

Mastering Pediatric Respiratory Emergencies

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Disclosure

I have no financial interests or relationships to disclose.



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Comparison with Adult Physiology

Predisposition for **respiratory failure**

Anatomic

Physiologic (1-2 min safe apnea time)

Susceptible to URIs

obligate nose breathers

small airway caliber

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95% of All **Cardiac Arrest**
in Children Is of a
Respiratory Etiology

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Upper Respiratory Tract Infections

- **Viral**
 - NO indication for antibiotics
 - Includes bronchitis and sinusitis (treat only if sx >3 weeks + purulent discharge + pain)
 - The **average cough last two weeks**
 - No antitussive medications in young children (<4 years)
- **Honey** (>1 year)

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Recent URI Resting Stridor



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Croup

Mild—cough, stridor with agitation (85%)

Moderate—mild stridor at rest,
increased wob

Severe—severe stridor, significant resp
distress (<1%)

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Croup

Mild—cough, stridor with agitation (85%)

Clinical Diagnosis

Severe—severe stridor, significant resp
distress (<1%)

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Croup Rx

Mild

Moderate

Severe

STEROIDS

EPI NEB

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Steroids

Dexamethasone*

0.15-0.6 mg/kg

PO/IM (*IV form PO*)

Budesonide

2 mg/2 mL Nebulized

(more expensive)

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Epinephrine Neb

Indications:

Stridor At Rest

Respiratory Distress

Observe for 2 hours

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Epinephrine Neb

Racemic Epinephrine

(2.25%) 0.5 mL

Epi 1:1000

0.5 mL/kg (max 5 mL)

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Croup Differential Diagnosis

Epiglottitis (rare)

Bacterial tracheitis

Peritonsillar abscess

Uvulitis

Retropharyngeal abscess

Allergic reaction

Foreign body aspiration

Neoplasm

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Croup Rx

Mild

Moderate

Severe

STEROIDS

EPI NEB

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Epiglottitis Overview

- Rare since Hib vaccine, check re immunizations
- Abrupt onset, minimal or no prodrome, often drooling, sitting tripod, sniffing, stridor, no cough
- Get help, IV ceftriaxone, get soft tissue images only if safe / direct visualization likely safer
- Be ready for airway management



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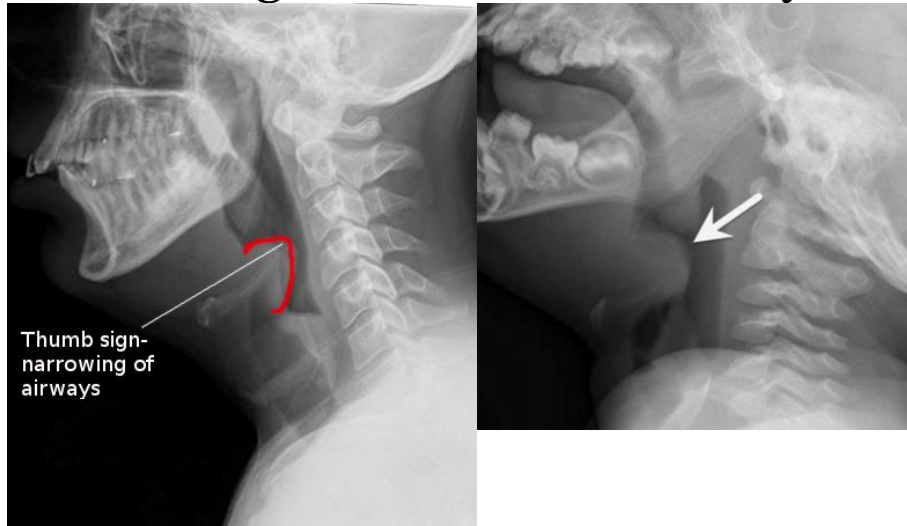
Epiglottitis D's:

Dysphagia
Drooling
Distress

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Epiglottitis on X-ray

- Thumb sign on lateral neck x-ray



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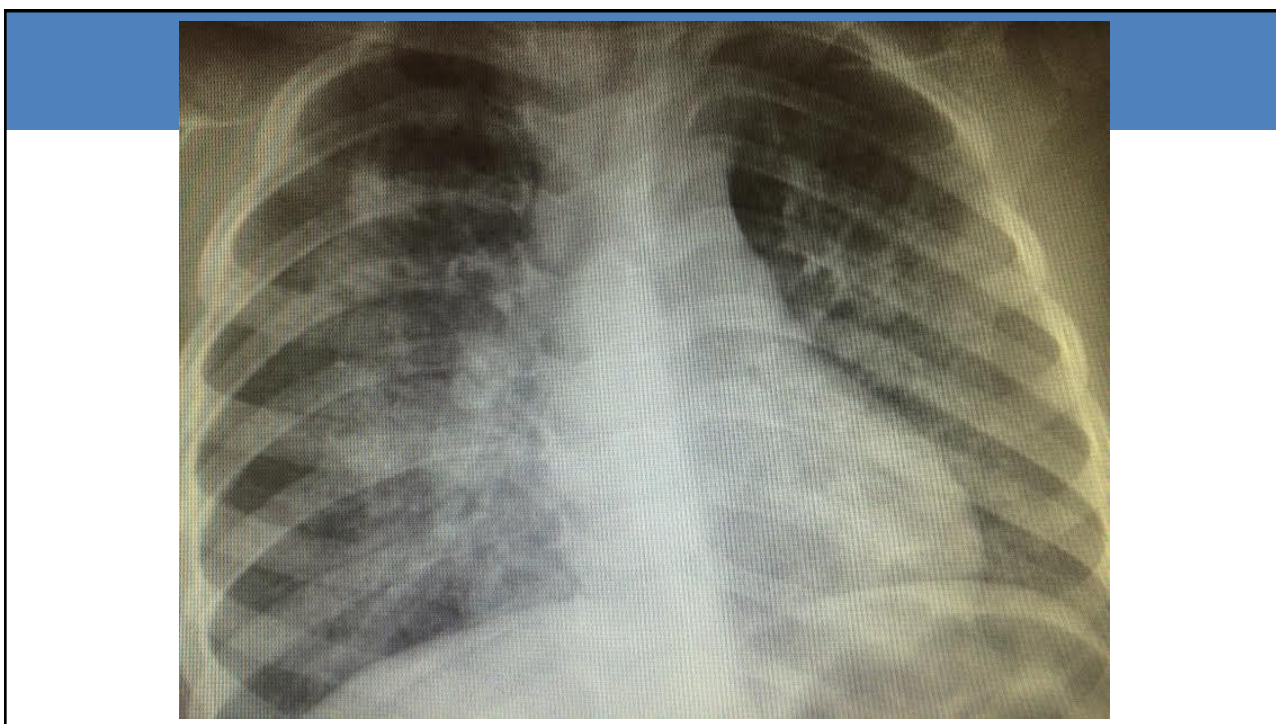
Oxygen Sat 89%
Tachypnea
Nasal Flaring
Intercostal Retractions



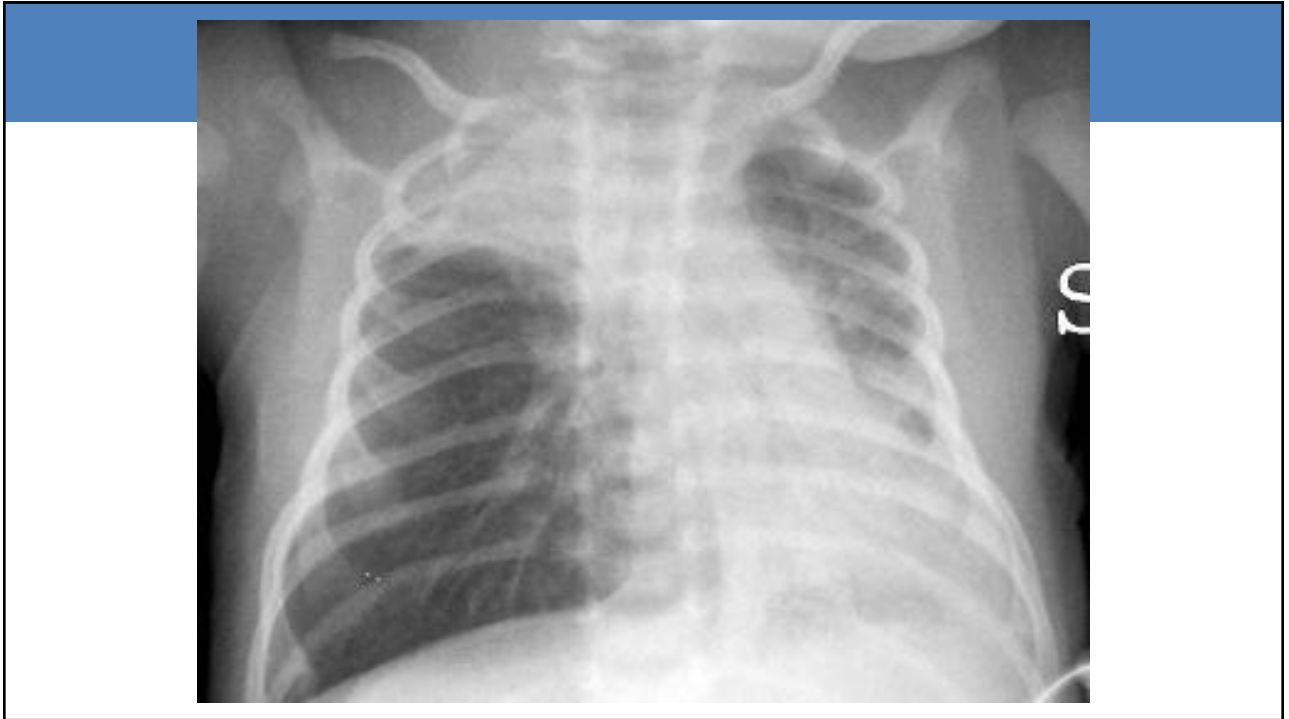
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Bronchiolitis

Diagnosis of **Hx** and **PE**

– Fine rales, diffuse, fine wheezing

<2 Years

Nov-April (PEAK **Jan/Feb**)

Apnea in neonates, ex-premies

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Bronchiolitis→

Clinical Diagnosis

NO imaging or laboratory testing

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Pathophysiology

- **RSV can cause severe pneumonia** with necrosis of lung parenchyma and formation of hyaline membranes
- Complications
 - Prolonged hospitalization
 - Respiratory failure → mechanical ventilation
 - Wheezing in the future
 - Bronchiolitis obliterans

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Evaluation

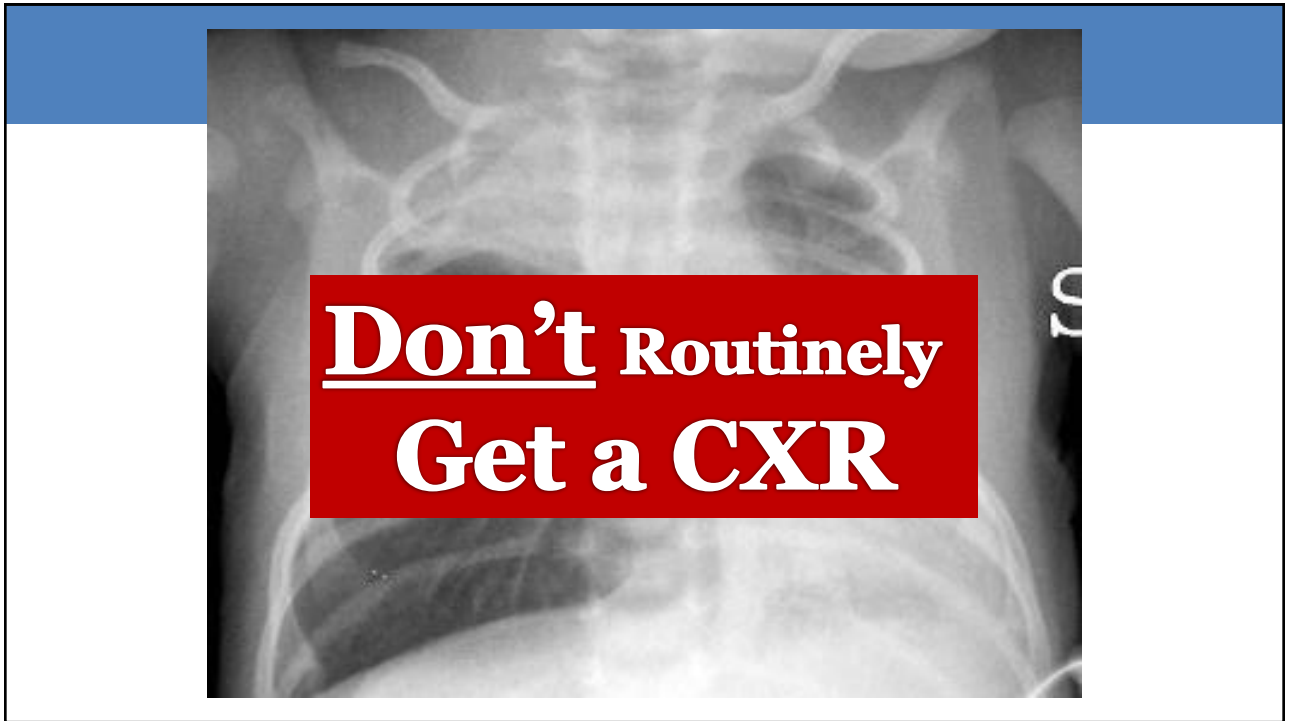
- **Several days of upper respiratory tract signs** (*usually associated with low-grade to moderate fever*)
- **Worsening cough**
- **Tachypnea**
- **Irritability, malaise, anorexia**

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Evaluation

- **CXR**
 - **AAP: No evidence to support routine chest x-ray in child with bronchiolitis**
 - **Hyperaeration** with areas of interstitial infiltration
 - **Consolidation**, which may represent atelectasis, occurs **in 25%**
- **Pulse oximetry**
 - **Hypoxemia** often in face of benign radiograph

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Bronchiolitis Treatment

I have some bad news...

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Don't Give...

- **Albuterol**
- **Epinephrine**
- **Hypertonic Saline**
- **Corticosteroids**
- **Oxygen (if >90%)**
- **Chest Physiotherapy**
- **Antibiotics**

AAP

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Bronchiolitis Treatment

Suctioning

If needed,

Oxygen

NPPV

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Bronchiolitis Treatment

YES

-Suction

-Oxygen

-NPPV

(if needed)

Maybe

-Albuterol

-Neb Hypertonic

Saline

-Neb Epi

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Treatment

Beta-agonists

AAP: “Should not administer albuterol (or salbutamol) to infants and children with a diagnosis of bronchiolitis”

(Level B, Strong recommendation)

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Treatment

Epinephrine

AAP: “Should not administer epinephrine to infants and children with a diagnosis of bronchiolitis”

(Level B, Strong recommendation)

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Bronchiolitis Treatment

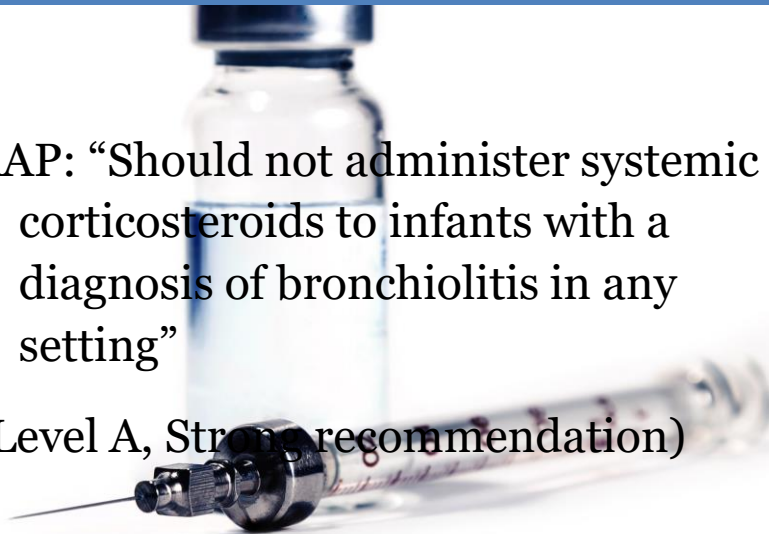
NO
Steroids
Routine Antibiotics

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Steroids

AAP: “Should not administer systemic corticosteroids to infants with a diagnosis of bronchiolitis in any setting”

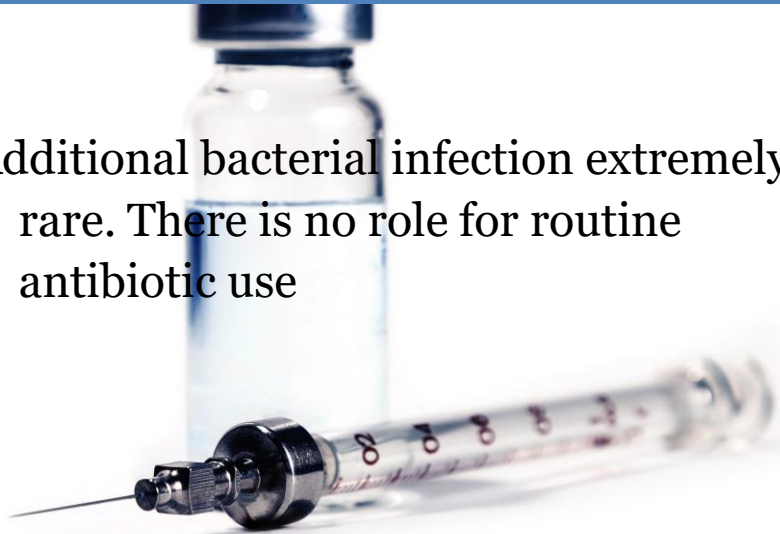
(Level A, Strong recommendation)



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Antibiotics

Additional bacterial infection extremely rare. There is no role for routine antibiotic use



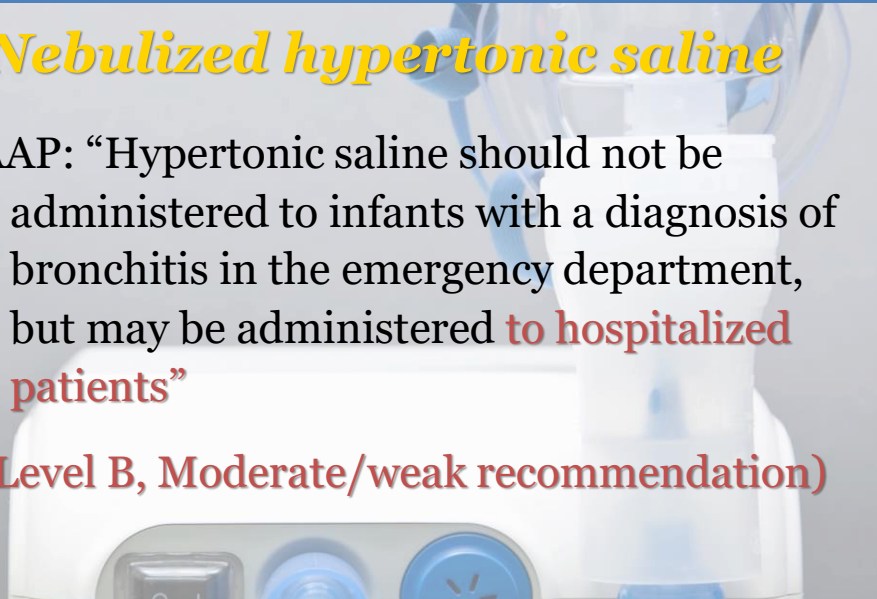
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Treatment

Nebulized hypertonic saline

AAP: “Hypertonic saline should not be administered to infants with a diagnosis of bronchitis in the emergency department, but may be administered **to hospitalized patients**”

(Level B, Moderate/weak recommendation)



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Bronchiolitis Admission?

- **Hypoxia (definition?)**
- **Tachypnea (>70-80 bpm)**
- **Respiratory Distress (retractions)**
- **Comorbid Conditions**
- **Ex-Premie**
- **Apnea**
- **Po Intolerance**

Low threshold in neonate/young infant

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Bronchiolitis
symptoms
peak
on *day 3-5*

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Bronchiolitis Admission?

- **Hypoxia (definition?)**
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Pneumonia



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Pathogens?

Neonates: Grp B Strep, Gram negative enteric bacteria, Listeria, Chlamydia

Infants/Toddlers: **Viral** (RSV, influenza, parainfluenza, metapneumovirus, adenovirus); **Bacterial** (Strep pneumo, Haemophilus, S. aureus, Pertussis, atypicals?)

>4-5 Years: Mycoplasma

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Antibiotics?

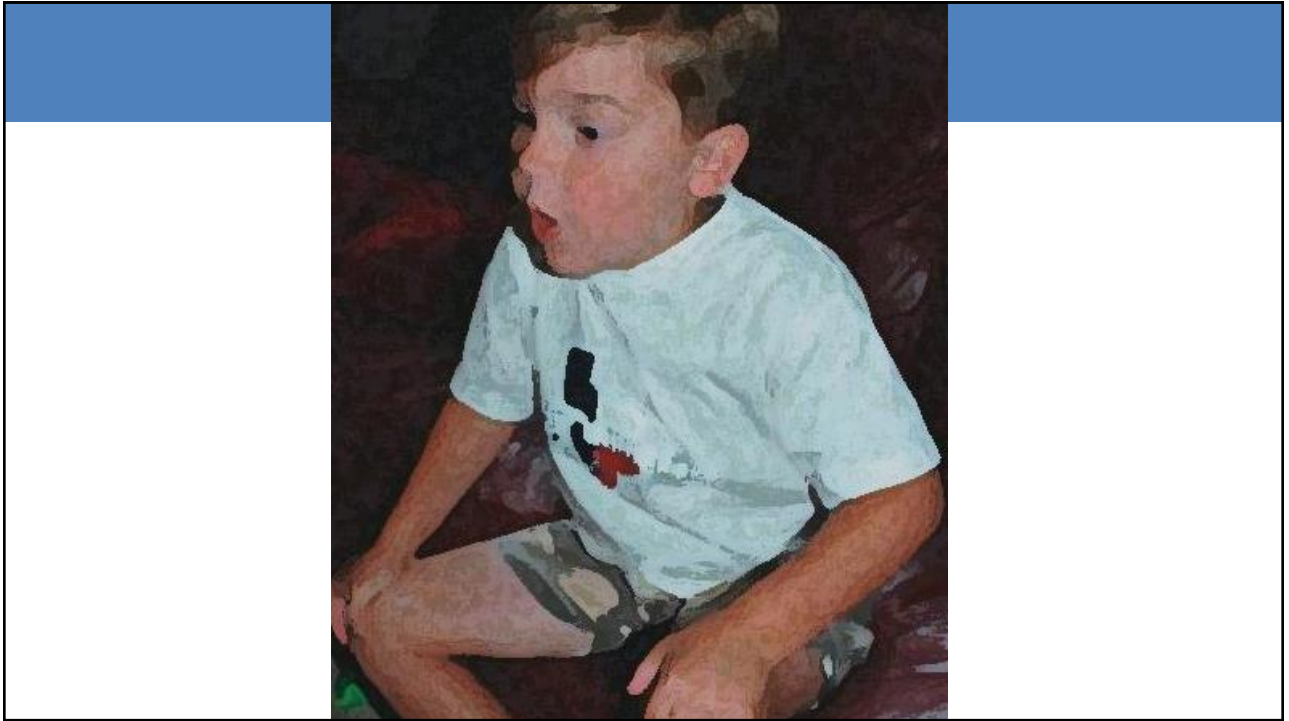
Neonate → Sepsis

Afebrile staccato cough →
Azithromycin

> 3 Months → Amoxicillin

> 4-5 Years → Macrolides

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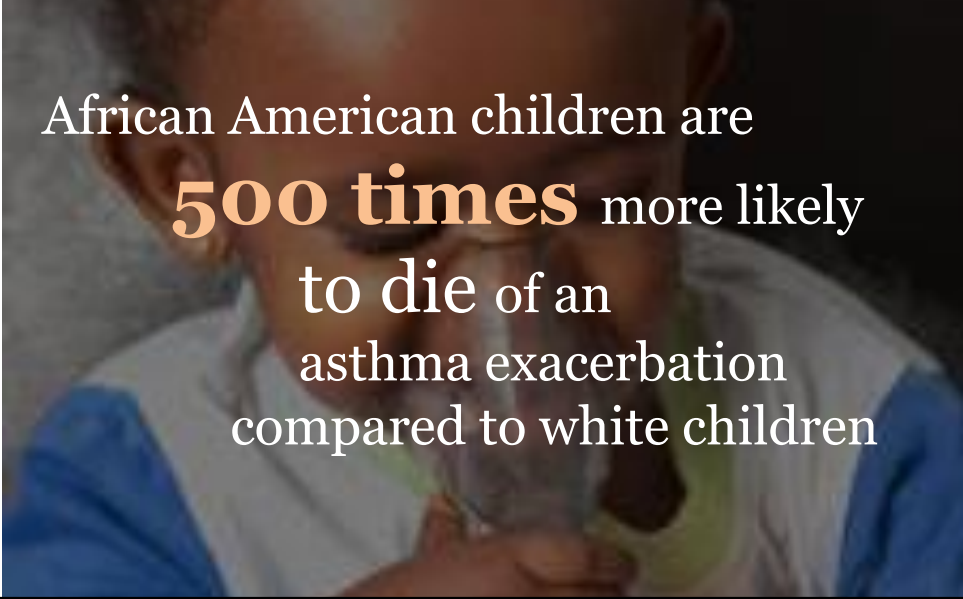
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Asthma Facts

- Asthma is **the most common chronic disease in** industrialized nations
- Asthma still **kills** kids (way more than it should)
- Significant **racial** and **socioeconomic** disparities exist

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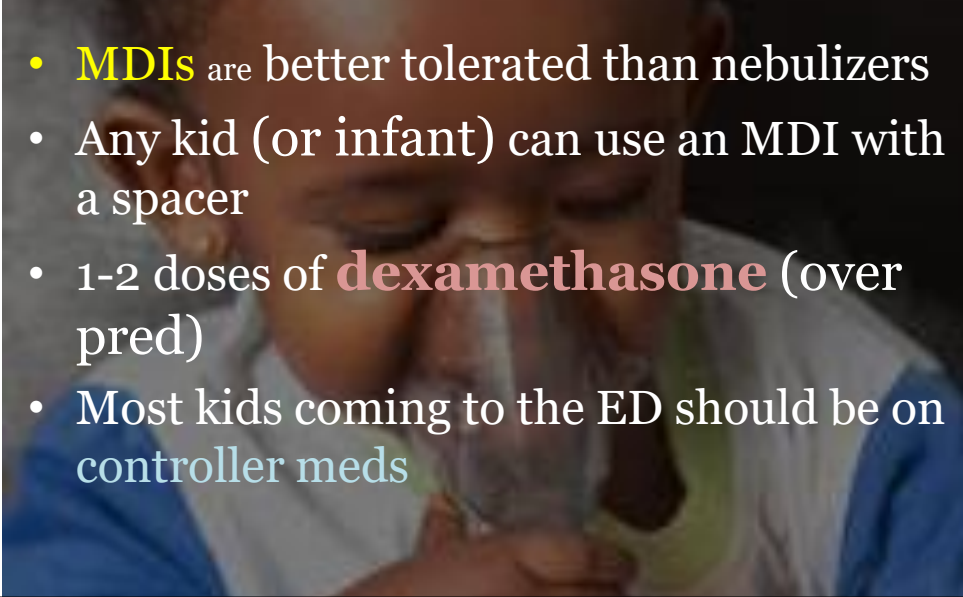
Asthma Facts



African American children are **500 times** more likely to die of an asthma exacerbation compared to white children

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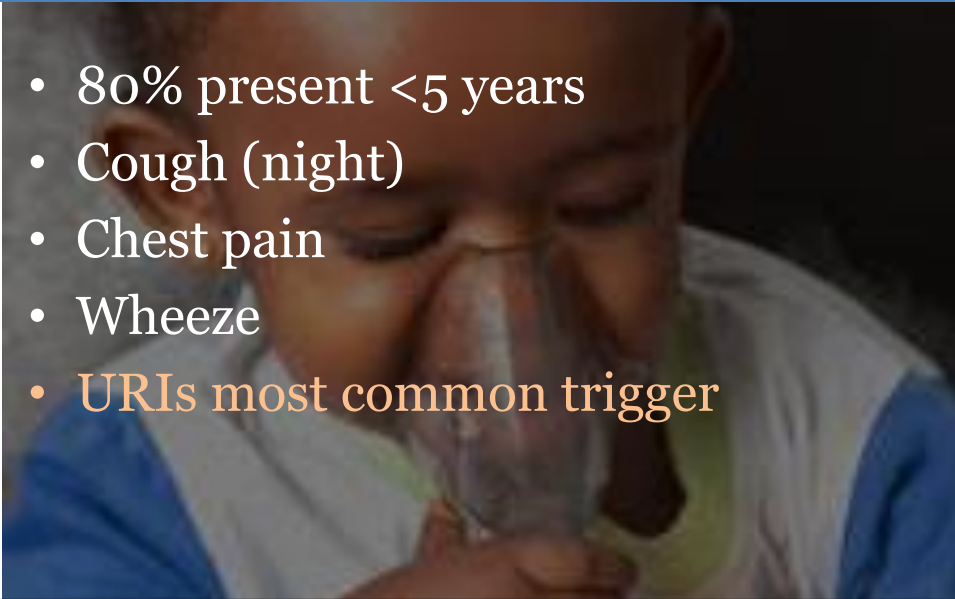
Asthma Updates

- 
- **MDIs** are better tolerated than nebulizers
 - Any kid (or infant) can use an MDI with a spacer
 - 1-2 doses of **dexamethasone** (over pred)
 - Most kids coming to the ED should be on controller meds

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Asthma

- 80% present <5 years
- Cough (night)
- Chest pain
- Wheeze
- URIs most common trigger

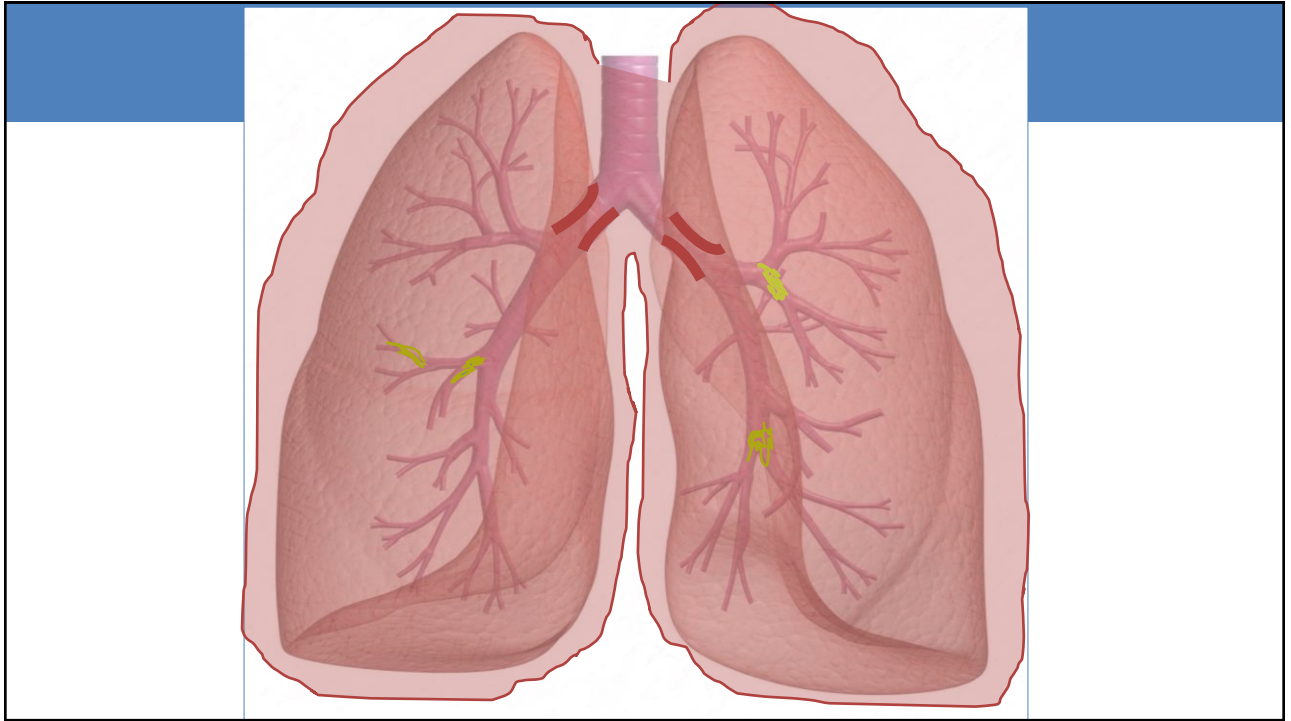


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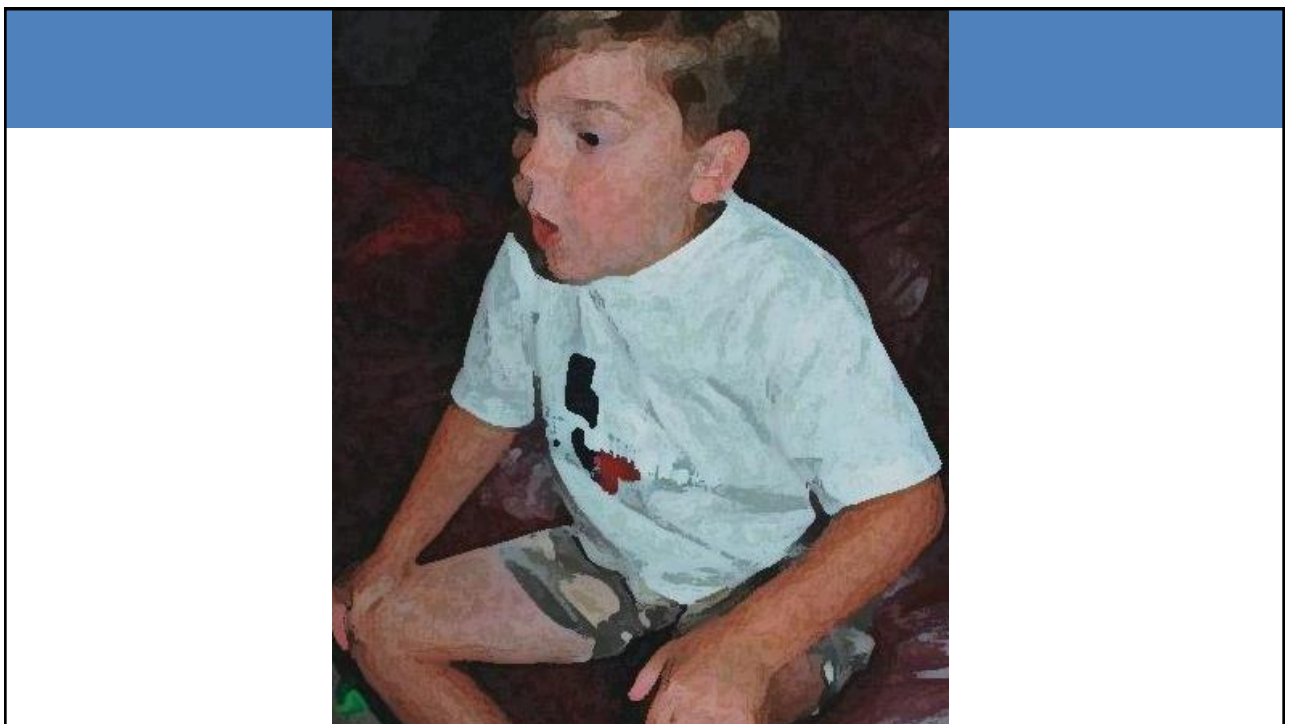
**Many Fatal or Near Fatal
Exacerbations Occur in
Kids without h/o Prior
Hospitalization for Asthma**

(PMID: 22494876)

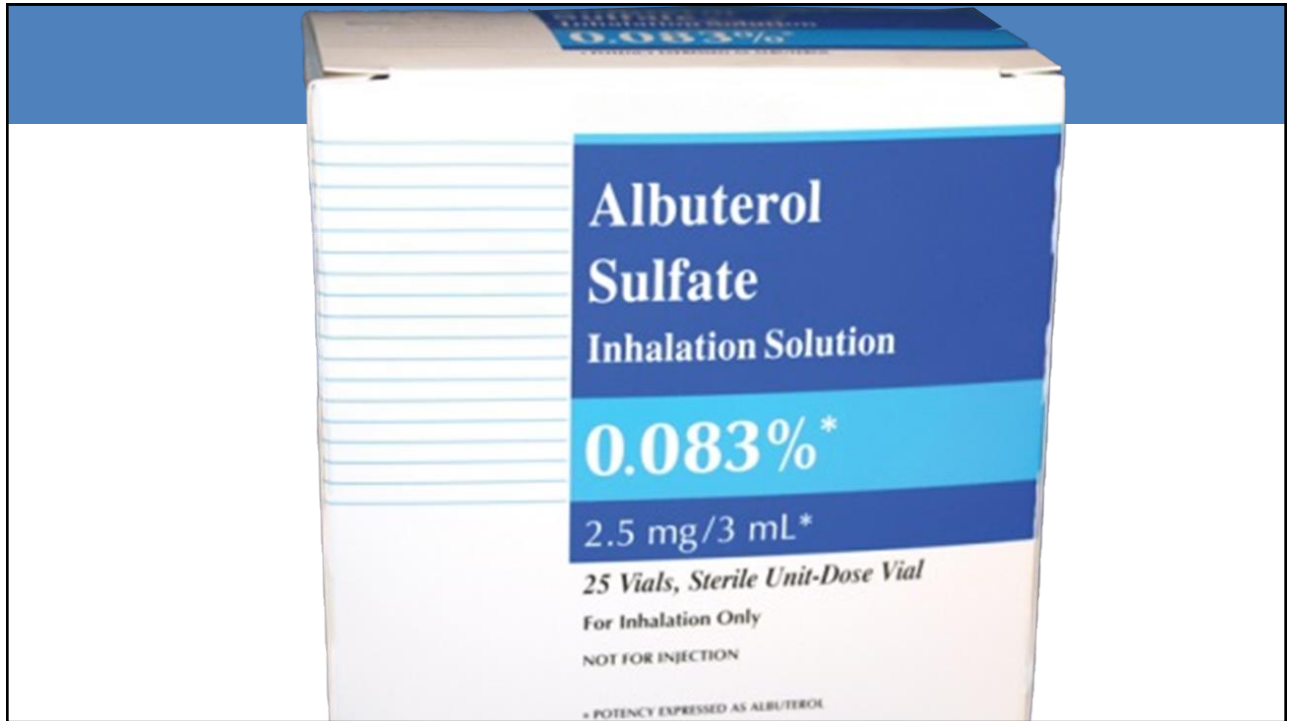
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Albuterol

Max dose??

Minimum dose = 2.5 mg

5 mg albuterol **neb** =
8 puffs albuterol **MDI**

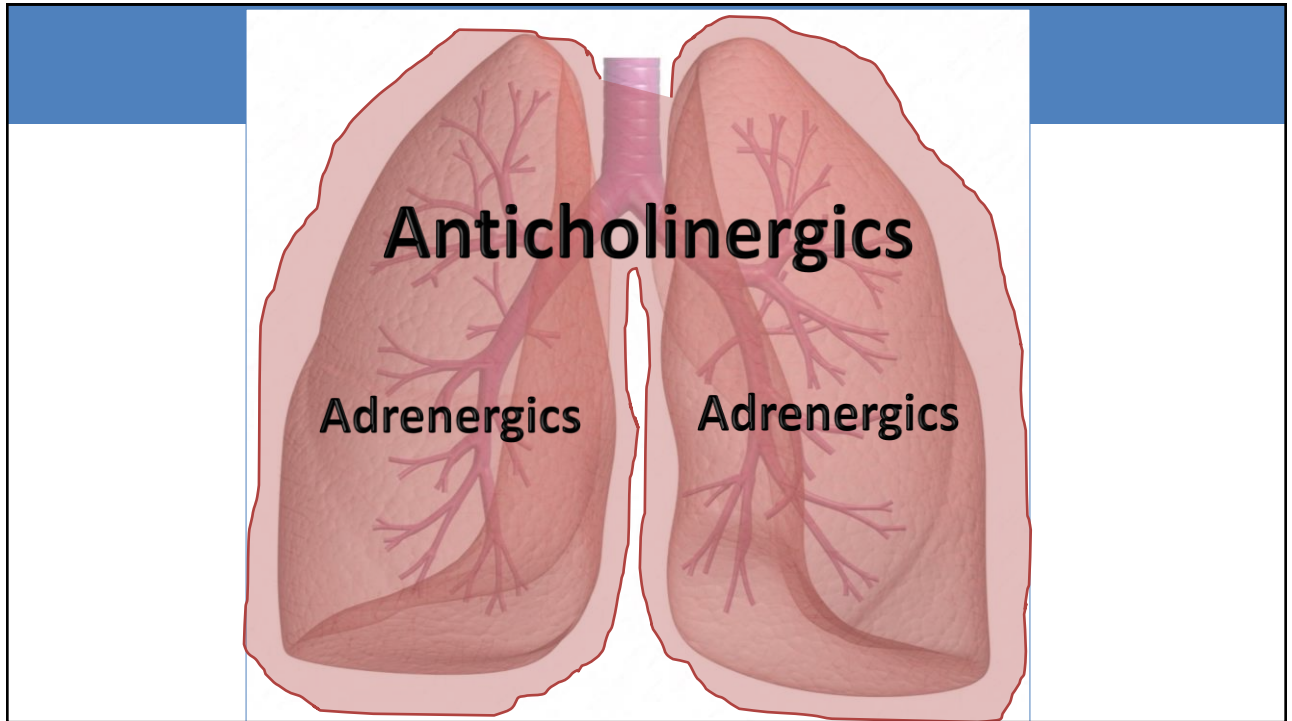
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Ipratropium Bromide



What About Atrovent?

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Ipratropium Bromide


250 mcg <20 kg
500 mcg

x3 doses in 24 hours

NTN 12

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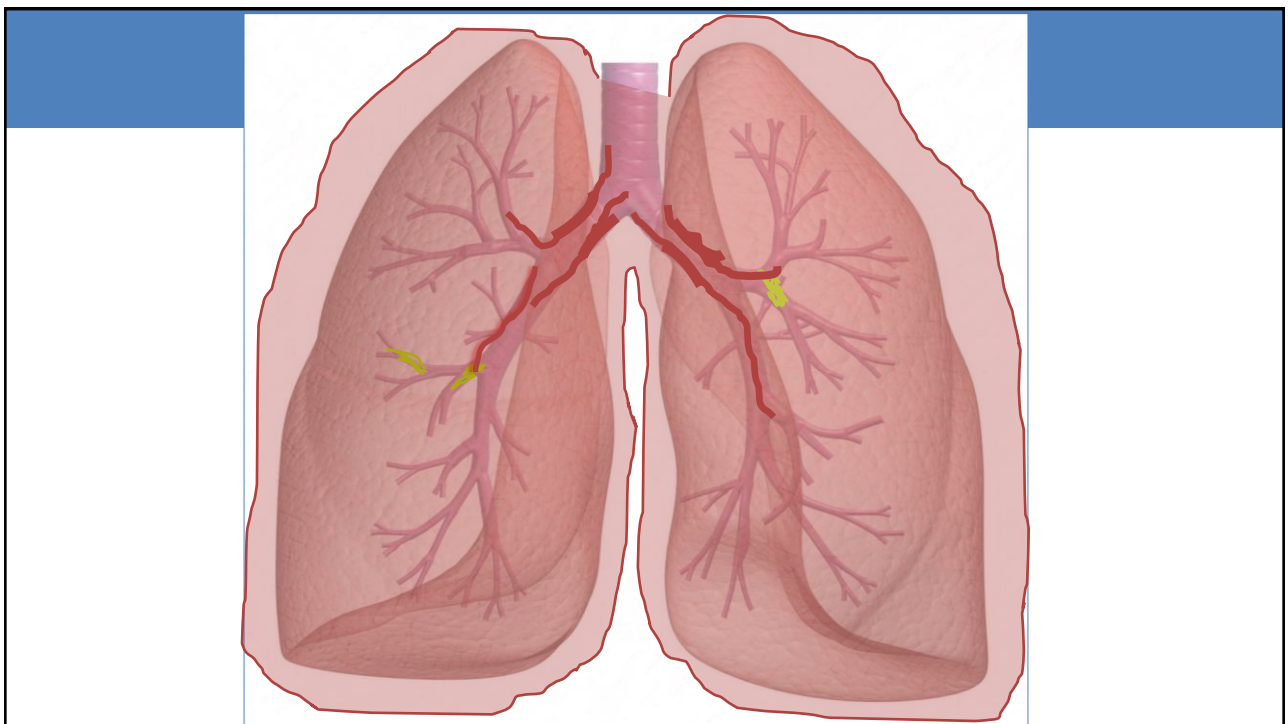
Steroids



Give within 1st hour

NNT 6 to prevent **1 admit**

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Steroids



Methylprednisolone
1 mg/kg

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Magnesium Sulfate

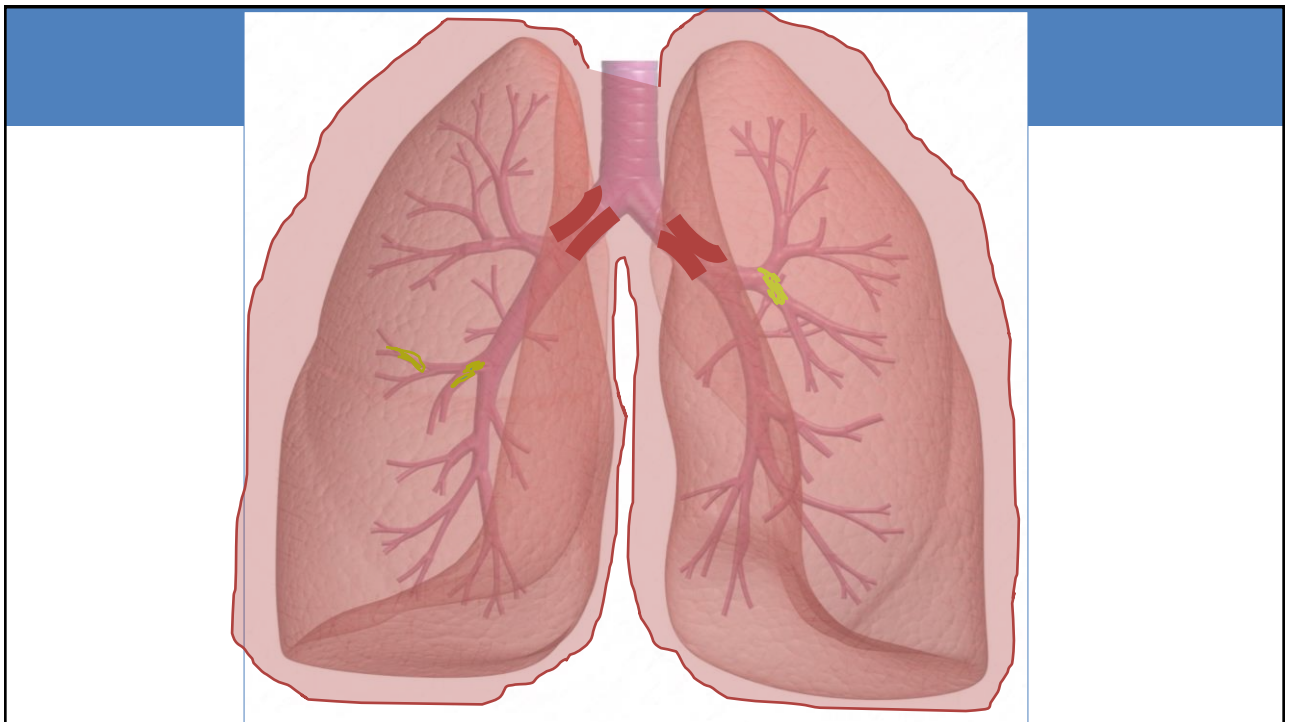


50-75
mg/kg

62

IVE

63



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Epinephrine



**0.01 mg/kg
1:1000 IM**

**0.3 mg
0.15 mg**

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Epinephrine



**10 mcg/kg Bolus
0.1 mcg/kg/min prn
1:10,000 IV**

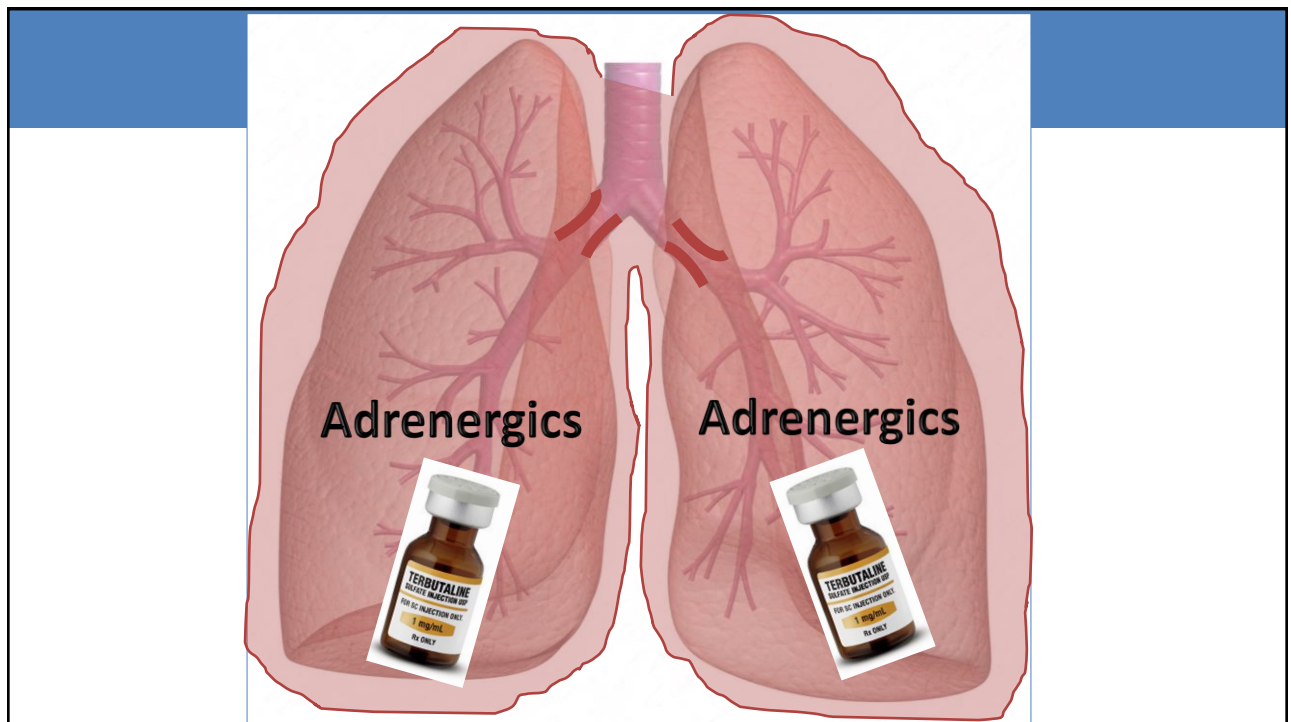
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Terbutaline



10 mcg/kg IV bolus
0.1 mcg/kg/min

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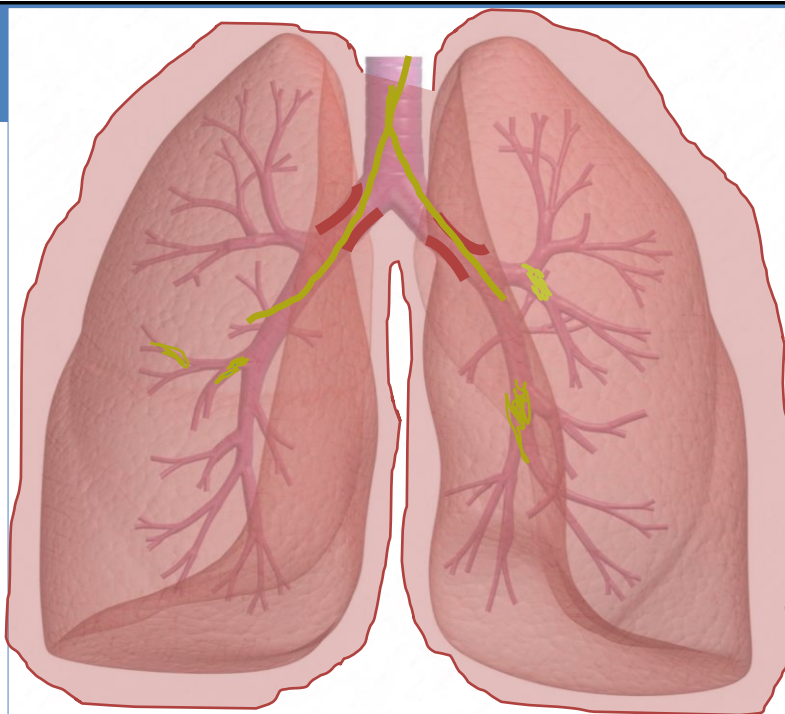


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Ketamine



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Ketamine



0.1-2 mg/kg

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Other Options

- **Nebulized lidocaine**
- **Heliox**
- **Methylxanthines**
- **Bronchoscopy with tpa**

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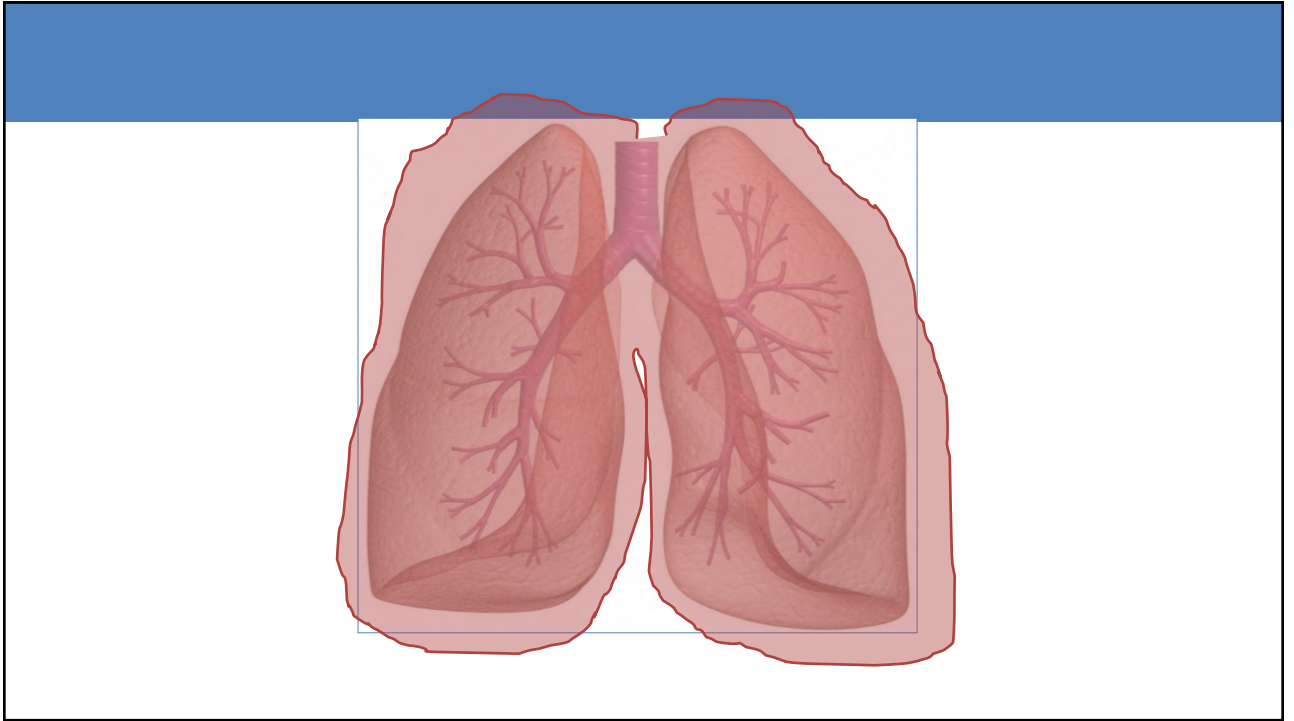
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Who Gets The Plastic?

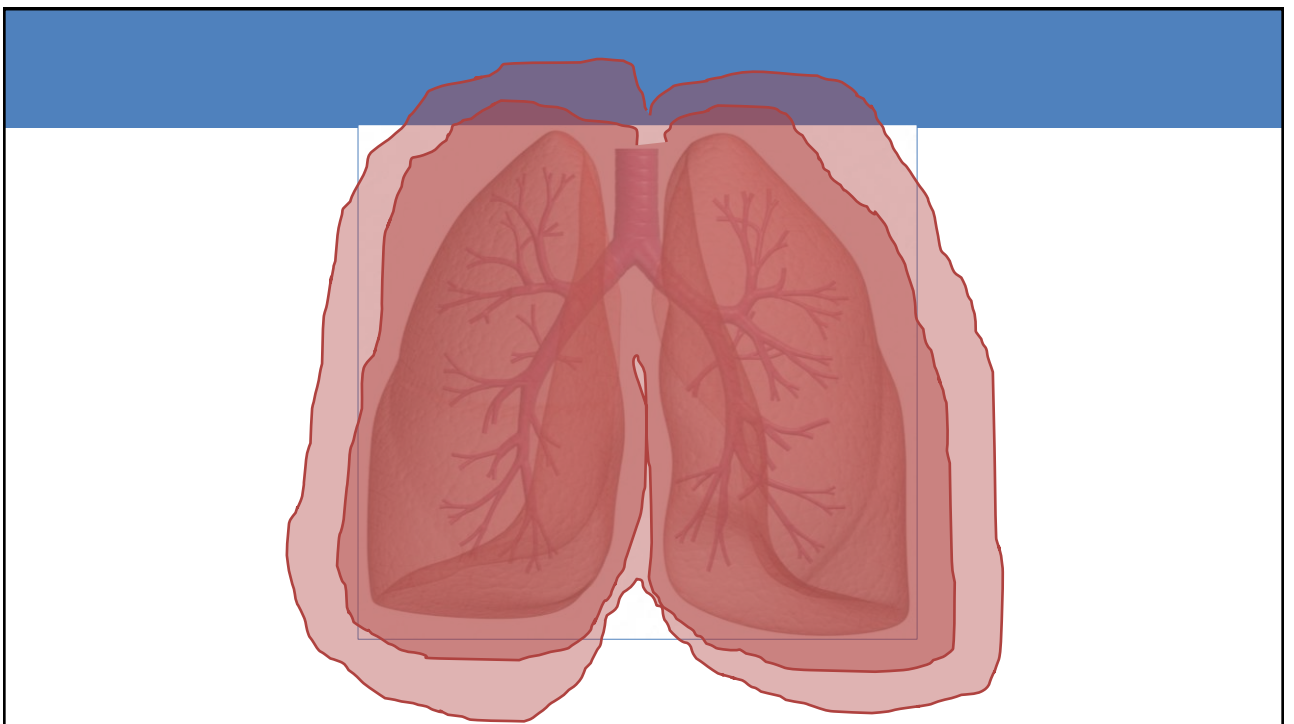
Continued **Progression
to Resp Failure Despite
Maximal Therapy**

10-20% mortality rate

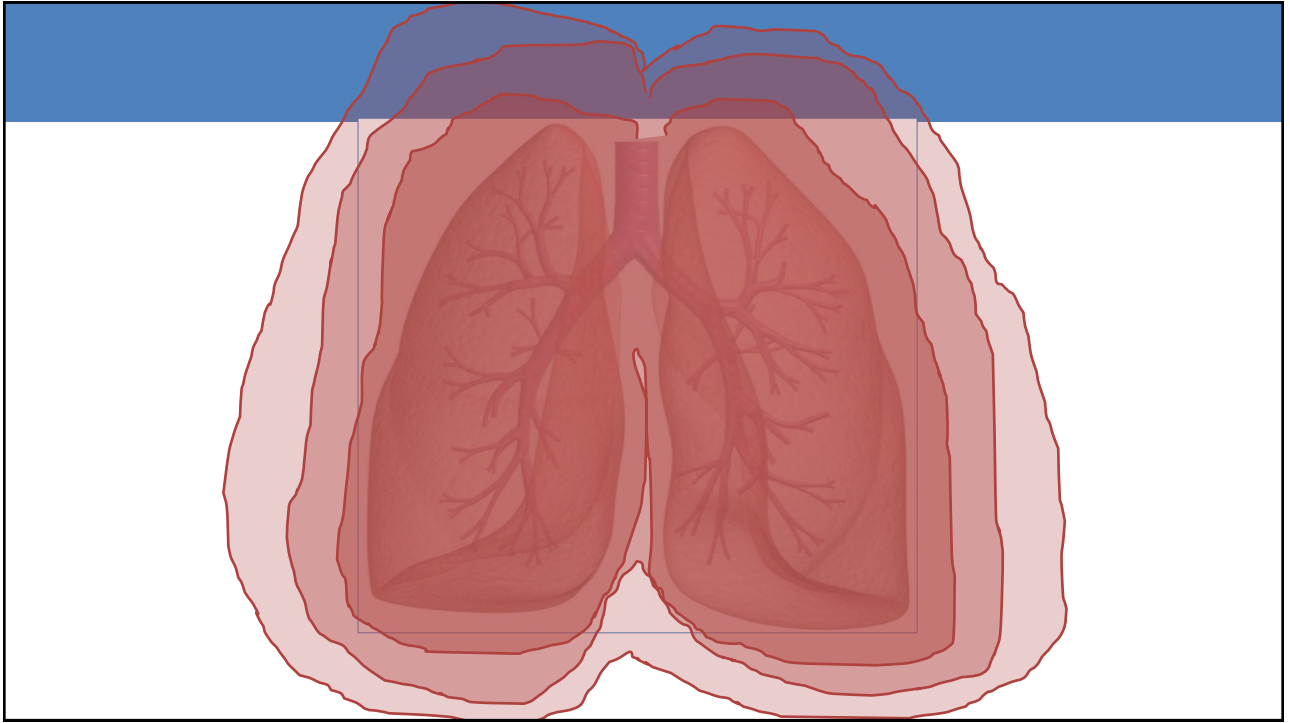
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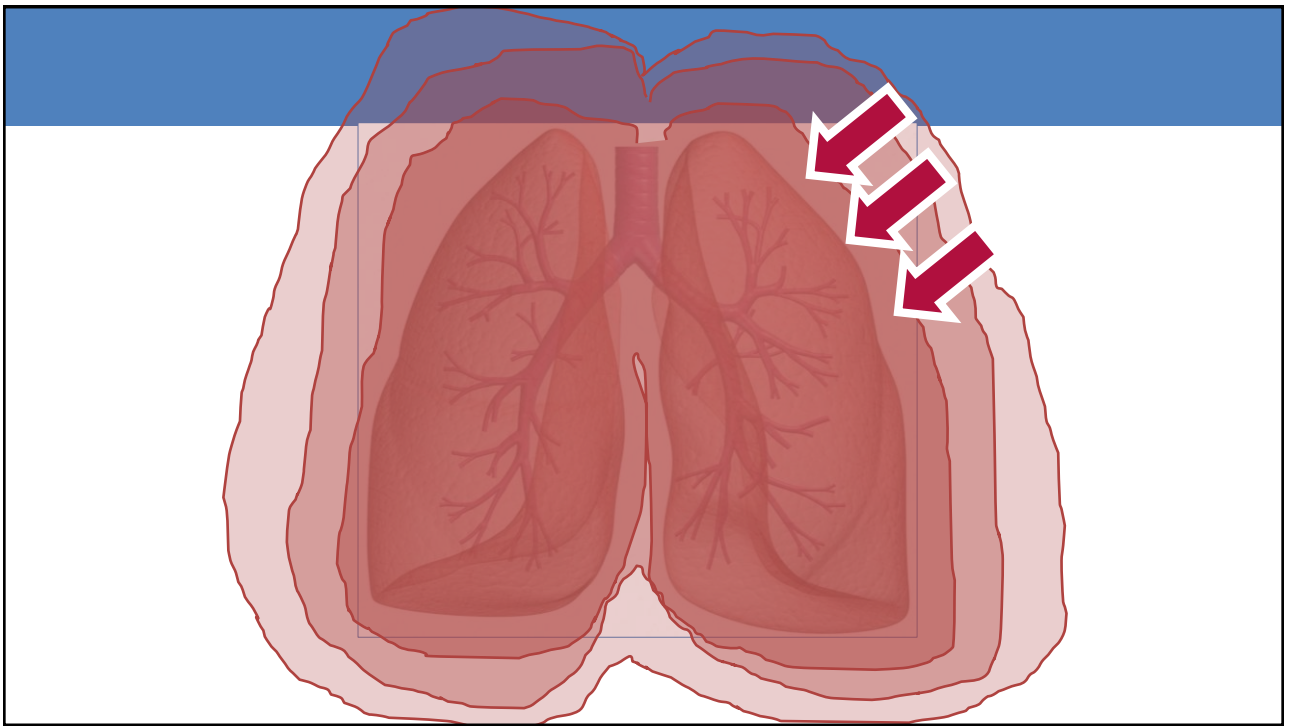
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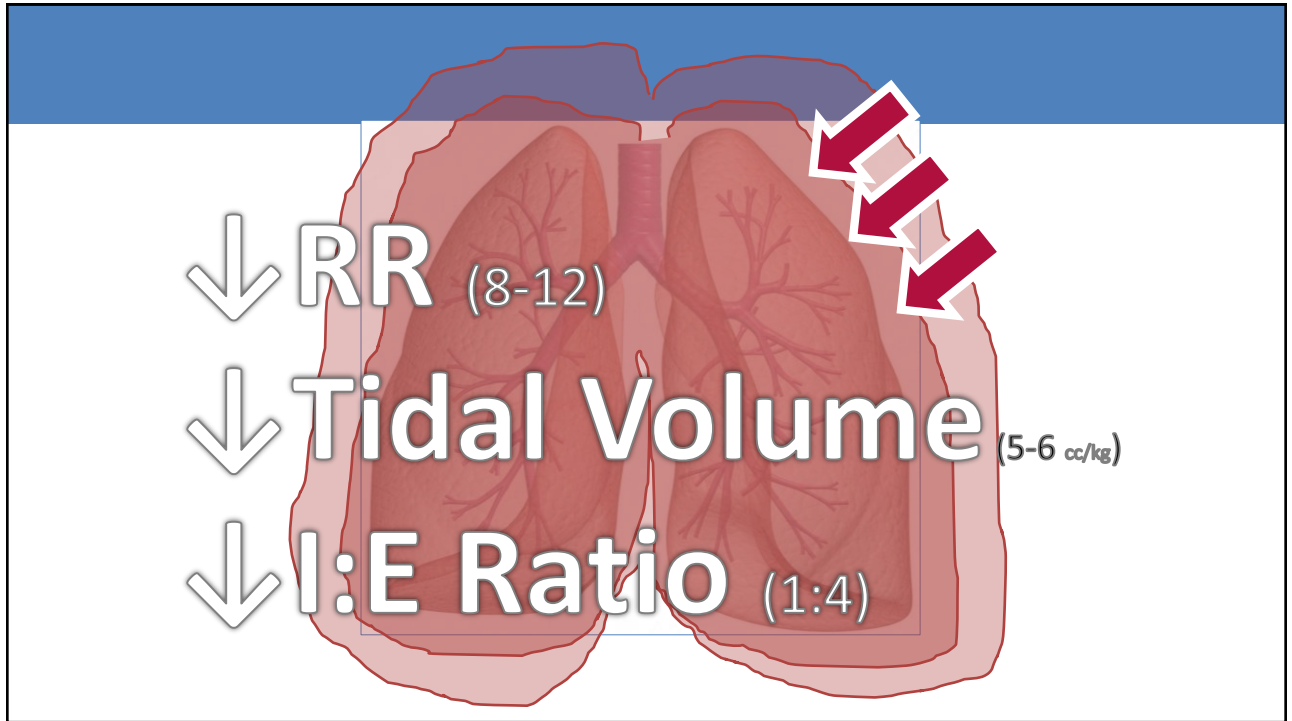
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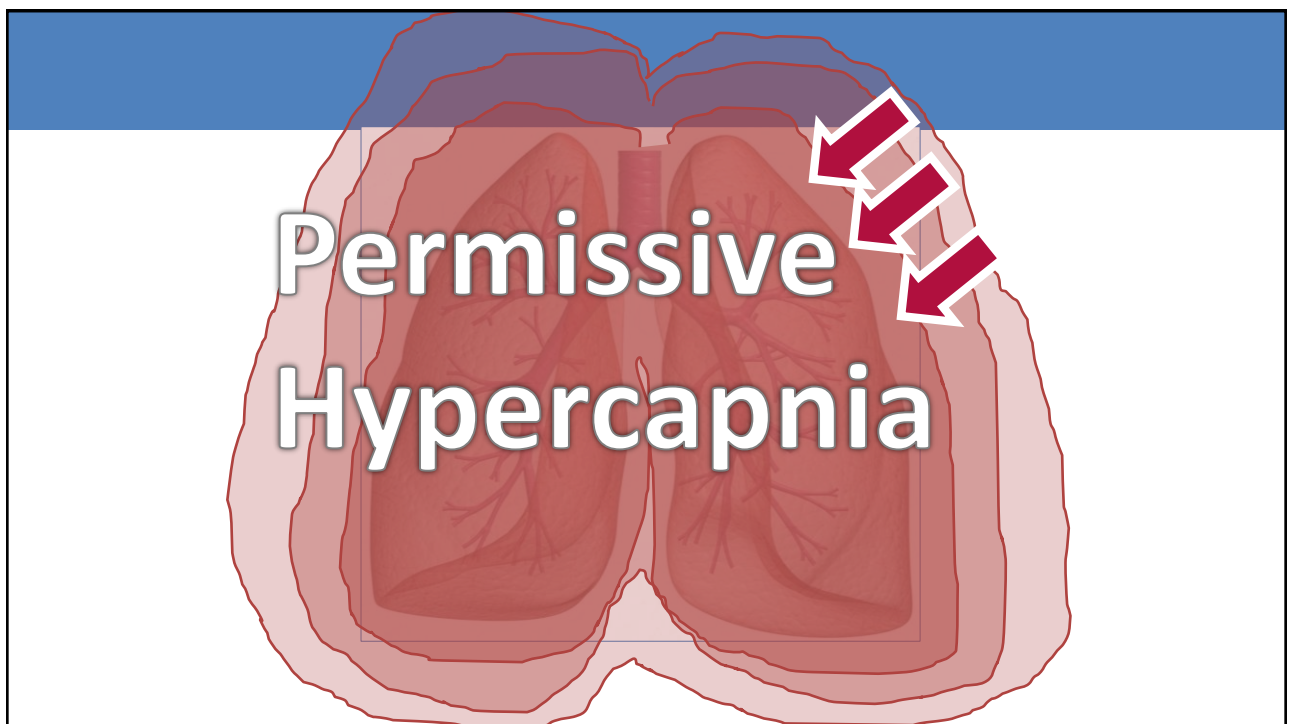
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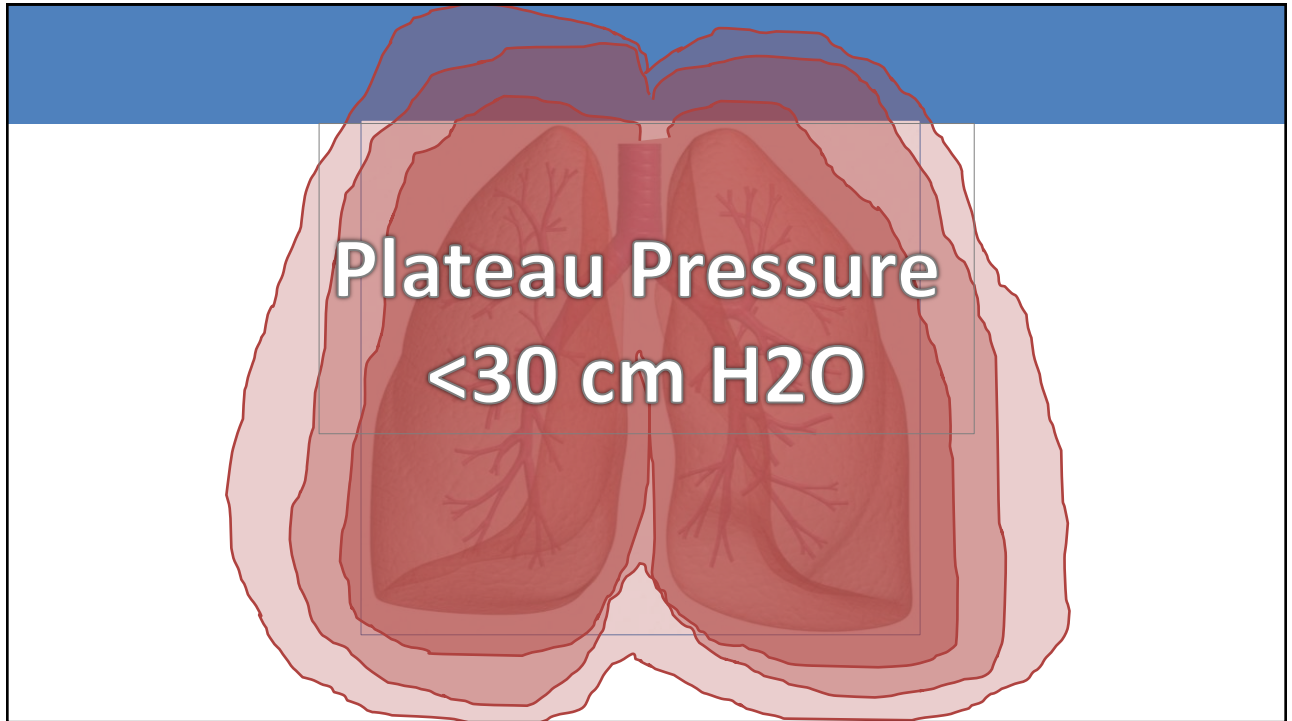
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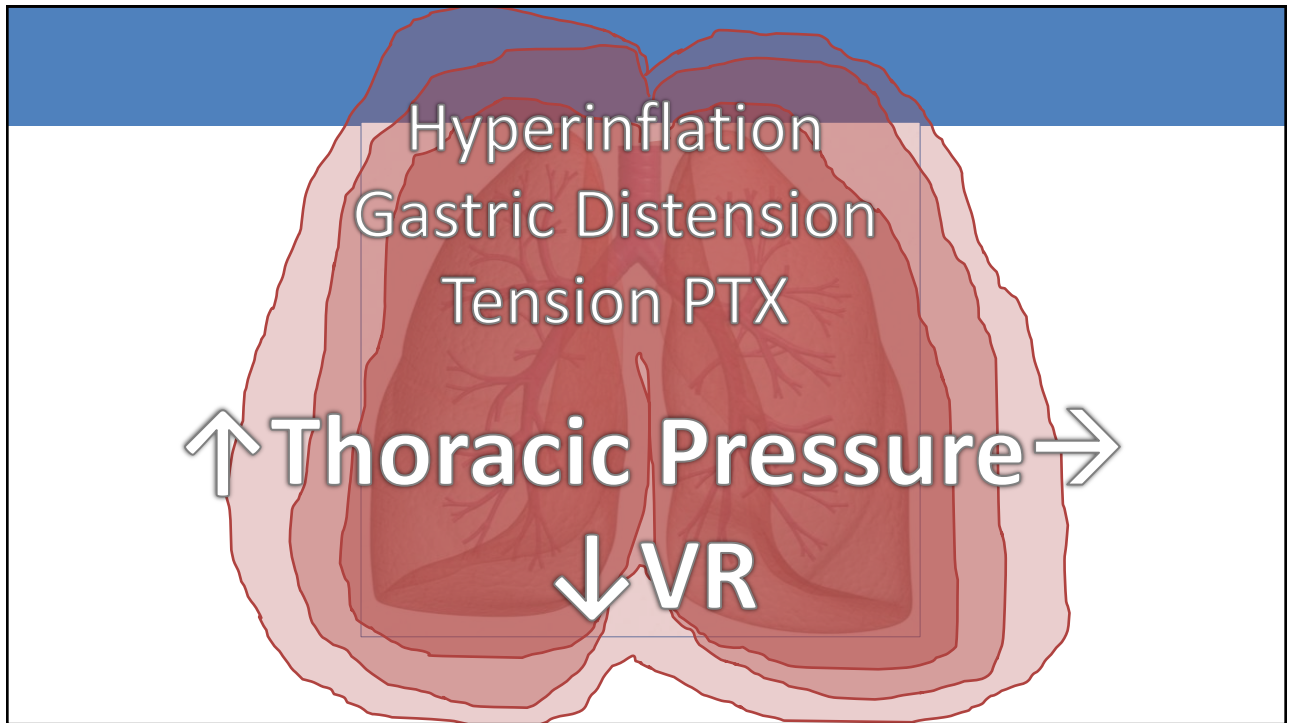
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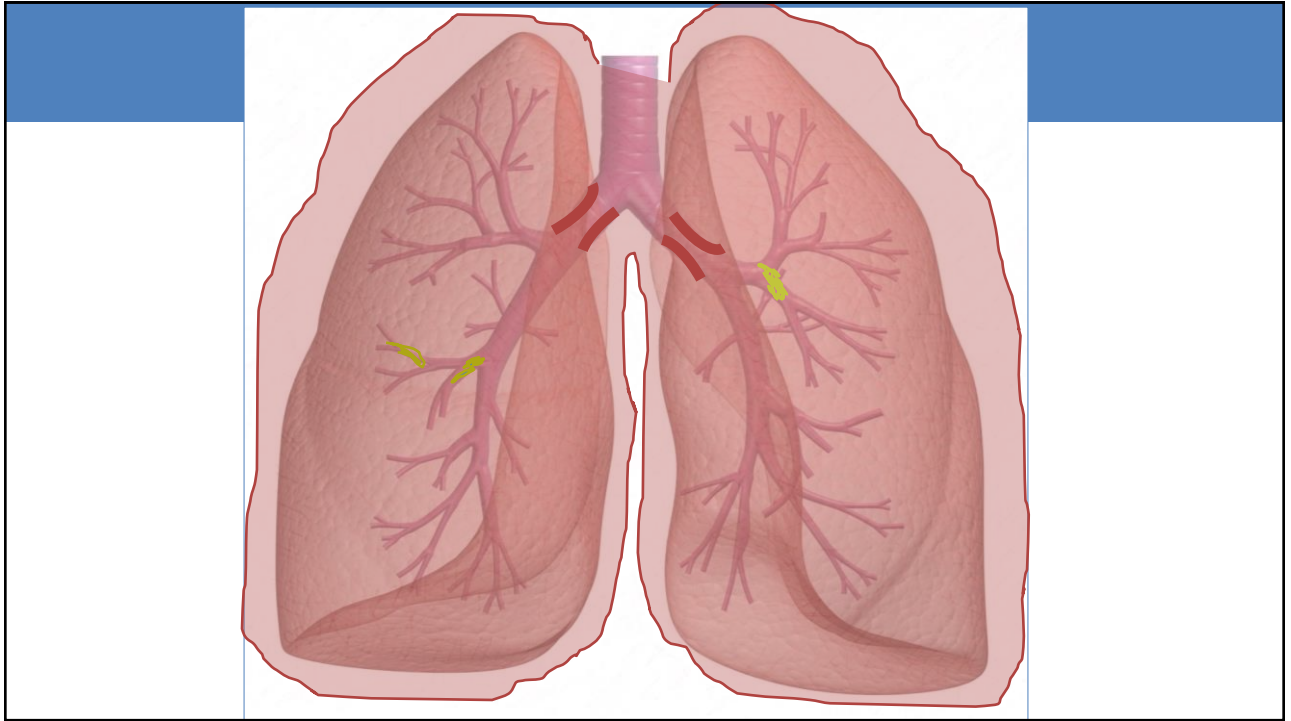


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Cardiac Arrest

1. **Disconnect Vent—Apnea/Slow Bag**
2. **IVF Bolus**
3. **Chest Wall Compression**
4. **B/L Needle/Chest Tubes**

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Status Asthmaticus

Continuous Albuterol

Atrovent x3

Steroids

Magnesium

IVF

**Parenteral Beta-agonist (epi or
terbutaline)**

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Asthma Discharge

5 mg Albuterol neb = 8 puffs MDI

Dex is more cost effective, patient/family preferred, and has less side effects

5 mg prednisone = 1 mg dexamethasone

1 dose dex = 3 days of prednisone/prednisolone

2 dose dex (day 2 or 3) = 5-6 days pred

Dex 0.6 mg/kg (max 16-18 mg)

80% bioavailability

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Asthma Updates

- Refill MDI (and teach how to admin)
- Educate patients
- Dexamethasone 1-2 doses
- Consider initiation of inhaled corticosteroids
 - Leukotriene modifiers
 - Anticholinergics
 - Biologics

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Respiratory Distress

- **Consider** FB aspiration in stridor
- Give **steroids** to all croupers, **epi neb** with concern
- Bronchiolitis is a clinical diagnosis and is treated with suctioning
- Asthma still kills children. Be an education advocate