PedsCases Podcast Scripts

This is a text version of a podcast from Pedscases.com on "**Approach to Bronchiolitis**." These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedcases.com/podcasts.

Approach to Bronchiolitis

Developed by Tahereh Haji and Dr. Susanna Martin for PedsCases.com
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Hello everyone. My name is Tahereh Haji and I'm a medical student at the University of Saskatchewan. This podcast was created in collaboration with Dr. Susanna Martin, a pediatrician and Associate Professor at the University of Saskatchewan. This podcast reviews an approach to bronchiolitis in the infant. At the end of the podcast, listeners will be able to:

1) Recognize the signs and symptoms of bronchiolitis;
2) List the risk factors for severe bronchiolitis;
3) Review the appropriate investigations;
4) Discuss the key principles of management and treatment of infants with bronchiolitis.

Let's start with a case! You are a third year medical student working in an emergency department on a cold November day. Your preceptor notes that a 5-month-old patient has presented with respiratory distress and wheeze. Knowing your interest in learning more about respiratory symptoms among infants, your preceptor sends you to see little Jacob.

Before you go in the room, you review what you know about wheeze and infants.

First, you remember that infants are more prone to wheeze than older children and adults because of the smaller diameter of their airways and increased lung compliance. As a result, children under the age of 1 are more susceptible to airway obstruction. The differential diagnosis is long, but the most likely possibilities include viral bronchiolitis, asthma, and pneumonia. You remember that you do not want to miss other less likely but important causes such as anatomic abnormalities, cystic fibrosis, gastroesophageal reflux disease or GERD, swallowing dysfunction with aspiration, and, in older infants, always rule out foreign body aspiration. In addition to the past medical history, family history and so on, you know that a thorough pregnancy and birth history, immunization status, as well as nutritional and developmental history will be critical to narrowing down the differential diagnosis and alerting you to less common possibilities. For more information about history taking, refer to the podcast on pediatric history taking on pedscases.com.

Back to our case!

In the exam room, you meet Jacob and his mom, Jane. She tells you that over the past few days, Jacob has been coughing, has a runny nose and a fever, and today, he has had trouble breathing. This has never happened before and he has been previously healthy. He has not vomited or had diarrhea. His gestational and birth history are unremarkable; he is a term baby and is bottle-fed. Jane notes that today, he has been feeding less, and has had fewer wet diapers than usual. He has also been sleepier; he is usually playful and happy. Jacob is meeting his developmental milestones. There is no family history of asthma, allergies or eczema, genetic diseases, or immunodeficiencies. He was given Tylenol earlier today for his fever but otherwise is not on any medications and does

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not have any allergies. His immunizations are up to date. Jacob lives with his mom, dad and older sister, Emily, who is 3 years old and attends daycare. No one smokes inside or outside the home. Jane mentions that Emily was a little sick last week with a cough and runny nose, but is back at daycare this week.

On examination, you note that Jacob is currently sleeping in Mom's arms. His heart rate is 190, and his respiratory rate is 70. He has a temperature of 38.6ºC, and an oxygen saturation of 88%. His weight is at the 60th percentile for his age. His mucous membranes are dry, but his capillary refill time is normal. He shows signs of increased work of breathing and you note nasal flaring and intercostal retractions. On auscultation, you hear bilateral wheezing and crackles. There is no eczema and no other abnormal findings.

So, let's review!

Jacob is a 5-month-old previously healthy boy who presents today with a 3-day history of cough, runny nose and fever. His mom brought him into the emergency department because since this morning he has been sleepy and not interested in feeding. He has no significant gestational or birth history, and is meeting his developmental milestones, but of note, he is bottle-fed. He is up-to-date on his immunizations. The only other significant detail is that his older sister was home sick from daycare last week. On exam, his heart rate is on the high end of normal, he is tachypneic, febrile and has a decreased oxygen saturation. His weight is normal for his age. He has signs of respiratory distress and on auscultation, bilateral wheeze and crackles were noted.

This history and the physical exam findings are highly suggestive of acute bronchiolitis. Bronchiolitis is characterized by inflammation of the lower respiratory tract and increased mucus production, typically from a viral source such as respiratory syncytial virus (RSV). RSV season, in Canada, starts in the winter months, and can last into the spring. Other common agents that can cause bronchiolitis in infants include human metapneumovirus, influenza, rhinovirus, adenovirus and parainfluenza, but keep in mind that no matter the etiology, the clinical picture is very similar. The signs and symptoms begin with a viral upper respiratory tract prodrome, such as runny nose, cough, and faster respiratory rate, followed by signs of respiratory illness such as increased respiratory effort, grunting, color changes or apnea, wheeze, crackles and lower O_2 saturations.

Risk factors for bronchiolitis include male sex, bottle-feeding, living in crowded conditions, and those infants who have young mothers or mothers who smoked during pregnancy. Sick contacts, such as older brothers and sisters, are a common source for the infection. Their larger airways are less affected by bronchiolar edema, and they present with upper respiratory tract symptoms. However, the same infection in an infant may result in bronchiolitis.

The other two options on our differential diagnosis, asthma and pneumonia, are less likely in this case. Though pneumonia symptoms can be nonspecific in infants, the clinical picture tends more towards acute fever, cough, difficulty breathing, poor feeding and lack of interest in normal activities, without wheeze. The diagnosis of asthma among young children remains challenging, and it is most commonly triggered by viruses in the young. However, our patient does not have signs of atopy and there is no family history of asthma, allergies or eczema. The most recent guidelines from the Canadian Thoracic Society and the Canadian Pediatric Society on the diagnosis and management of asthma in preschoolers state that acute bronchiolitis usually presents as the first episode of wheeze or cough in children under 1 year of age. Note that if this were Jacob's second episode of cough and wheeze, or if he were over 1 year of age, it would be important to consider asthma, and a trial of bronchodilators may be indicated, especially if there is a strong family history of atopy.

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Diagnosis of bronchiolitis is based on a focused history and physical exam. Chest X-rays or other laboratory or imaging studies are not indicated unless the diagnosis is unclear, the rate of improvement is not as expected, or the severity of disease makes other diagnoses, such as a pneumonia, more likely. It is for this reason that it is important to determine, during the history and physical exam, if the patient most likely has a viral bronchiolitis or another disorder. At the same time, it is important to determine the severity of the disease in order to decide whether the patient can be safely treated as an outpatient, or if he requires an admission to hospital. To do so accurately, you may decide that you need serial observations over time.

The decision to admit is challenging. Those who are at high risk for severe bronchiolitis include: premature infants born at less than 35 weeks of gestational age; infants who are less than 3 months old at presentation with bronchiolitis; infants who have hemodynamically significant cardiopulmonary disease; and infants who have an immunodeficiency. Any of these risk factors in an infant with bronchiolitis should lower your threshold for admission to hospital. For patients without those risk factors, the Canadian Pediatric Society or CPS guidelines on bronchiolitis suggest that the following may be reasons to admit a patient:

- Signs of severe respiratory distress;
- The need for supplemental O_2 to keep oxygen saturations above 90%;
- Dehydration or poor fluid intake;
- Cyanosis or a history of apnea; and/or
- The family is unable to cope.

In the case of Jacob, he is not a high risk patient, but he does have some of respiratory distress, a low oxygen saturation, and poor fluid intake.

You present his case to your preceptor and recommend that Jacob be admitted. She agrees with you and you inform the family.

Now that you have admitted your patient, let's move on to discuss how to manage bronchiolitis. Because this is a very challenging topic, we are going to spend some time going through evidenced-based recommendations from the CPS and the American Academy of Pediatrics or the AAP.

Bronchiolitis is a self-limiting disease and most children can be managed with supportive care at home. For those patients who require hospital admission, the CPS recommends supportive care by providing supplemental O_2 and hydration. Gentle nasal suctioning may also be used to relieve nasal obstruction.

Supplemental oxygen therapy should be provided if saturations fall below 90% and used to maintain saturations at over 90%. This should be provided using nasal cannulae, or a face mask.

Adequate hydration should be maintained by encouraging frequent feeding and supporting breastfeeding. In infants with a respiratory rate >60 or significant nasal congestion, the risk of aspiration may be increased and it may not be safe to feed orally. In these cases, nasogastric tube feeding or IV fluids may be used.

It is extremely important to note there that there is a tendency to want to administer salbutamol to patients with bronchiolitis, in the hope that it may assist with their respiratory distress. However, there is no proven benefit to bronchodilators such as salbutamol, and the potential adverse effects, such as tachycardia and tremors, greatly outweigh any potential benefits. Remember that the pathophysiology of bronchiolitis is characterized by airway obstruction, not *constriction*. As a result, both the AAP and the CPS strongly recommend against the use of salbutamol in bronchiolitis.

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Similarly, inhaled corticosteroids, antibiotics, antivirals, chest physiotherapy or cool mist therapies or therapy with saline aerosol are not recommended either as there is no evidence to support their use.

Nebulized epinephrine, on the other hand, has a slightly different role in the treatment of bronchiolitis. It is also not routinely recommended for use among inpatients; however, it can be used as rescue treatment of rapidly deteriorating patients.

There is currently equivocal evidence for nasal suctioning, 3% hypertonic saline nebulization, and combination epinephrine and dexamethasone.

So to summarize, bronchiolitis is a self-limiting illness. The mainstay of treatment is oxygen supplementation to keep O_2 saturations above 90%, and ensuring adequate hydration.

Monitoring in hospital should be done by regular clinical assessments of respiratory rate, work of breathing, level of alertness, oxygen saturation, findings on auscultation, and general condition, including feeding and hydration. Continuous pulse oximetry monitoring is not required unless the patient is on supplemental oxygen as it has been associated with an increased length of stay. If patients do not need supplemental oxygen, spot O_2 checks are sufficient.

Patients can be discharged if:

- Tachypnea and work of breathing are improved;
- They can maintain O_2 saturations above 90% without the need for supplemental oxygen; and
- They have adequate oral feeding.

It is important to appropriately educate parents to recognize and respond to symptoms of deterioration, such as increased work of breathing, and inadequate hydration, before discharging patients home, and to have a follow-up plan.

What if Jacob had not needed admission? Since the vast majority of infants do not require admission to hospital, it is important to know how acute bronchiolitis is managed among outpatients.

In previously healthy children with mild bronchiolitis and no risk factors for severe illness, education and reassurance of parents are key. First, you should clearly explain that acute bronchiolitis is most often caused by a viral illness. As a result, antibiotics are not indicated in the vast majority of bronchiolitis, and should not be prescribed unless there is clear evidence of a bacterial infection. Parents should be advised that they can provide gentle nasal suctioning to relieve nasal obstruction, and ensure that their infant is receiving adequate feeds so as to maintain hydration. The expected clinical course is that the illness begins with upper respiratory tract symptoms, followed by lower respiratory tract symptoms and signs on days 2-3 that peak by the end of one week, and gradually resolve over the course of 2-3 weeks. Parents should avoid providing over-the-counter decongestants and cough medicines as they have no proven benefit and may have serious adverse effects including death. For this reason, child preparations of these medications are no longer on the market.

You should also ensure that parents know the signs of deterioration and that they indicate a need to seek medical attention immediately. These signs are:

- Apnea;
- Cyanosis;
- Poor feeding or decreased fluid intake (<75% of normal, or no wet diaper for 12 hours);
- New fever;
- Increased respiratory rate and/or increased work of breathing; and

- Exhaustion or lethargy.

Outpatients should also be monitored for progression and resolution of disease. Follow-up should occur within one to two days.

Wow! That was quite a bit to cover!

Let's summarize:

1. Acute bronchiolitis is a self-limiting illness characterized by inflammation of the lower respiratory tract and increased mucus production, typically from a viral source such as RSV. The result is airway obstruction, which can present as tachypnea, increased respiratory effort, wheeze, lethargy and poor feeding.
2. The differential diagnosis for wheeze in infants is long. This is why a thorough and focused history and physical exam, as well as consideration of risk factors is important. Patients with acute bronchiolitis will present with a history of an upper respiratory tract infection such as runny nose, fever, and cough, followed by signs of respiratory distress, decreased feeding and, in severe cases, exhaustion.
3. The diagnosis of bronchiolitis is based the history and physical exam. Routine laboratory tests or imaging are not indicated unless the diagnosis is uncertain.
4. The decision to treat as an inpatient or an outpatient is based on clinical judgment, risk factors for severe illness, and the need for supportive care and monitoring in a hospital setting.
5. The mainstay of treatment is supportive care in the form of O_2 supplementation to maintain an oxygen saturation of above 90%, gentle nasal suctioning, and maintaining adequate hydration status, which may require NG or IV fluid supplementation.
6. Parent education and follow-up is very important. Make sure that parents know what the signs of deterioration are and when to come back to the hospital, and that patients are followed-up to ensure adequate recovery.

Thanks for listening!

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