LESLIE DINGELDEIN: Hi. I'm Leslie Dingeldein. I'm an attending physician at Rainbow Babies Children's Hospital in the emergency room. And this presentation is going to discuss the emergency management of pediatric respiratory illness.

It will cover the recognition, initial management, and disposition of some common pediatric respiratory illnesses. We will not be covering the management of children who are less than three months old, children who have immunodeficiencies, and children who have complex or chronic illness needs.

We'll start our talk by talking about asthma exacerbation. Asthma exacerbations can occur after exposure to triggers such as viral illnesses, secondhand smoke exposure, or exposure to allergens.

In our emergency room at Rainbow, we use a clinical severity score. This helps to guide management in an acute asthma exacerbation. Asthma exacerbations can be classified as mild, moderate, or severe. Typically, a mild exacerbation, a child who has a mild exacerbation will have just wheezing and not distress. They'll be able to speak in full sentences and have no accessory muscle use.

Moderate exacerbations typically present with wheezing, sometimes biphasic wheezing with respiratory distress, including accessory muscle use and sometimes hypoxia, as well as tachypnea And severe exacerbations will often present with inaudible breath sounds, minimal wheezing, poor aeration, significant accessory muscle use, and sometimes in extreme cases, respiratory failure.

In a mild exacerbation, you'll have a clinical severity score that's less than 3. These kids will often respond to one albuterol treatment. If they do, then they can go home after a short period of observation with an albuterol inhaler. And they should use that albuterol inhaler every four hours at home, four to six puffs, and use a mask and spacer.

If they do not respond to the first albuterol treatment that they receive, then oral steroids are reasonable. You can use prednisolone, two milligrams per kilogram per dose in the ER, and then at home, two milligrams per kilogram per day for two to four more days.

Alternatively, you can use prednisone in the older kids or dexamethasone has also been studied as a reasonable alternative to prednisolone or prednisone. You would give one dose, 0.6 per kilo in the emergency department. And depending on the severity of the exacerbation, you could consider sending the child home with another dose to take the day after the emergency department visit.

In a moderate exacerbation, as we discussed, kids will have retractions, wheezing. These children who have a clinical severity score of 3 to 6 should get albuterol and ipratropium or DuoNeb combo treatment every 20 minutes for three treatments. If they do improve after two treatments, you can stop treatments, but it's important to assess between treatments if you're going to recommend cessation of beta 2 agonist treatment.

In addition, these kids should all get oral steroids. If for some reason they do not tolerate oral steroids, it is reasonable to place an IV and give IV steroids, but it is not usually required with kids with a moderate exacerbation.

Children with severe asthma exacerbations, you should start continuous albuterol and ipratropium treatment. And it should go for at least an hour and with regular reassessments for deteriorating clinical status.

These kids will need IV steroids. And depending on how severe their distress is, you should consider adjunct therapy. Either if they are very severe or if they are not responding to beta agonists and steroid treatment, you can consider IV magnesium and IV terbutaline. In addition, because of the risk of hypotension with the IV magnesium, you can give a 0.9% normal saline bolus. This also helps, because many of these kids start out dehydrated because of their tachypnea and increased insensible losses of free fluid with their respiratory distress.

So even kids with severe asthma exacerbation can sometimes be discharged home if they respond well to therapy. Criteria for discharge in all kids with asthma exacerbation, they must have no respiratory distress. So retractions, tachypnea, dyspnea should resolve completely, and it should stay resolved for at least one to two hours after the most recent albuterol treatment.

The more severe the exacerbation is, the longer the observation period is warranted before kids are discharged home. They should have normal or equal air exchange throughout. Mild expiratory wheezing is OK. It should not prevent a child from going home. But if air exchange is not equal and if you're not hearing good aeration with continued wheezing, that would be a concern for discharge to home.

They should not have an oxygen requirement, and they should demonstrate the ability and willingness to administer albuterol as indicated at home. Parents should demonstrate understanding of the discharge instructions and willingness to follow up also with their primary care physician in the next 24 to 48 hours for reassessment.

Consider admission for all kids with an asthma exacerbation who have an asthma clinical severity score of greater than 2 after treatment. So if they have wheezing and distress, then they need to be admitted. So kids with continued respiratory distress, need for albuterol treatment more often than every four hours, oxygen requirement, all of those kids should stay in the hospital until they're better.

Consider sending a child to the ICU for continuous albuterol requirement. Kids that can't go, can't be taken off the albuterol without decompensation need to stay on albuterol and be in the ICU.

If they have a need for respiratory support beyond just a nasal cannula for oxygen support. So if they need high-flow nasal cannula, BiPAP, or invasive ventilation, then they need to be in the intensive care unit. And then if they need continued adjunct therapy, if they need repeated doses of magnesium, if they need epinephrine drip, if they need terbutaline, then they need to be in an ICU setting.

Next, we'll talk about viral croup. It's a very common condition that can be very scary for practitioners and for parents. It presents with a barky cough, a hoarse voice, or in infant's, a hoarse cry. Often, parents can tell you if they have a hoarse voice or if their cry sounds hoarse, even if you can't tell whether or not their voice is different from normal.

Kids will have difficulty breathing or a history of difficulty breathing at home. Listen to parents, and believe them when they say that a child was having a lot of difficulty making noises at home when they were breathing, having retractions at home. Often on the way to the hospital after exposure to cool night air, kids will improve, making the diagnosis of croup difficult. But it can be made just based on the history from the parents.

Viral croup often has a sudden onset with a URI prodrome. So maybe a day of congestion and mild cough, and then as the evening hours set in, the cough becomes acutely worse. Very barky. Parents often say that it just came out of nowhere. The kids will present with stridor at times, but not always. And croup is typically worse at night and in the early morning, and improves during the day. It does get better, as I said before, after exposure to cool, humidified air.

So in the emergency department when a child presents, you need to assess whether that child has stridor at rest, cyanosis, retractions, and whether or not they are aerating their lungs. Kids who come to the hospital are often upset and afraid of health care providers.

Do your very best to make the child feel comfortable and get them calm, because that is the only way that you will get an accurate assessment of whether they have stridor at rest or not. If the child is truly agitated and you cannot get them to calm down and you can't get a true assessment of whether or not they have stridor at rest, then it is reasonable to go ahead and assume that they do have stridor at rest, and that their agitation may be because they are having difficulty breathing.

So if a child has stridor at rest or extreme agitation or cyanosis with or without agitation, then it is appropriate to give a racemic epinephrine nebulizer treatment. It is also indicated to give Decadron. We give a dose of 0.6 milligrams per kilogram with a maximum dose of 10 to 12 milligrams, either by mouth or intramuscularly.

Most kids with croup, even when they're in some distress and have stridor at rest, can tolerate Decadron by mouth, so it's a good idea to try the oral dose first. If that fails and the child throws it up or cannot keep it down or refuses to take it, then move on to the intramuscular route.

After the racemic epinephrine nebulizer treatment, it's important to reassess response. And if there's no stridor at rest after a racemic epinephrine treatment, then you can observe for two hours for return of symptoms. If stridor returns prior to two hours, then that is an indication for a repeat racemic epinephrine treatment and admission to the hospital.

If after initial racemic epinephrine dosing the child does not improve, and you give another racemic epinephrine treatment and the child still does not improve, and you're giving another one, that would be an indication for transfer to an ICU setting. At that point, you could consider a Heliox treatment if that is something that's available to you. Heliox has been shown to improve croup within the first 60 minutes of initiation of therapy.

Also rarely, kids with viral croup need to be intubated in order to protect their airway. Again, this is rare. But if you have a child who is not responding to treatment, it may be necessary.

It's important to make sure that you have an expert intubator close by. If you do not feel that you are expert in intubating children, please ask anesthesia or ear, nose, and throat to be nearby to assist with airway management.

As far as disposition in a child who has viral croup, discharge criteria include no stridor at rest. It's OK for them to have stridor if they have fever, but then you need to observe longer. Wait for that fever to go away. Make sure that the stridor goes away. They need to be calm. If they're running around the room playing and the stridor comes back, that's OK. That's not an indication for admission. But you should try and get them calm and an a resting state to make sure that that stridor resolves when they're calm.

You don't want any return of stridor or distress after the two-hour observation period that we discussed following the racemic epi treatment. Otherwise, if the stridor does return, that patient needs to be admitted.

So again, just to reiterate one more time, admit for continued or recurrent distress despite racemic epinephrine treatment and steroids. And admit to the ICU for refractory stridor with persistent distress and if you have a need for Heliox or intubation.

Next, we'll talk about community-acquired pneumonia. The diagnosis is clinical. Kids will often present with tachycardia, even if they don't have a fever. They will present with fever, vomiting, persistent or worsening cough, sometimes following URI symptoms.

They will sometimes have a productive cough, but it is not a requirement for the diagnosis. Many kids with pneumonia have an unproductive cough. Kids with pneumonia will sometimes present with rales, decreased or asymmetric aeration on auscultation as well.

Testing in community-acquired pneumonia is not required. If an IV is being placed, you could consider a CBC, a blood culture, or CRP. Typically, these are in the kids that are more ill-appearing and sicker with pneumonia than if they're getting an IV. And consider rapid viral testing or influenza testing in kids who are being admitted to the hospital or who are a little bit more ill. Many cases of community-acquired pneumonia are caused by viral organisms, not bacterial organisms.

Outpatient treatment for community-acquired pneumonia consists of amoxicillin, 45 milligrams per kilogram per dose, BID for 10 days for all age groups as initial therapy, and azithromycin, 10 mg per kg once on day one, and then five mg per kg daily on days two through five for school-aged kids, or kids older than five years.

If a child is sick enough to be inpatient, then you should start with Ampicillin, 50 milligrams per kilogram. You can give one IV dose in the emergency department. And then if they're greater than five years, again, consider the addition of azithromycin, 10 milligrams per kilogram in the ED.

If a child is toxic-appearing and staph pneumonia is a concern or resistant strep pneumo is a concern, then you should change the Ampicillin to cefotaxime or ceftriaxone, 50 milligrams per kilogram IV, and consider the addition of vancomycin, 20 milligrams per kilogram IV once in the emergency department.

Community-acquired pneumonia disposition criteria require that the patient be in no distress, not to be hypoxic, they need to be drinking fluids well and able to take the oral antibiotic that they are going home with, and they need to have reliable follow-up within 48 hours to monitor response to antibiotic therapy. Please consider admission for kids with respiratory distress, kids that are vomiting or unable to drink or take medications, or if they have an unreliable social situation or no follow-up with a pediatrician available.

Kids with SIRS who are unresponsive to a fluid bolus and antipyretics who may be showing signs of septic shock need to be monitored in an ICU setting. Obviously, if a child is intubated and has a need for positive pressure ventilation in order to assist ventilation for respiratory failure, they need to be in an ICU setting.

Also, kids who are on greater than 50% FIO2 and are satting less than 92% on that much oxygen need to be monitored in the ICU. They are at risk for respiratory failure. If a child has altered mental status or is having apnic episodes or has a multilobar infiltrate, those kids are also at risk for respiratory failure and need to be monitored in an ICU setting.

Bronchiolitis is a lower respiratory infection that is caused mostly by RSV, but by several other viruses. It occurs in children who are less than two years old typically. And the typical symptoms of bronchiolitis include coarse breath sounds on exam, wheezing, tachypnea, shallow breathing, retractions and accessory muscle use, persistent cough. Some kids will have fever, but not all.

First line treatment of bronchiolitis is nasal suctioning. Many kids with bronchiolitis, if they are having respiratory distress and wheezing, will improve significantly with nasal suctioning. If a child is hypoxic, you can give supplemental oxygenation. Consider ventilatory support such as high-flow nasal cannula or intubation.

You can do an albuterol trial, although current recommendations are trying to get practitioners away from using albuterol in bronchiolitis as the pathophysiology is thought to be caused by mucous and cellular debris in the airway as opposed to bronchospasm. There are children who have reactive airway disease with bronchiolitis, as it is a viral illness, and so that is why we still trial an albuterol treatment to see if there is a good response.

If there is a response, these kids can be continued on albuterol as an outpatient or in the hospital. If there is no response, then there is no utility to sending a family home with albuterol for their child.

You can consider a nebulized racemic epinephrine for severe distress. This should be limited to the kids who are expected to be admitted to the hospital. You should perform a feeding trial in young infants to assess whether or not it will be appropriate to send them home or admit them to the hospital. And you need to provide IV or NG hydration if there's oral intake, severe tachypnea, or poor urine output reported.

There is no role in bronchiolitis for steroids, antibiotic, or viral testing. Diagnosis is clinical and is viral, and treatment does not depend on knowing what virus is causing the illness.

Admission in bronchiolitis is indicated for kids with tachypnea, and that means kids who are three to 12 months. If they're breathing greater than 50 to 60 times a minute, they need to be admitted. Or kids who are one to two years old, if they're breathing greater than 40 times a minute. Infants who are less than 60 days are at risk of apnea and more severe illness, and they need to stay in the hospital for observation.

If kids have a pulse ox of less than 90% while awake or less than 88% while sleeping, they should be admitted to the hospital for oxygen therapy. If they are refusing to drink or they cannot drink because of severe tachypnea, they also need to be in the hospital.

And if they have poor follow-up or significant parental discomfort with discharge, this in and of itself is also an indication for admission. Kids who have apnea, bradycardia, cyanosis, are toxic-appearing, or have a need for ventilatory support such as high-flow nasal cannula, CPAP, or intubation need to be monitored in an ICU setting.

There is no role for radiography in bronchiolitis unless ICU care is indicated. It can lead to an overuse of antibiotics because of the appearance of atelectasis and areas of pseudoconsolidation in bronchiolitis.

Pneumonia is a clinical diagnosis. An X-ray is not routinely required for diagnosis. Radiography is not useful in croup. It's also a clinical diagnosis. There's no need to identify the classic steeple sign.

And radiography, however, can be useful in children who are not responding to treatment, who have prolonged fever, and don't have a source but also have respiratory symptoms. And if they have persistent tachycardia, even though they don't have a fever, the X-ray can be helpful, especially if you suspect that they may have a pneumonia, but you can't hear it on auscultation, which is sometimes the case.

And then most importantly, when treatment doesn't work-- so a child has croup and you give racemic epinephrine and you give Decadron and you don't see improvement, or they have an asthma exacerbation and you're giving beta 2 agonists and see no improvement-- you should consider transfer to a pediatric center or to an ICU. And also, you should consider alternative diagnoses, such as foreign body anaphylaxis, anterior chest mass, congestive heart failure, or congenital conditions such as vascular rings, slings, TEFs, or laryngo/tracheomalacia.

These are all conditions that can mimic or that can cause wheezing and/or stridor in young children. And that's the end of the talk. Thank you for your attention. I hope it was helpful.