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

**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:

**Modified CAS (Woods and Downes) Asthma Score:**

<table>
<thead>
<tr>
<th>Score points</th>
<th>SpO2</th>
<th>Wheezing</th>
<th>Accessory Muscle Use</th>
<th>Inspiratory BS’s</th>
<th>CNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>95+ in RA</td>
<td>None/none/expiratory</td>
<td>None</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>&lt;95 in RA</td>
<td>Entire expiratory phase</td>
<td>Substernal, subcostal, intercostal, nasal flaring</td>
<td>Unequal</td>
<td>Altered mental status/ agitated</td>
</tr>
<tr>
<td>2</td>
<td>&lt;95 with a simple mask</td>
<td>Expiration &amp; inspiration</td>
<td>Supraclavicular, see-saw respiration</td>
<td>Decreased</td>
<td>Depressed</td>
</tr>
</tbody>
</table>

**Initial Asthma Score**

- **CAS 0-2**
  - Single Albuterol Neb within 15 minutes

- **CAS 3-5**
  - Continuous Albuterol with Atrovent Neb over 1 hour within 15 minutes.
  - Oral steroids 2mg/kg up to 60 mg

- **CAS 5-10**
  - Continuous Albuterol with atrovent Neb over 1 hour immediately. Consider other
Repeat Asthma Score at 1 hour

- CAS 1-2
  - Single Albuterol Neb within 15 minutes
- CAS 3-5
  - Continuous Albuterol Neb over 1 hour.
- CAS 5-10
  - Continuous Albuterol Neb over 1 hour immediately. Consider other interventions.*

Repeat Asthma Score at 2 hours

- CAS 1-2
  - Single Albuterol Neb within 15 minutes
- CAS 3-5
  - Continuous Albuterol Neb over 1 hour.
- CAS 5-10
  - Continuous Albuterol Neb over 1 hour immediately. Consider other interventions.*

Repeat Asthma Score at 3 hour

- CAS 1-2
  - Admit to Floor Max q 2hour nebs
- CAS 3
  - Admit to TCU q 2 hour nebs. May have q 1hour x 1-2
- CAS 4-10
  - Admit PICU. Consider CBG's
# Nebulization Dosing

<table>
<thead>
<tr>
<th>Asthma Score</th>
<th>Duration</th>
<th>Wt ≥ 20 kg</th>
<th>Wt &lt; 20 kg</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 2</td>
<td>5 -15 min</td>
<td>Albuterol 5 mg/1ml in 3 ml NS @8-10 L</td>
<td>Albuterol 2.5 mg/ 0.5 ml in 3 ml NS @8-10 L</td>
<td>RN to initiate if RT not avail. in 15 minutes.</td>
</tr>
<tr>
<td>3 – 5</td>
<td>Continuous over 1 hour</td>
<td>Albuterol 20 mg/4ml + Atrovent 500 mcg/ 2.5 ml in 19 ml NS [total 25 ml] @ 10L Oral steroids 2 mg/kg up to 60 mg</td>
<td>Albuterol 10 mg/2ml + Atrovent 250 mcg/ 1.25 ml in 22 ml NS [total 25 ml] @ 10 L Oral steroids 2mg/kg</td>
<td>RN to initiate in RT not avail. in 15 min. Notify attending and place chart in door.</td>
</tr>
<tr>
<td>5 – 10</td>
<td>Continuous over 1 hour</td>
<td>Albuterol 20 mg/4ml + Atrovent 500 mcg /2.5 ml in 19 ml NS [total 25 ml] @ 10L</td>
<td>Albuterol 10 mg/2ml + Atrovent 250 mcg/ 1.25 ml in 22 ml NS [total 25 ml] @ 10 L</td>
<td>RN to initiate if RT not immediately avail. Notify attending to see patient immediately.</td>
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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 hyperresponsiveness
- 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 and beta agonists (terbutaline)
Unproven Therapy:

- Methylxanthines (theophylline/amiphylline) 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) Asthma Score.

Step 3:

Asthma score < 3

1 - Order a single albuterol nebulizer treatment of 5 mg for children weighing 20 kg. and above, or 2.5 mg for children less than 20 kg.
2 - Place chart in door rack.
3 – The RN should initiate the treatment if respiratory therapy has not arrived within 15 minutes.
**Asthma score 3 to 5**

1 - Place the child on continuous pulse oximetry

2 - Order a continuous nebulization treatment with albuterol and atrovent to 
   Run over 1 hour: 10 mg and 250 micrograms in children less than 20 kg. 
   20 mg and 500 micrograms in children 20 kg and above. 
   The RN should initiate the treatment if respiratory therapy has not 
   Arrived within 15 minutes.

3 – Request the respiratory therapy check post treatment peak flows in 
   children 6 year age and older

4 – 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.

5 – Place the chart in the door, notify the attending or fellow of patient’s 
   enrollment in the pathway and when the nebulization treatment is 
   complete.

**Asthma score > 5**

1 – Place the child on continuous pulse oximetry

2 – The RN initiates a continuous nebulization treatment if respiratory 
   therapy is not immediately present.

3 – Notify the attending or fellow of patient’s enrollment and need for their 
   attendance at the bedside.

4 - The timing and route of administration of steroids as well as any 
   supplemental medications (Magnesium, terbutaline, etc.) should 
   be determined by the attending or fellow at the time of their evaluation. 

**Magnesium:** 25 - 75 mg/kg IV up to 2 grams

**Therbutaline:** 2 – 10 mcg/kg IV load followed by 0.1 – 0.4 mcg/kg/min. 
   (May titrate in incements of 0.1 – 0.2 mcg/kg/min Q 30 min)
Admission of asthma patients:

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

Discharge from the emergency department requires that:

- 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 (2 mg/kg/day, max. of 60 to 80 mg) 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 in 1 week
ED to Inpatient Admission Pathway

Score 1: <3 intermittent nebbs, ≥3 continuous nebbs
Score 2: <3 soft continuous, ≥3 continuous
Score 3: ≤3 off continuous, ≥4 continuous

Pt presents to ED
1 hour units

Use modified Wood – Downes Score

Patients are assessed upon presentation to ED, then subsequently each hour till discharge or admit. Therapy is based on flow chart above.

ED to Inpatient

<3 Floor admit max q 2 hours nebs

3 TCU admit q 2 hour may have q1 x 1-2

≥4 PICU consult, consider blood gas