Whistlers: The Wheezing Child

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Associate Professor
Department of Pediatrics
Objectives

1. Review the different etiologies of wheezing in the pediatric patient.
2. Describe the appropriate use of diagnostic tests and their limitations in the assessment of the acutely wheezing child.
3. Review newer treatment strategies for bronchiolitis and asthma.
4. Illustrate these principles through a case-based approach
Case 1.1

Patient

3mosM BIB parents due to 1 day of clear rhinorrhea now with cough and “noisy breathing.” Nl full-term infant w/o medical problems. No meds/allergies. Slept poorly overnight.

RR 44 98% RA HR 156 T 37.2

clear rhinorrhea w/o nasal flaring
transmitted upper airway sounds, lungs o/w clear
your thorough exam is o/w unremarkable
What to do?

Young child with URI

**Dx**
- CXR
- RSV antigen/RVB
- Blood
- Urine

**Tx**
- Isolation
- Nasal suction
- Bronchodilator trial
- Steroids
- Antibiotics
- Hypertonic saline
- Counseling
Case 1.2

Patient

8mosF BIB parents with 3 days of clear rhinorrhea and cough now with “noisy breathing.” Slept poorly overnight. Nl full-term kid. Imm UTD. First illness. Felt hot at home today.

RR 52  98% RA  HR 156  T 39.2
clear rhinorrhea w/o nasal flaring
diffuse scattered rales and wheezes
mild increased WOB with mild retractions
your thorough exam is o/w unremarkable
What to do?

2mo-2yo with “routine” bronchiolitis

Dx

CXR
CXR: In clinical bronchiolitis

1. Not recommended by AAP for routine use
   - Studies show < 1% rate of unexpected abnormalities
   - Very rarely results in change of clinical mgmt

2. CXR may be helpful:
   - “If the severity of disease requires further evaluation”
   - Another diagnosis suspected
   - Atypical presentation

3. Atelectasis:
   - If present – increased likelihood of severe dz
   - Often correlates w/ clinical picture
   - Increases use of antibiotics
Chest radiograph in the evaluation of first time wheezing episodes: Review of current clinical practice and efficacy

MARK G. ROBACK, MD, DAVID A. DREITLEIN

300 Kids
First-time wheezers in PED 1994

60% NOT Xray’d

Fever  Focal Exam  No atopy
Clinical Factors Associated with Focal Infiltrates in Wheezing Infants and Toddlers

E. M. Mahabee-Gittens, MD, MS¹
M. D. Dowd, MD, MPH²
J. A. Beck, RRT¹
S. Z. Smith, RRT¹

Clinical Pediatrics; Jul 2000; 39, 7; ProQuest Research Library pg. 387

471 Kids (0-18mos) Wheezers in PED 1996-7

Total population
10% + CXR

Grunting

Hypoxia

Of those Xray’d
23% + CXR

First-wheezing
Fever
Tachypnea
First-time wheezing in infants during respiratory syncytial virus season: Chest radiograph findings

140 Kids (0-12 mos) All had CXR

17% abnormal

1 VSD

All else ATX/infiltrate
# What to do?

**2mo-2yo with “routine” bronchiolitis**

<table>
<thead>
<tr>
<th>Dx</th>
<th>Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>CXR</td>
<td>Isolation</td>
</tr>
<tr>
<td>RSV antigen/RVB</td>
<td>Nasal suction</td>
</tr>
<tr>
<td>Blood</td>
<td>Bronchodilator trial</td>
</tr>
<tr>
<td>Urine</td>
<td></td>
</tr>
</tbody>
</table>

- Red thumbs down: 
  - CXR
  - RSV antigen/RVB
  - Blood
  - Urine

- Green thumbs up: 
  - Isolation
  - Nasal suction
  - Bronchodilator trial
Loose fit  Tight fit Screaming  Tight fit Calm

MDI/spacer

Nebulizer

What to do?

2mo-2yo with “routine” bronchiolitis

**Dx**
- CXR
- RSV antigen/RVB
- Blood
- Urine

**Tx**
- Isolation
- Nasal suction
- Bronchodilator trial
- Steroids
Steroids for bronchiolitis
Steroids for bronchiolitis

1. A Multicenter, Randomized, Controlled Trial of Dexamethasone for Bronchiolitis. Corneli et al. NEJM 2007. PECARN
   - 600 kids 2-12mos, first-time wheezers
   - 1mg/kg po dex vs placebo
   - No difference: admission rate, resp status after 4hrs, LOS for admitted pt’s

   - 13 RCTs included: 1200 kids w/ viral bronchiolitis
   - No difference: admission rate, readmission rates, hospital revisit, resp status
What to do?

2mo-2yo with “routine” bronchiolitis

**Dx**
- CXR
- RSV antigen/RVB
- Blood
- Urine

**Tx**
- Isolation
- Nasal suction
- Bronchodilator trial
- Steroids
- Antibiotics
- Hypertonic saline
- Heliox
- nCPAP
## Risk factors for severe disease

### History
1. < 12 wks of age
2. Prematurity
3. Underlying lung dz (CF, CLD)
4. Significant co-morbidity
   - CHD
   - Immunodeficiency

### PE
1. Ill-appearing
2. O2 sat < 94% RA
3. RR > 70, or > ULN for age
4. Mod-severe distress
What to do?
2mo-2yo with “routine” bronchiolitis
SUMMARY

2mo-2yo with “routine” bronchiolitis

**Dx**
- CXR
- RSV antigen/RVB
- Blood
- Urine

**Tx**
- Isolation
- Nasal suction
- Bronchodilator trial
- Steroids
- Antibiotics
- Hypertonic saline
- Heliox
- nCPAP
Case 1.3

Patient

3wkF BIB parents with 3 days of clear rhinorrhea and cough now with “noisy breathing.” Slept poorly overnight. Nl full-term kid. First illness. Felt hot at home today.

RR 52   98% RA   HR 156   T 39.2
clear rhinorrhea w/o nasal flaring
diffuse scattered rales and wheezes
mild increased WOB with mild retractions
your thorough exam is o/w unremarkable
What to do?

Neonate with fever and bronchiolitis
What to do?

Neonate with fever and bronchiolitis

**Dx**
- CXR
- Blood
- Urine
- CSF
- RSV antigen/RVB

**Tx**
- Isolation
- Nasal suction
- Bronchodilator trial
- Steroids
- Antibiotics
What to do?

Neonate with fever and bronchiolitis
A word on APNEA
A word on APNEA

- Limited data, none from ED setting
- Retrospective data dominates

Willwerth et al 2006:
- 700 hospitalized patient < 6mos of age
  1. Full-term < 1mos
  2. Premie < 48wks post-conception
  3. h/o apnea of prematurity
  4. Witnessed apnea
I'm having trouble breathing.
Case 2.1

Patient

6yoF w/ known asthma BIB parents d/t cough and “wheezing” for the past 2 days. Has been using albuterol MDI every 4-6hrs for last 36hrs No other meds. Hosp x 1 9mos ago w/o PICU or intubation. 2 ED visits in last 6 mos and needed po steroids both times (last was 4wks ago). No fever.

RR 32  96% RA  HR 118  T 37.4
clear rhinorrhea
Diffuse insp-exp wheeze w/ prolonged exp phase. No focal findings. + retractions. Speaking in short sentences. your thorough exam is o/w unremarkable

Next week

ED, Room 3
What to do?
Moderate asthma exacerbation

Tx

Abluterol: neb vs. MDI
Atrovent
Systemic steroids
Inhaled steroids

Dx

CXR

Antibiotics
What to do?
Moderate asthma exacerbation

**Tx**
- Abluterol: neb vs. MDI
- Atrovent
- Systemic steroids
- Inhaled steroids
- Antibiotics

**Dx**
- CXR
- Peak flow
- Blood gas
- CBC
- BMP
- Other

EDUCATE!!
EMERGENCY DEPARTMENT—ASTHMA DISCHARGE PLAN

Name: ___________________________ was seen by Dr. ______________________ on __/__/____

- Take your prescribed medications as directed—do not delay!
- Asthma attacks like this one can be prevented with a long-term treatment plan.
- Even when you feel well, you may need daily medicine to keep your asthma in good control and prevent attacks.
- Visit your doctor or other health care provider as soon as you can to discuss how to control your asthma and to develop your own action plan.

Your followup appointment with ___________________________ is on: __/__/____ Tel: ____________

YOUR MEDICINE FOR THIS ASTHMA ATTACK IS:

<table>
<thead>
<tr>
<th>Medication</th>
<th>Amount</th>
<th>Doses per day, for # days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisone/prednisolone (oral corticosteroid)</td>
<td></td>
<td>_____ a day for _____ days Take the entire prescription, even when you start to feel better.</td>
</tr>
<tr>
<td>Inhaled albuterol</td>
<td></td>
<td>_____ puffs every 4 to 6 hours if you have symptoms, for _____ days</td>
</tr>
</tbody>
</table>

YOUR DAILY MEDICINE FOR LONG-TERM CONTROL AND PREVENTING ATTACKS IS:

<table>
<thead>
<tr>
<th>Medication</th>
<th>Amount</th>
<th>Doses per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaled corticosteroids</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

YOUR QUICK-RELIEF MEDICINE WHEN YOU HAVE SYMPTOMS IS:

<table>
<thead>
<tr>
<th>Medication</th>
<th>Amount</th>
<th>Number of doses/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaled albuterol</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASK YOURSELF 2 TO 3 TIMES PER DAY, EVERY DAY, FOR AT LEAST 1 WEEK:

“How good is my asthma compared to when I left the hospital?”

If you feel much better:
- Take your daily long-term control medicine.
- If you feel better, but still need your quick-relief inhaler often:
  - Take your daily long-term-control medicine.
  - See your doctor as soon as possible.

If you feel about the same:
- Use your quick-relief inhaler.
- Take your daily long-term-control medicine
- See your doctor as soon as possible—don’t delay.

If you feel worse:
- Use your quick-relief inhaler.
- Take your daily long-term-control medicine.
- Immediately go to the emergency department or call 9-1-1.

YOUR ASThma IS UNDER CONTROL WHEN YOU:

① Can be active daily and sleep through the night.
② Need fewer than 4 doses of quick-relief medicine in a week.
③ Are free of shortness of breath, wheeze, and cough.
④ Achieve an acceptable “peak flow” (discuss with your health care provider).
University of Michigan Health System
Emergency Department
Asthma Discharge Instructions

MOST PEOPLE WITH ASTHMA DO NOT GET SO SICK THAT THEY NEED EMERGENCY CARE.

The fact that you had to get emergency care may mean:
- you are not taking your long term control medicine the right way
- you have not been prescribed any/enough long term control medicine
- you are still exposed to triggers that start your asthma symptoms

You can avoid asthma flare-ups by using this F.L.A.R.E. plan until you see your primary doctor.

FOLLOW UP WITH YOUR PRIMARY DOCTOR- CALL TO MAKE AN APPOINTMENT TO BE SEEN WITHIN ___ DAYS.
- If you have trouble making an appointment, ask to speak to the office nurse.
- If you do not have a primary care doctor call (866) 888-9050 or call the number on the back of your insurance card to get one.
- At the follow up appointment:
  ✓ Bring all of your medications and this plan with you.
  ✓ Make an asthma action plan with your doctor that you can follow every day to keep your asthma under control.
  ✓ Write down your questions and your doctor’s answers.

This will make your emergency visits rare.

LEARN ABOUT YOUR ASTHMA MEDICINES. TAKE ALL OF THESE MEDICINES JUST AS THE DOCTOR TELLS YOU, EVEN IF YOU ARE FEELING MUCH BETTER.

<table>
<thead>
<tr>
<th>Kind of medicine</th>
<th>Name of medicine</th>
<th>How much</th>
<th>How often and how long you need to take it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick-relief/Rescue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long term control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steroid pills or syrup</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
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ASTHMA IS A LIFE-LONG (CHRONIC) DISEASE.
Even though your breathing is better after getting emergency care, you still need to get long term control of your asthma. If you do not, you are at risk for more severe flare-ups and even death.
- If you use quick-relief medicine more than 2 times per week then your asthma is not under control. You need to see your doctor or an asthma specialist to make a plan to get control of your asthma.
- Take long term control medicine every day as ordered by your doctor.
- Figure out what things make your asthma flare up and try to stay away from these “triggers”.

RESPOND TO THESE WARNING SIGNS THAT YOUR ASTHMA IS GETTING WORSE:
- Your chest feels tight
- You are short of breath
- You are wheezing
  - Your coughing
  - Your peak flow is getting low

KEEP TAKING YOUR MEDICINES AS PRESCRIBED AND CALL YOUR DOCTOR.

EMERGENCY CARE MAY BE NEEDED IF YOU:
- Have trouble talking
- Your breathing is noisy
- You are wheezing
- Take your quick-relief medicine and wait 20 minutes

TAKE YOUR QUICK-RELIEF MEDICINE AND WAIT 20
What to do?
Moderate asthma exacerbation
SUMMARY

Moderate asthma exacerbation

**Tx**
- Abluterol: neb vs. MDI
- Atrovent
- Systemic steroids
- Inhaled steroids
- Antibiotics

**Dx**
- CXR
- Peak flow
- Blood gas
- CBC
- BMP

EDUCATE!!
Case 2.2

Patient

6yoF w/ known asthma BIB parents d/t cough and “wheezing” for the past 2 days. Has been using albuterol MDI every 4-6hrs for last 36hrs. No other meds. Hosp x 1 9mos ago w/o PICU or intubation. 2 ED visits in last 6 mos and needed po steroids both times (last was 4wks ago). No fever.

RR 52  86% RA  HR 170  T 37.4
1-2 word phrases w/ obvious resp distress
poor air mvmt w/ nearly inaudible insp/exp + suprasternal retractions
Tachy, reg rhythm. Nl perfusion

Your thorough exam is o/w unremarkable

Next week

ED, Room 3

LITTLE CHANGE AFTER 3 DUONEBS
# What to do?

**SEVERE** asthma exacerbation

<table>
<thead>
<tr>
<th>Tx</th>
<th>Dx</th>
</tr>
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<tbody>
<tr>
<td>O₂</td>
<td>CXR</td>
</tr>
<tr>
<td><strong>Abluterol</strong></td>
<td><strong>Blood gas</strong></td>
</tr>
<tr>
<td><strong>Atrovent</strong></td>
<td><strong>CBC</strong></td>
</tr>
<tr>
<td>Steroids</td>
<td><strong>BMP</strong></td>
</tr>
<tr>
<td>Epi/terbutaline</td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td></td>
</tr>
<tr>
<td>Heliox</td>
<td></td>
</tr>
<tr>
<td>Leukotriene inhibitors</td>
<td></td>
</tr>
<tr>
<td>Methylxanthines (theophyline)</td>
<td></td>
</tr>
<tr>
<td>Intubate</td>
<td></td>
</tr>
</tbody>
</table>
Risk factors for DEATH

Any:
- ICU, Intubation

Prior yr:
- 2+ hosp
- 3+ ED visits

Prior month:
- Asthma hosp
- >2 SABA canisters

Social
- Low SES
- Drug use
- Psychosocial problems

Co-morbidities
- CV dz
- Other lung dz
- Psych dz
What to do?

SEVERE asthma exacerbation

Style-by-design.blogstop.com

Een.wikipedia.org
SUMMARY

SEVERE asthma exacerbation

**Tx**

- O₂
- Abluterol
- Atrovent
- Steroids
- Epi/terbutaline
- Magnesium
- Heliox
- Leukotriene inhibitors
- Methylxanthines (theophyline)
- Intubate

**Dx**

- CXR
- Blood gas
- CBC
- BMP
“That’s a puffer. If you want to blow a house down, you’ll also need a huffer.”
Case 3

Patient

5yoF w/ cough, congestion, fever for 3 days. Healthy, fully immunized girl. Kid seemed to have more difficulty breathing over last 24 hrs. Decr po and UOP. Reports some abd pain and had 3 episodes of NBNB emesis in last 12 hours.

RR 30  96% RA  HR 128  T 38.6  100/62
mildly ill-appearing, well-hydrated
decr BS with rales RLL. Nl WOB
your thorough exam is o/w unremarkable
The Management of Community-Acquired Pneumonia in Infants and Children Older Than 3 Months of Age: Clinical Practice Guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America

John S. Bradley,¹,a Carrie L Byington,²,a Samir S. Shah,³,a Brian Alverson,⁴ Edward R. Carter,⁵ Christopher Harrison,⁶ Sheldon L. Kaplan,⁷ Sharon E. Mace,⁸ George H. McCracken Jr,⁹ Matthew R. Moore,¹⁰ Shawn D. St Peter,¹¹ Jana A. Stockwell,¹² and Jack T. Swanson¹³
What to do?

Child with PNA appropriate for OUTPATIENT CARE

<table>
<thead>
<tr>
<th>Dx</th>
<th>Tx</th>
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<tbody>
<tr>
<td>Pulse oximetry</td>
<td>Isolation</td>
</tr>
<tr>
<td>CXR</td>
<td>Antibiotics</td>
</tr>
<tr>
<td>CBC/Blood Cx</td>
<td>Oxygen</td>
</tr>
<tr>
<td>Sputum Cx</td>
<td>IVF</td>
</tr>
<tr>
<td>Urine antigen testing</td>
<td>Bronchodilator trial</td>
</tr>
<tr>
<td>Acute phase reactants</td>
<td>Steroids</td>
</tr>
<tr>
<td></td>
<td>Cough suppressant</td>
</tr>
<tr>
<td></td>
<td>Counseling</td>
</tr>
</tbody>
</table>
Patient

5yoF w/ cough, congestion, fever for 5 days. Since being seen 2 days ago, she’s taken her amoxicillin without difficulty but she remains febrile and her cough and breathing have worsened. Her po intake and UOP remain low. In general, she seems sicker.

RR 48  88% RA  HR 160  T 39.0  100/62
ill-appearing but nontoxic, clearly dyspneic
decr BS with rales RLL, + retractions. No cyanosis.
tachycardia, 2+ radial pulses. Brisk CR.
your thorough exam is o/w unremarkable
**What to do?**

Child with PNA requiring HOSPITALIZATION

<table>
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</table>
GESUNDHEIT...
Case 4

Patient

12mosM w/ fever and URI sx’s for 3 days. Went to PCP for eval of fever. Incidentally reported pt was eating a peanut that morning, immediately began coughing and wheezing. Had intermittent wheezing in office. No tx in office – sent to ED for eval.

RR 30  96% RA  HR 154  T 38.2
crying
exp wheezing throughout R>L. Decr BS on right?
your thorough exam is o/w unremarkable

3 wks from now

ED, Room 4
What to do?
Soooo....

- We gave him an albuterol neb
  - Wheezing resolved
  - Symmetric BS
  - No distress

WHAT WOULD YOU DO AT THIS POINT?
Summary

**Bronchiolitis**
- Clinical diagnosis
- Bronchodilator trial
- Consider high risk features

**Pneumonia**
- CXR not required
- Amoxil 1\textsuperscript{st}-line

**Asthma**
- Albuterol + Atovent in ED
- Systemic steroids
- Consider inhaled steroids
- Work hard not to intubate

**Foreign Body**
- High-index of suspicion
Selected References


