PEDIATRIC EMERGENCY DEPARTMENT CLINICAL GUIDELINE: 
ASTHMA ACUTE CARE PROTOCOL

Physical Examination:
- Rapid cardiopulmonary assessment
- Evaluation of work of breathing
  - Asthma Score: 5 components scored 1-3 scale (see Asthma Severity Assessment)
    - Respiratory rate
    - Oxygen saturation (on room air if possible)
    - Auscultation
    - Retractions
    - Degree of Dyspnea
  - % Predicted Peak Flow
- Evaluation of perfusion
- General physical examination for evidence of focal infection, hydration status

History:
- Determine primary clues as to the severity of the child’s asthma
  - Number of hospitalizations in past year, missed days of school
  - Ever been/number of times in the PICU or intubated
  - Last time/number of times on steroids
- Medications
  - Recent usage of quick relief medications (inhaler/neb use) over past 24hrs
  - Usual daily regimen when not sick
  - Taking adjunctive/prophylaxis medications (leukotriene inhib/inhaled steroid/cromolyn)
- Allergies/Triggers/allergens
- Fever, productive cough, history of pneumonia, immunocompromise, comorbidities

Diagnostic Evaluation:
- A CXR is generally not indicated unless there is a fever to R/O pneumonia, or severe respiratory distress to R/O some other unusual process (pneumothorax). However, all patients going to either the PICU OR stepdown should have a PCXR.
- A CBC with differential and blood culture may be helpful if the patient has a high fever or is ill in appearance, particularly if the patient is younger, or has other comorbidities or complicating factors. Not all patients with clinical pneumonias, however, require labwork. This is particularly true for older children (over 2 years) who are fully immunized, are well in appearance and have reliable parents with good followup.
- Blood gas analysis (ABG, CBG) is generally not necessary for tracking oxygenation, but is invaluable in terms of evaluating ventilation (pCO₂) and acid-base balance (pH). It should be reserved for these specific questions.
- Attempts should be made to access the medical records. The electronic medical record often contains detailed clinic notes and discharge summaries with a wealth of information (i.e., lab summaries, discharge medications, dosages, prior complications).
Asthma Score

Circle the appropriate five clinical criteria to determine the Total Asthma Score.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>1 Point</th>
<th>2 Points</th>
<th>3 Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESP RATE</td>
<td>2-3 yrs</td>
<td>≤ 34</td>
<td>35-39</td>
</tr>
<tr>
<td></td>
<td>4-5 yrs</td>
<td>≤ 30</td>
<td>31-35</td>
</tr>
<tr>
<td></td>
<td>6-12 yrs</td>
<td>≤ 26</td>
<td>27-30</td>
</tr>
<tr>
<td></td>
<td>&gt; 12 yrs</td>
<td>≤ 23</td>
<td>24-27</td>
</tr>
<tr>
<td>O₂ SATURATION</td>
<td>(Room Air)</td>
<td>&gt; 95%</td>
<td>90-95%</td>
</tr>
<tr>
<td>AUSCULTATION</td>
<td>Nl to mild end-expiratory wheezing</td>
<td>Expiratory wheezing</td>
<td>Insp + Exp wheezing, or Diminished BS</td>
</tr>
<tr>
<td>RETRACTIONS</td>
<td>None, or Intercostal</td>
<td>Intercostal + Substernal</td>
<td>Intercostal, Substernal, + Supraclavicular</td>
</tr>
<tr>
<td>DYSPNEA</td>
<td>Speaks in sentences or coos and babbles</td>
<td>Speaks in partial sentences, or utters short cries</td>
<td>Speaks in single words or short phrases, or grunts</td>
</tr>
</tbody>
</table>


Severity Assessment

Circle the appropriate objective indicators for Severity of Asthma.

<table>
<thead>
<tr>
<th>Asthma Score</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5-7</td>
<td>8-11</td>
<td>12-15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Predicted Pk Flow</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 70%</td>
<td>50-70%</td>
<td>&lt; 50%</td>
<td></td>
</tr>
</tbody>
</table>
Severity Stratification and Therapeutic Management:

- **MILD** (Asthma Score 5-7; Pk Flow > 70% predicted)
  - Albuterol 2.5mg nebulizer x 1
  - Prednisolone/prednisone 2mg/kg PO (max 60mg)
  - Asthma severity reassessment documented ½ hr following respiratory treatment

- **DISPOSITION:** Likely discharge, not a candidate for Obs Status or Transfer.
  - *Asthma Teaching* (verbal and written instructions with follow-up) given and documented if discharged

- **MODERATE** (Asthma Score 8-11; Pk Flow 50-70% predicted)
  - Albuterol continuous (15mg/hr) x 1hr
  - Atrovent 1mg (added into first hour of continuous nebulization)
  - Prednisolone/prednisone 2mg/kg PO (max 60mg), or
  - Methylprednisolone (Solumedrol®) 2mg/kg IV (max 125mg) as initial dose
  - Asthma severity reassessments documented ½ hr following the respiratory treatment, and at minimum every 2 hours until discharge/transfer

- **DISPOSITION:** Likely needs several hours of respiratory tx’s → **Admit to ER OBS Status.** If still needs ongoing treatment after 8-23hrs of ER OBS transfer to LaRabida (or admission to COMER/Intermediate Unit if still requiring continuous nebs or higher level care).
  - *Asthma Teaching* (verbal and written instructions with follow-up) given and documented if discharged

- **SEVERE** (Asthma Score 12-15; Pk Flow < 50% predicted)
  - IV access, oxygen, monitor
  - IVF’s. Most patients are relatively dehydrated due to decreased oral intake and increased insensible losses. An IV fluid bolus may be given if there is evidence of decreased perfusion, or the patient may be given 1.5-2x maintenance of normal saline.
  - Albuterol continuous nebulization (15mg/hr) x 2hrs
  - Atrovent 1mg (added into first 2hrs of continuous nebulization)
  - Methylprednisolone (Solumedrol®) 2mg/kg IV (max 125mg) as initial dose
  - MgSO4 50mg/kg (2g max) IV over ½ hr.
    - Requires continues pulse oximetry, does not require cardiac monitor.
    - May cause pain at the IV site. Pain may be decreased by using a larger bore IV catheter, increasing the rate of administration of a piggyback fluid, and/or by decreasing the actual rate of medication delivery.
    - Hypotension and weakness are rare in children at these doses.
  - Asthma severity reassessments documented ½ hr following the end of any respiratory treatment, and at minimum every hour until discharge/transfer

- **DISPOSITION:** Likely needs admission to Intermediate Unit or PICU. However, if improves significantly with treatment revert to Moderate Severity Pathway.
  - *Consider Epinephrine:* 0.01 mg/kg sq (max 0.3mg)
    - Potent alpha and beta agonist (reserved for severe asthmatics)
  - *Consider Terbutaline:* Requires both an IV bolus, and continuous drip infusion
    - Terbutaline bolus 10mcg/kg (max 300mcg) over 1-2min
    - Terbutaline drip 0.5-1.0 mcg/kg/min
    - High side-effect profile. Tolerated better in younger patients. Titrate to maximum tolerated heart rate for age.
    - Best reserved for those with markedly decreased air entry in whom inhaled beta agonists have limited absorption.
  - *Consider Heliox (70:30 or 60:40 mix):* Child must be able to tolerate FIO₂ ≤ 40%
  - *Consider BiPAP*

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3/2/2010
### CRITICAL/MORIBUND (Refractory hypoxemia, progressive ventilatory failure or obtundation)
- *All of the above, and*
- Consider pneumothorax/tension pneumothorax *(chest wall crepitations)*
- Consider the need for rapid sequence intubation and begin preparing for it.
- **DISPOSITION:** Admission to PICU
# Pediatric Emergency Department Clinical Guideline: Asthma Acute Care Protocol

## MILD

(AS 5-7)  
(PF > 70%)

<table>
<thead>
<tr>
<th>Albuterol 2.5mg neb x 1</th>
<th>Prednisolone/Prednisone 2mg/kg PO (60mg max)</th>
</tr>
</thead>
</table>

Re-Eval after ½ hr off neb

### Improved

(AS < 7)

Objectively/subjectively improved  
Back to baseline/wants to go home

### No change or Worse

(AS > 7)

Move to Moderate Algorithm

### Discharge

- Generally not a candidate for ER Obs Status (Discharge in less than 8hrs)
- Refill baseline inhalers/meds
- Give Rx for 4 days of prednisolone/prednisone (unless not indicated)*
- Consider/assess for future prophylactic therapy (see NHLBI guidelines)
- Give written and verbal teaching instructions
- Utilize the Asthma Center (2-1858) for asthma teaching and discharge planning
- Ensure adequate follow-up

*This is merely a paradigm shift in thinking.
MODERATE
(AS 8-11)
(PF 50-70%)

Continuous Albuterol 15mg/hr x 1hr
[alternative is levalbuterol (Xopenex®) 5mg/hr x 1hr]
Atrovent® 1mg added into first neb
Continuous Pulse Oximetry
Prednisone/Prednisolone 2mg/kg PO (60mg max), or
Methylprednisolone (Solumedrol ®) 2mg/kg IV (125 mg max)
[alternative is dexamethasone 0.5mg/kg IV/IM (12 mg max)]

Re-Eval after ½ hr off treatment

Improved
(AS 5-7)

No change
(AS 8-11)

Worse
(AS 12-15)

Observe ½-2hrs
D/C vs ER Obs Status

Continuous Albuterol 15mg/hr x 1hr
Admit to ER OBS Status
Re-Eval ½ hr after treatment

Improved
(AS 5-7)

No change or Worse
(AS 8-11)

ER OBS Status (8-23hrs)
Albuterol 2.5mg nebs q2hr
q2hr→ Transfer LaRabida
Weaned to >q2hr→ D/C

ER OBS Status (8-23hrs)
Still requiring cont nebs
Admit COMER/Intermed
(All pts need CXR and IV)
| SEVERE  
| (AS 12-15)  
| (PF <50%)  

**IV, O₂, Monitor**  
**Albuterol 15mg/hr x 2hrs**  
(alternative is levalbuterol (Xopenex®) 5mg/hr x 2hrs)  
**Atrovent® 1mg added into first neb**  
**Methylprednisolone (Solumedrol®) 2mg/kg IV (125 mg max)**  
(alternative is dexamethasone 0.5mg/kg IV (12 mg max))  
**MgSO₄ 50mg/kg IV (2g max) IV over ½ hr**  
Consider Epinephrine 0.01mg/kg sq (0.3mg max)

| Reassess ½-1hr into initial management  

**Significant Improvement**  
Continous neb treatments  
**Admit to ER Obs Status** (8-23hr)  
Re-evaluate every ½-1hr  
Still requiring Continuous  
**Admit to Intermediate Unit**

**Minimal improvement or Worse**  
**Admit to PICU**  
Consider other therapies:  
- Heliox (age < 6yrs)  
- Terbutaline  
- Repeat MgSO₄ 25mg/kg (total 4g max)  
- BiPAP (age > 6yrs)  
- Ketamine  
- Intubation  
- Eval for pneumothorax
**Asthma Severity Assessment**

- **Mild**
  - Initiate Tx
  - **worse**
    - Re-Eval after 1小时
    - **better**
      - Better (> q2hr)
      - q2hr
      - Discharge

- **Moderate**
  - Initiate Tx
  - **worse**
    - Re-Eval after 1小时
    - **better**
      - Admit ER OBS *
      - Continuous
      - Discharge
      - Transfer LaRabida

- **Severe**
  - Initiate Tx
  - **worse**
    - Re-Eval after 1/2hour
    - **better**
      - No change or worse
      - Admit PICU

* **ER OBS Status** is intended for patients in the Moderately Severe category who when re-evaluated after 1 hour of continuous nebs appear likely will require multiple hours of continuous nebs. In order to meet the requirements for this status, the patient must remain in the ER for a time period of **8-23hrs**, and have appropriate documentation be completed (ER OBS Order Sheet and Progress Note).
REFERENCES:

General

Beta receptor/bronchodilator therapy


BiPAP/Noninvasive Positive Pressure Ventilation


Corticosteroids:

**Heliox**


**Ipratropium**


**Ketamine**


Hanazaki M, Jones KA, Warner DO: Effects of intravenous anesthetics on Ca2+ sensitivity in canine tracheal smooth muscle. Anesthesiology 2000;92:133-.


**PEDiatric EMERGency DEPARTMENT CLINICAL GUIDELINE:**
**ASThma ACUTE CARE PROTOCOL**

**Magnesium**


**Methylxanthines (theophylline, aminophylline, doxofylline)**


**Terbutaline (continuous infusion)**


**DISCLAIMER:**
This clinical guideline has been developed for the purpose of unifying the general emergency care of patients with asthma. It is intended to aid, rather than substitute for, professional judgment. It is not intended to serve as a rigid protocol or a written proxy for the standard of care. Failure to comply with this guideline does not represent a breach of the standard of care.