Asthma Care
in the
Emergency Department

Clinical Practice Guideline
Protocol Approved by: Division of Pediatric Emergency Medicine
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Asthma Care in the Emergency Department

Clinical Practice Guideline

**Inclusion:** 1) Children 2 years of age or older with a prior history of wheezing, and 2) Children less than 2 years of age with likely Asthma* rather than Acute Bronchiolitis

* Likely Asthma: on home controller medications/steroids, followed by Pulmonary or Allergy Service, multiple previous wheezing episodes, history of atopy, and/or strong family history of asthma

**Exclusion:** History of unstable heart disease or suspicion of other reason for wheezing (laryngomalacia, tracheomalacia, foreign body, etc.)

**Time 0:** Obtain vital signs, pulse oximetry and height in children older than 6 years, then determine initial asthma score:

### Clinical Asthma Score (CAS)

<table>
<thead>
<tr>
<th>Score points</th>
<th>SpO2</th>
<th>Auscultation</th>
<th>Accessory Muscle Use/Retractions</th>
<th>Inspiratory breath sounds</th>
<th>Dyspnea</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&gt;95% on room air</td>
<td>None or end expiratory wheezes</td>
<td>None</td>
<td>Normal</td>
<td>Speaks in sentences/coos and babbles</td>
</tr>
<tr>
<td>1</td>
<td>90-95% on room air</td>
<td>Wheezing through entire expiratory phase</td>
<td>Substernal/subcostal/intercostal/nasal flaring</td>
<td>Unequal</td>
<td>Speaks in partial sentences/short cry</td>
</tr>
<tr>
<td>2</td>
<td>&lt;90% on room air/requiring any oxygen</td>
<td>Inspiratory and expiratory wheezing</td>
<td>Supraclavicular/See-saw respirations</td>
<td>Decreased</td>
<td>Speaks in single words/short phrase/grunting</td>
</tr>
</tbody>
</table>
ED to Inpatient Admission Pathway

Key Points:

1) Patients are assessed using the CAS upon presentation to ED, then subsequently each hour until discharge, or admission decision at 180 minutes (3 hours).
2) Therapy is based on flow chart on the following pages.
3) Respiratory Therapy will come to the ED, CAS will be applied, and then discuss the appropriate admission unit with the ED Physician.

CAS Score @ 180 minutes

1 - 3  Floor or TCU Admission

≥ 4  PICU Admission
Initial 0 minutes CAS 0-2?

Yes
- Single dose of Albuterol.
- Consider Oral steroids 2 mg/kg up to 60 mg

No

CAS 5-10
Or any Mental Status Change

Yes
- Continuous Albuterol with Atrovent neb over 1 hour within 15 minutes of arrival
- Oral steroids 2 mg/kg up to 60 mg
- Continuous Albuterol with Atrovent over 1 hour immediately
- IV steroids 2 mg/kg up to 125 mg
- Consider IV Mg, +/- IM/IV beta agonists, +/- IV Ketamine

No
CAS 3-4

Level I 60 minutes CAS 0?

Yes
- No further albuterol
- If Continuous Albuterol given, monitor for 1 hour
- If CAS still 0, then discharge to home
- If CAS >0, then go to next page.

No

No

CAS 3-4

- Continuous Albuterol with Atrovent over 1 hour immediately
- Oral steroids 2 mg/kg up to 60 mg
- Consider IV Mg, +/- IM/IV beta agonists, +/- IV Ketamine
**Level I**

60 minutes

CAS 1-2?

Yes

- Single dose of Albuterol.
- If not already given, Oral steroids 2 mg/kg up to 60 mg

No

CAS 5-10
- Or any Mental Status Change

Yes

CAS 3-4

Continuous Albuterol over 1 hour

No

- Continuous Albuterol over 1 hour
- Consider IV Mg, +/- IM/IV beta agonists, +/- IV Ketamine

**Level II**

120 minutes

CAS 0?

Yes

- No further albuterol
- If Continuous Albuterol given, monitor for 1 hour
  - If CAS still 0, then discharge to home
  - If CAS >0, then go to next page

No

- If CAS >0, then go to next page.
**Level II**

120 minutes
CAS 1-2?

- **Yes**
  - Single dose of Albuterol.
  - No
  - CAS 5-10
    - Or any Mental Status Change

- **No**
  - CAS 3-4
  - Continuous Albuterol with Atrovent neb over 1 hour within 15 minutes of arrival

**Level III**

180 minutes
CAS 0?

- **Yes**
  - Continuous Albuterol over 1 hour
    - Consider IV Mg, +/- IM/IV beta agonists, +/- IV Ketamine

- **No**
  - No further albuterol
  - If Continuous Albuterol given, monitor for 1 hour
    - If CAS still 0, then discharge to home
    - If CAS >0, then go to next page.
* For ALL Asthma Admissions: Prior to entering “Place Patient In” Admission Order into EPIC:
- Order “Albuterol asthma pathway dosing order per RT” and await Respiratory Therapy’s agreement with appropriate disposition destination

† Prior to entering “Place Patient In” Admission Order in EPIC for TCU Admits:
- Have Unit Secretary text page pediatric floor resident “TCU admission in the ED”, then verbal communication with floor resident
Nebulization and Steroid Dosing During 1st Hour

<table>
<thead>
<tr>
<th>CAS Score</th>
<th>Duration</th>
<th>Wt &lt; 20 kg</th>
<th>Wt ≥ 20 kg</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 2</td>
<td>5-15 min</td>
<td>Albuterol 2.5 mg/0.5 ml in 3 ml NS @8-10 L</td>
<td>Albuterol 5 mg/1 ml in 3 ml NS @8-10 L</td>
<td>RN to initiate if RT not available within 15 minutes.</td>
</tr>
<tr>
<td>3 – 4</td>
<td>Continuous over 1 hour</td>
<td>Albuterol 10 mg/2 ml + Atrovent 750 mcg/3.75 ml in 19 ml of NS [total 25 ml] @ 10 L</td>
<td>Albuterol 20 mg/4 ml + Atrovent 1500 mcg/7.5 ml in 13.5 ml NS [total 25 ml] @ 10 L</td>
<td>RN to initiate if RT not available within 15 min. Notify attending.</td>
</tr>
<tr>
<td>5 – 10</td>
<td>Continuous over 1 hour</td>
<td>Albuterol 10 mg/2 ml + Atrovent 750 mcg/3.75 ml in 19 ml of NS [total 25 ml] @ 10 L</td>
<td>Albuterol 20 mg/4 ml + Atrovent 1500 mcg/7.5 ml in 13.5 ml NS [total 25 ml] @ 10 L</td>
<td>RN to initiate if RT not immediately available. Notify attending to see patient immediately.</td>
</tr>
</tbody>
</table>

[Place on continuous oximetry]
Cardinal Glennon Children’s Medical Center
Asthma Care in the Emergency Department

Asthma is a major public health problem of increasing concern in the United States. From 1980 to 1996, asthma prevalence among children increased by an average of 4.3% per year, from 3.6% to 6.2%. Low-income populations, minorities, and children living in inner cities experience disproportionately higher morbidity and mortality due to asthma. Asthma's effects on children and adolescents include the following:

- Asthma accounts for 14 million lost days of school missed annually.
- Asthma is the third-ranking cause of hospitalization among those younger than 15 years of age.
- The number of children dying from asthma increased almost threefold from 93 in 1979 to 266 in 1996.
- The estimated cost of treating asthma in those younger than 18 years of age is $3.2 billion per year.

Environmental Hazards & Health Effects: Asthma. [www.cdc.gov/asthma/children.htm](http://www.cdc.gov/asthma/children.htm)

The pathophysiology of asthma is composed of:
- Bronchoconstriction by bronchial smooth muscle contraction
- Airway edema
- Airway hyper-responsiveness
- Airway remodeling

Emergency department management of asthma includes:
- Oxygen to maintain pulse oximetry>90%
- Short acting beta agonist therapy in the form of repetitive or continuous administration: three treatments spaced every 20-30 minutes or continuous administration
- Inhaled ipratropium bromide particularly for patients with severe airflow obstruction
- Corticosteroids by the parenteral or oral routes
- Intravenous Magnesium Sulfate
- IV/IM/SQ beta agonists (Terbutaline, Epinephrine)
- IV/IM Ketamine
Unproven Therapy:

- Methylxanthines (theophylline/amiophylline) is not recommended though it may be utilized as an aggressive measure to stave off intubation
- Antibiotics
- Routine chest radiographs
- Aggressive hydration
- Chest physical therapy
- Mucolytics

Emergency Department Asthma Care Pathway

Who Qualifies:

1) Children older than 2 years of age with a prior history of wheezing, and 2) Children less than 2 years of age with likely asthma rather than acute bronchiolitis

Who Does NOT Qualify:

Children with unstable heart disease or suspicion of other reasons for wheezing, such as a laryngomalacia, tracheomalacia, or foreign body

Step 1: Obtain vital signs, pulse oximetry and height in children older than 6 years.

Step 2: Determine asthma score: Modified CAS (Woods and Downes)

Step 3: Treatment as Follows:

Asthma score < 1-2

a. Nurse to assign Triage ESI 3
b. Order a single albuterol nebulizer treatment of 5 mg for children weighing > 20 kg., or 2.5 mg for children < 20 kg.

c. The RN should initiate the treatment if respiratory therapy has not arrived within 15 minutes
**Asthma score 3 to 4**

a. Nurse to assign Triage ESI 3  
b. Place the child on continuous pulse oximetry  
c. Order a continuous nebulization treatment with albuterol and atrovent to run over 1 hour  
   i. For children ≥ 20 kg, albuterol 20 mg and atrovent 1500 mcgs  
   ii. For children < 20 kg, albuterol 10 mg and atrovent 750 mcgs  
d. The RN should initiate the treatment if respiratory therapy has not arrived within 15 minutes.  
e. Request the respiratory therapy check post treatment peak flows in children 6 year age and older  
f. Order and administer 2 mg/kg of oral steroid (form at the discretion of the RN) with a maximum of 60 mg. Notify MD if unable to tolerate PO dose.  
g. Notify the attending or fellow of patient’s enrollment in the pathway and when the nebulization treatment is complete.

**Asthma score ≥ 5**

a. Nurse to assign Triage ESI 2  
b. Place the child on continuous pulse oximetry  
c. The RN initiates a continuous nebulization treatment if respiratory therapy is not immediately present.  
d. Notify the attending or fellow of patient’s enrollment and need for their immediate presence at the bedside.  
e. Administer IV Solumedrol 2 mg/kg (maximum 125 mg)  
f. Consider IV Magnesium, IV/IM/SQ Beta Agonists (Terbutaline,Epinephrine), and/or IV/IM Ketamine:  
   i. **Magnesium:** 25 - 50 mg/kg IV up to 2 grams  
   ii. **Terbutaline:**  
      - 2 – 10 mcg/kg IV load followed by 0.1 – 0.4 mcg/kg/min. (May titrate in increments of 0.1 – 0.2 mcg/kg/min Q 30 min)  
      - 10 mcg/kg (1 mg/ml), maximum 0.25 ml IM/SQ x 1; may repeat x 1 in 20 minutes for maximum of 2 doses  
   iii. **Epinephrine:**  
      - 0.1 ml/kg (0.01 mg/kg) IV load (1:10,000) followed by 0.1-1.0 mcg/kg/min  
      - 0.01 ml/kg (0.01 mg/kg/dose) IM/SQ (1:1,000), maximum 0.5 ml IM/SQ, x 1; may repeat q 20 minutes for maximum 3 doses  
   iv. **Ketamine:**  
      - 0.5 mg/kg/dose (maximum 25 mg) IV/IM
Admission of asthma patients:

The pathway for admission of patients to the appropriate unit in the hospital is outlined in the ED to Inpatient Asthma Pathway.

Discharge from the emergency department requires that:

- CAS 0 – 1 (With ED physicians discretion when CAS = 1)
- The patient is not hypoxic
- If the patient is able to perform an appropriate peak flow it should be greater than or equal to 70% of predicted (available in table format with peak flow meters)
- The patient is comfortable and is able to tolerate oral meds and fluids as well as inhaled bronchodilators
- The above conditions remain stable 30 to 60 minutes after the last nebulized treatment

Discharge medications:

- Inhaled bronchodilator (albuterol via a home nebulizer or MDI) including education in the use of an MDI as indicated. Albuterol: MDI: 2 – 4 puffs, Nebulizer: 2.5 mg.
- Oral corticosteroids (1- 2 mg/kg/day, max. of 60 to 80 mg/day) for 4 to 5 days
- Continuation of any current asthma medications (long term bronchodilators, inhaled corticosteroids, etc)
- Consider adding an inhaled corticosteroid for patients with persistent disease
- Follow-up with a health care provider within 1 week