

# Texas Prehospital Pediatric Readiness Education

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# Acute Respiratory Diseases in Children

# Objectives

- Understand the significance of respiratory disease in the pediatric patient
- Discuss the clinical presentation of the most common respiratory diseases in the pediatric patient
- Review assessment and management of the pediatric patient with respiratory disease

# The Pediatric Difference

## Special Considerations:

- Hand to mouth behavior increases risk of disease spread
- Inability to “blow their nose” affecting secretion clearance
- Obligate nose breather until approx 6 months
- Smaller airways
- Dependent on adult caregiver choices such as passive smoke exposure

# Respiratory Illnesses in Children

Acute URI

Pneumonia

Bronchiolitis

Asthma

Croup

Bronchopulmonary Dysplasia

Cystic Fibrosis

# Bronchiolitis: Epidemiology

- Less than 2 yrs old
- Peaks in fall/winter
- Most common cause of hospitalization in young children
- Noninvasive respiratory support (eg HFNC) have reduced need for intubation

## Common Causes

RSV

Rhinovirus

Parainfluenza virus

Human metapneumovirus

Influenza virus

Adenovirus

Coronavirus

# Bronchiolitis: Clinical Features

- Affects children <2
- URI precedes lower respiratory symptoms
- Peak severity day 3-5

## **Presentation**

Cough

Increased respiratory rate

Retractions

Wheezing and/or crackles

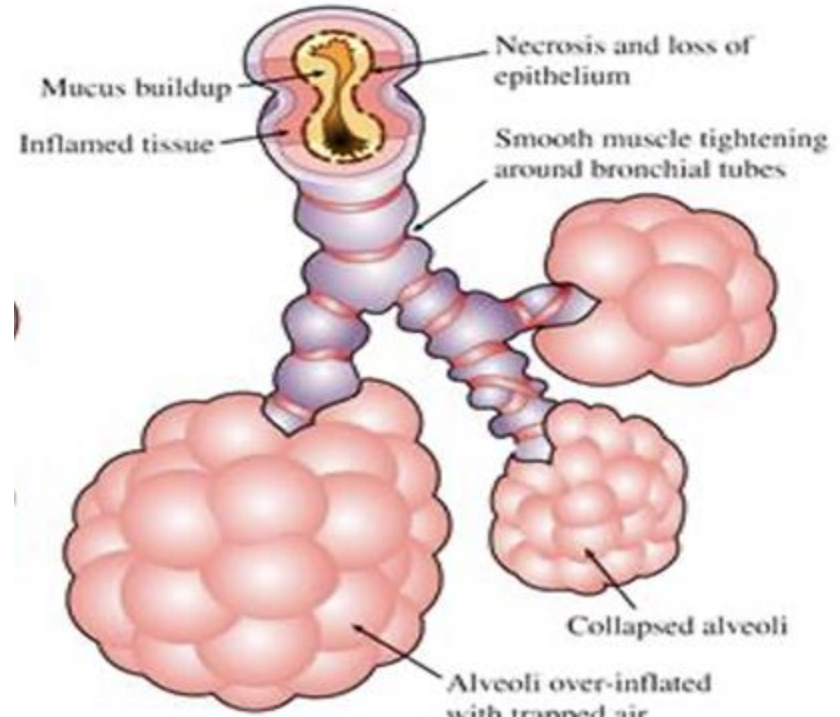
Nasal congestion

	0 Points	1 Points	2 Points	3 Points
<b>Respiratory Rate</b>				
< 2 months		≤ 60	61-99	≥ 70
2-12 months		≤ 50	51-99	≥ 60
1-2 years		≤ 40	41-44	≥ 45
<b>Retractions</b>	None	Subcostal or intercostal	2 of the following: subcostal, intercostal, substernal, or nasal flaring	3 of the following: Subcostal, intercostal, substernal, suprasternal, supradavicular, or nasal flaring/head bobbing
<b>Dyspnea</b>	Normal feeding, vocalization and activity	1 of the following: difficulty feeding, decreased vocalization, or agitation	2 of the following: difficulty feeding, decreased vocalization, or agitation	Stops feeding, no vocalization, or drowsy and confused
<b>Auscultation</b>	Normal breathing, no wheeze	End-expiratory wheeze only	Expiratory wheeze only (greater than end-expiratory wheeze)	Inspiratory and expiratory wheeze OR diminished breath sounds OR both



# Bronchiolitis: Pathogenesis

- Viral infection affecting cells of terminal bronchioles
- Edema, mucous and sloughed epithelial cells obstruct small airways
- Secondary bacterial infection is uncommon



# Bronchiolitis: Risk Factors

## **Congenital**

Prematurity  
Low birth weight  
Age <12 weeks  
Hx Bronchopulmonary  
dysplasia  
Abnormal airway anatomy  
Heart disease  
Neurologic disease

## **Environmental**

Smoke exposure  
Crowded household  
Daycare  
Birth during peak season  
Higher altitude  
Air pollution

# Bronchiolitis: Best Practices

- Assess and address hydration status-Oral route preferred unless severe respiratory distress
- Supplemental Oxygen if desaturation
- Suction and reposition can result in significant improvement
- HFNC for sig distress



**therapy in pediatric patients**

Age	Body weight	Flow range <sup>†</sup>	Manufacturer-recommended cannula size	
			Fischer & Paykel <sup>‡</sup>	Vapotherm
≤ 1 month	< 4 kg	5–8 L/min	S, M	Neonatal, Infant
1 month–1 year	4–10 kg	8–20 L/min	M, L	Pediatric small
1–6 years	10–20 kg	12–25 L/min	L, XL	Pediatric small, Pediatric (Adult small)
6–12 years	20–40 kg	20–30 L/min	XL, Small	Pediatric (Adult small),
12–18 years	> 40 kg	25–50 L/min	Small, Medium	Pediatric (Adult small), Adult

OD, outer diameter.

<sup>†</sup> Allowed flow range might be different from the manufacturer's recommendations.

<sup>‡</sup> XS, S, M, L, and XL in Optiflow™ Junice 2, Small and Medium in Optiflow™ Plus.

# Bronchiolitis: Evidence-Based Care

American Academy of Pediatrics **DOES NOT** support routine use of the following:

- Albuterol
- Hypertonic Saline
- Steroids
- Antibiotics

American Academy of Pediatrics **DOES** support:

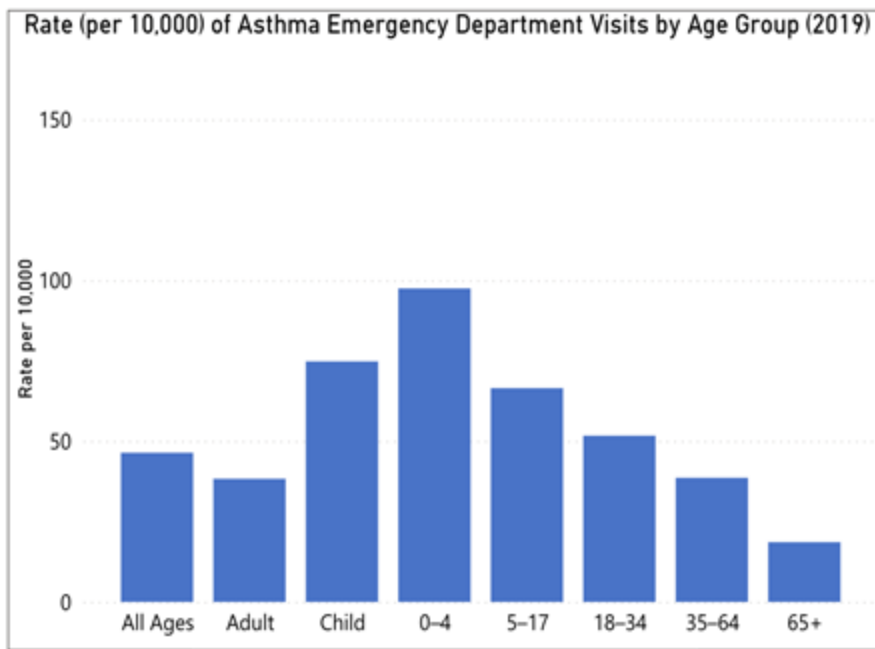
- Supplemental Oxygen to keep sats >90%
- Use of Non-invasive Respiratory Support

# Asthma: Epidemiology

- Approx 4.5 million children affected
- Male>Female
- Hispanic and Black children are affected at a disproportionately higher rate than non-Hispanic White children

# Asthma: Epidemiology

- 38% of children with asthma will report an annual exacerbation
- 63% will occur in age < 5
- Approx 50% are poorly controlled
- Estimated 1 million annual ED visits
- >14 million missed school days per year



# Asthma: Pathogenesis

- Triggering agent/event
  - Viral illness
  - Allergen
  - Cold induced
  - Exercise Induced
- Immune system dysregulation
- Airway inflammation
- Bronchoconstriction



# Asthma: Clinical Features

Wheezing

SOB

Cough

Chest Tightness

Tachypnea

Retractions

Agitation/Restlessness

Activity Intolerance

Dec Breath Sounds

Hypoxia

Accessory Muscle Use

Cyanosis

# Asthma: Best Practices

- Address Bronchospasm
  - Bronchodilators
- Reduce Airway Inflammation
  - Corticosteroids
- Supplemental Oxygen if needed
  - Sats >90%
- Non-Invasive Respiratory support as needed

## Medications for the emergency department management of asthma exacerbations

Medication name	Route	Typical dose	Typical maximum dose
<b>Primary medications</b>			
Albuterol sulfate	HFA	4–8 puffs	
	Nebulized	2.5–5 mg	
	Continuous	5–20 mg/hour	
Ipratropium bromide	HFA	4–8 puffs	
	Nebulized	0.25–0.5 mg	1.5 mg/hour
Dexamethasone	PO, IV, IM	0.6 mg/kg	16 mg
Prednisone	PO	2 mg/kg	60 mg
Prednisolone	PO	2 mg/kg	60 mg

## Medications for the emergency department management of asthma exacerbations

Medication name	Route	Typical dose	Typical maximum dose
<b>Secondary medications</b>			
Magnesium sulfate	IV	25–75 mg/kg	2 g
Epinephrine	IV, IM	0.01 mg/kg	1 mg
Terbutaline	SC		250 mcg /dose
		<12 years	10 mcg/kg/dose every 15 minutes for 2 doses
		>12 years	0.25 mg/dose every 15 minutes for 2 doses
	IV	2–10 mcg/kg loading dose followed by infusion 0.1–0.4 mcg/kg/min	3 mcg/kg/min
Ketamine	IV	2 mg/kg loading dose followed by 20–60 mcg/kg/min	

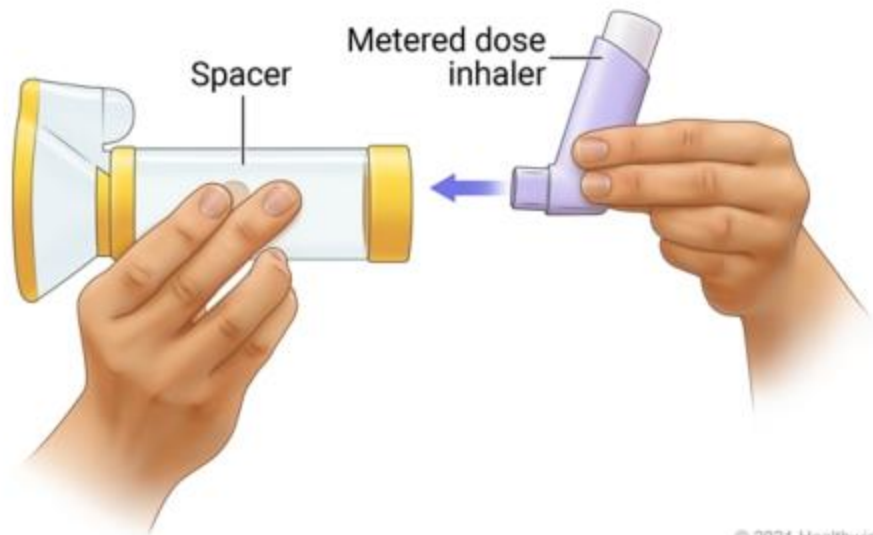
# Asthma: Evidence-Based Care

- Goal to reduce obstruction to airflow and improve gas exchange in acute setting
- Can provide “back to back” bronchodilator q 20min x 1 hour
- Ipratropium indicated for significant exacerbation
- Based on severity of presentation and/or response to initial treatment consider:
  - Terbutaline
  - Magnesium Sulfate
  - Non-invasive Respiratory Support
  - Ketamine

PAS component score	0	1	2	3
Respiratory rate				
6 months to 2 years	<30	31–45	46–60	>60
2–3 years	18–26	27–34	35–39	≥40
4–5 years	16–24	25–30	31–35	≥36
6–12 years	14–20	21–26	27–30	≥31
>12 years	12–18	19–23	24–27	≥28
Oxygen saturation	>98% on room air	95–97% on room air	90–94% on room air	<90% on room air or on any oxygen
Auscultation	Normal breath sounds with good aeration throughout	End-expiratory wheezing only	Expiratory wheezing	Inspiratory and expiratory wheezing to diminished breath sounds
Retractions	None	Intercostal	Intercostal and substernal	Intercostal, substernal, and supraclavicular
Dyspnea	Speaks in complete sentences	Speaks in short sentences, coos, and babbles	Speaks in partial sentences, short cry	Speaks in single words; short phrases/grunting

## Asthma Classification

	Symptoms		≤ 5 years of age	> 5 years of age	
	Daytime	Nighttime	Exercise tolerance	PEF or FEV1	PEF variability
<b>Mild intermittent</b>	≤ 2 per week	≤ 2 per month	Excellent tolerance	≥ 80%	< 20%
<b>Mild persistent</b>	> 2 per week, but < 1 per day	> 2 per month	Exercise symptoms	≥ 80%	20%-30%
<b>Moderate persistent</b>	Daily symptoms	> 1 per week	Frequent exercise symptoms	60%-80%	> 30%
<b>Severe persistent</b>	Continual day symptoms	Frequent night symptoms	Exercise severely limited	≤ 60%	> 30%





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### Using a spacer

If you use a meter-dose inhaler (MDI), a spacer will help to get the right dose of medicine into your lungs. Your doctor will give you a spacer to use. Remember not to share your spacer with anyone else, and ask for a new one every year.

1. Hold the spacer upright and give it a good shake.
2. Fit the spacer into the opening of the mouth of the spacer.
3. Seal the lips firmly around the mouth piece - press the inhaler slowly.
4. Take 1 slow breath in and out through your mouth. Do not remove the spacer from your mouth between breaths.
5. Remove the spacer from your mouth. Repeat steps 1-4 for further doses.

### How to care for your spacer

1. Take the spacer apart (both the small and the larger spacer) immediately after 1 use.
2. Use warm water with a little dishwashing liquid and hand wash your spacer.
3. Do not rinse or wipe the spacer. Leave the pieces on the side to dry.
4. Put the spacer back together.

### Child Asthma Action Plan



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### Well

**When you're well:**

1. I wake up coughing.
2. I get up often at night.
3. I use my inhaler/spacer less than 2 times a week.

**My asthma is:**

Remember to take 10 puffs whenever you're well.

The name of my inhaler is \_\_\_\_\_ The number of puffs in the morning and \_\_\_\_\_ puffs at night through a spacer.

**Remember:** Take the only inhaler that is \_\_\_\_\_ The name of my inhaler is \_\_\_\_\_

Take \_\_\_\_\_ puffs through a spacer when I wake up when it's hard to breathe.

If I don't feel as healthy when I wake up, I take \_\_\_\_\_ puffs of my inhaler.

### Worse

**When my asthma is getting worse:**

- I cough up sputum and it's hard to breathe at \_\_\_\_\_
- I'm waking up often because of my asthma at \_\_\_\_\_
- I cough up sputum when I get up, or \_\_\_\_\_
- I need my inhaler/spacer to control my asthma more than 2 times per week.

**If my asthma gets worse I should:**

Keep taking my inhaler every day as normal and take \_\_\_\_\_ puffs of my inhaler every 4 hours. If I'm not getting better during that I should see my doctor today.

**Get back:**

### Worried

**My asthma is getting worse:**

- My asthma isn't responding at all to the inhaler/spacer I'm using, or \_\_\_\_\_
- The breathing feels even better, or \_\_\_\_\_
- The breathing is even worse, my chest hurts, my lips turn blue or my skin is turning pale or blue.

- Do not drive anyone to the hospital.
- Take one 4 puffs of salbutamol through a spacer, every 4 hours for each 4 puffs.
- If I don't start to improve I need help now.

### Emergency

**When I'm worried for my asthma:**

Always use the spacer.

- Take 10 puffs of salbutamol every 4 hours through a spacer.
- Take 4 puffs of salbutamol through a spacer every 4 hours until you feel better.
- If you don't feel any better, call 911 or go to the hospital.

Dear Physician: \_\_\_\_\_ Doctor Signature: \_\_\_\_\_ Plan to be reviewed when treatment changed.

# Croup: Epidemiology

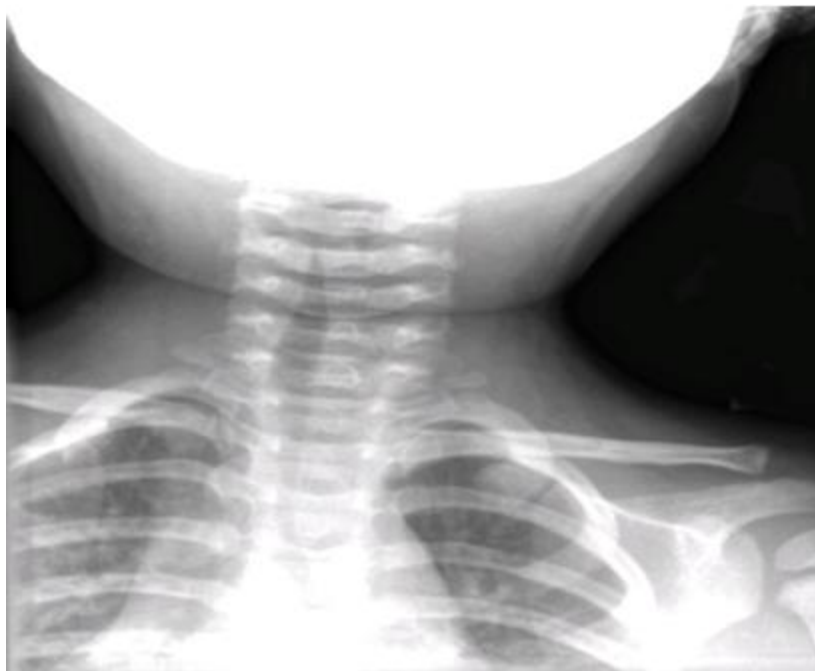
- 6mo-3 yrs
- Fall/early winter
- Incidence 3-5% per year
- Parainfluenza MC viral cause
- Boys > girls
- > 350,000 ED visits per yr

## Symptoms

- Rhinorrhea
- Congestion
- Fever
- Hoarse Voice
- Barky Cough
- Stridor
- Retractions

# Croup: Pathophysiology

- Viral upper airway infection
- Narrowing of Subglottic airway
- Steeple sign on CXR
- Fixed obstruction at rigid cricothyroid ring
- Dynamic obstruction with crying or agitation



# Croup: Best Practices

## Mild Croup:

- Barky Cough
- No stridor at rest
- No stridor with agitation
- Normal or mild inc WOB

## Treatment:

- Dexamethasone

# Croup: Best Practices

## Moderate Croup:

- Barky cough
- No stridor at rest
- Stridor with agitation
- Mild inc WOB

## Treatment:

- Dexamethasone
- ED observation 4 hours

# Croup: Best Practices

## Severe Croup:

- Barky cough
- Stridor at rest
- Significant inc WOB

## Treatment:

- Dexamethasone
- Racemic Epinephrine 1:1000 5 ml Neb
- ED Observation 4 hours

# Croup: Best Practices

- All croup patients receive Dexamethasone
- Racemic Epi nebulized for stridor as indicated
- Oxygen for sats < 90%
- Treat fever with Antipyretics
- Avoid painful procedures and keep a calm atmosphere

# Croup: Evidence-Based Care

No evidence to support:

- Saline nebs
- Multiple doses of steroid
- Parenteral administration of steroid vs oral





# Questions