular weakness, immune-incompetence
- Age < 6 weeks (corrected)
- Prematurity
- Family anxiety
- Reattendance

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TREATMENT

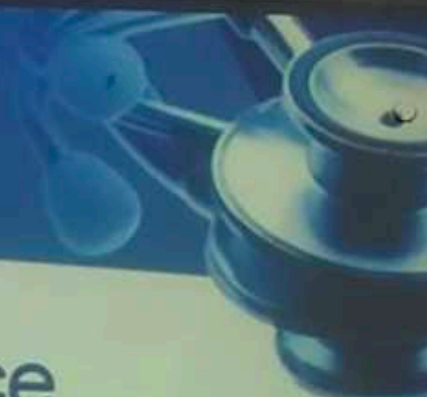
- Supportive care
- Pharmacologic therapy
- Ancillary evaluation
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Labs

- Most useful in children with complicating symptoms--fever, signs of lower respiratory tract infection
- CBC--to help determine bacterial illness
- Blood gas--evaluate respiratory failure
- CXR--evaluate pneumonia, heart disease

SUPPORTIVE CARE



- Respiratory support and maintenance of adequate fluid intake
- Saline nasal drops with nasal bulb suctioning
- Routine deep suctioning not recommended
- Antipyretics
- Rest

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RESPIRATORY SUPPORT



- Oxygen to maintain saturations above 90-92%
- Keep saturations higher in the presence of fever, acidosis, hemoglobinopathies
- Wean carefully in children with heart disease, chronic lung disease, prematurity
- Mechanical ventilation for $p\text{CO}_2 > 55$ or apnea

FLUID ADMINISTRATION



- IV fluid administration in face of dehydration due to increased need (fever and tachypnea) and decreased intake (tachypnea and respiratory distress)
- Monitor for fluid overload as ADH levels may be elevated

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CHEST PHYSIOTHERAPY

- Controversial (?Not recommended)
- Does not improve clinical status, reduce oxygen need or shorten hospitalization
- May increase distress and irritability

BRONCHODILATORS



- Generally not recommended or helpful
- Subset of children with significant wheezing or a personal or family history of atopy or asthma may respond
- Trial with salbutamol/ipratropium may be appropriate
- Therapy should be discontinued if not helpful or when respiratory distress improves

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CORTICOSTEROIDS



- Not recommended in previously healthy children with their first episode of mild to moderate bronchiolitis
- May be helpful in children with chronic lung disease or a history of recurrent wheezing
- Prednisolone, dexamethasone

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INHALED CORTICOSTEROIDS



- Not helpful acutely to reduce symptoms, prevent readmission or reduce hospitalization time
- No data on chronic use in prevention of subsequent wheezing

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ANTIBIOTICS



- Not useful in routine bronchiolitis
- Should be used if there is evidence of concomitant bacterial infection
 - Positive urine culture
 - Acute otitis media
 - Consolidation on CXR

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NONSTANDARD THERAPIES

- Heliox
 - Mixture of helium and oxygen that creates less turbulent flow in airways to decrease work of breathing
 - Only small benefit in limited patients
- Anti-RSV preparations RSV-IGIV or Palivizumab 120
 - No improvement in outcomes
- Surfactant
 - May decrease duration of mechanical ventilation or ICU stay

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COMPLICATIONS

- Highest in high-risk children
- Apnea
 - Most in youngest children or those with previous apnea
- Respiratory failure
 - Around 15% overall
- Secondary bacterial infection
 - Uncommon, about 1%, most in children requiring intubation

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DISCHARGE CRITERIA

- Stable and improving
- SpO₂ maintained >92% in air for period of 8-12 hours including a period of sleep
- Feeding adequately (more than 2/3 normal feeds)²⁰
- Family confident in their ability to manage
- Adequate home support for therapies such as inhaled medication

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DISCHARGE ADVICE & EDUCATION

- Refrain from smoking
- Symptoms may persist for 10- 14 days
- Re-infection may occur
- Increased risk of wheezing after bronchiolitis

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CARETAKER EDUCATION



- Expected clinical course
- Proper suctioning techniques
- Proper medication administration
- Indications for contacting physician

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- Overall rate < 2% in hospitalized children
- Mean mortality 2.8 per 100,000 live births
- 79% of deaths occurred in children less than 1 year old
- Death 1.5 times more likely in boys
- Approximately 20% of deaths were in children with underlying medical conditions
- Mortality rate decreases with increasing birth weight (29.8/100,000 if < 1500 grams, 1.3/100,000 if > 2500 grams)

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OUTCOMES-MORTALITY

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ASSOCIATION WITH ASTHMA



- Infants hospitalized with bronchiolitis, especially RSV, are at increased risk for recurrent wheeze and decreased PFT's
 - Frequent wheezing odds ratio 4.3
 - – Infrequent wheezing odds ratio 3.2
 - Reduced FEV1 up to age 11
- Association of RSV with later asthma
 - May reflect predisposition for asthma or increased risk factors for asthma

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PREVENTION

- Good hand washing
- Avoidance of cigarette smoke
- Avoiding contact with individuals with viral illnesses
- Influenza vaccine for children > 6 months and household contacts of those children

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PALIVIZUMAB

- Humanized monoclonal antibody against RSV
- Indications
 - Prematurity
 - Chronic lung disease
 - Congenital heart disease
- Given monthly through RSV season

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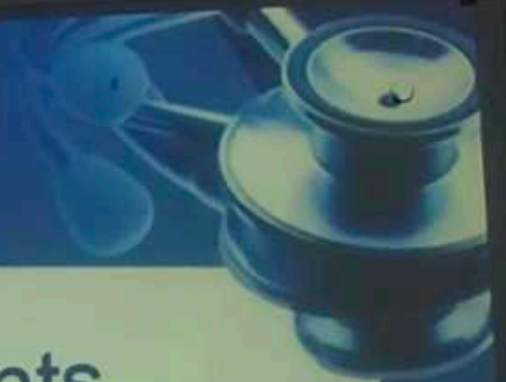
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