

Pediatric Asthma – Inpatient Clinical Practice Guideline

These guidelines are modified from the 1997 National Heart, Lung, and Blood Institute (NHLBI) Asthma Guidelines and the 2007 update. They are intended for use in patients with known asthma who are between the ages of 2 and 18 years. Please direct any questions to Dr. Jennifer Jewell 207-662-2541.

ACUTE ASTHMA EXACERBATION CLASSIFICATION

Mild Exacerbation

- Patient is alert and oriented, speaks in sentences, is dyspneic only with activity, may have slight expiratory wheezing, and is tachypneic.
and/or
- FEV₁/peak flow \geq 70% of predicted or personal best
and/or
- O₂ saturation > 95% (O₂ saturation not usually necessary)

Moderate Exacerbation

- Patient is agitated, not playful, and speaks in phrases. Patient is using accessory muscles, may have loud wheezing, and is tachypneic.
and/or
- FEV₁/peak flow 40 - 69% of predicted or personal best
and/or
- O₂ saturation 90 - 95% (O₂ saturation not usually necessary)

Severe Exacerbation

- Patient is breathless at rest. Dyspnea interferes with conversation (e.g. speaks in words). Patient is using accessory muscles, has suprasternal retractions, may or may not have loud wheezing (throughout inhalation and exhalation), and is tachypneic.
and/or
- FEV₁/peak flow < 40% of predicted or personal best
and/or
- O₂ saturation < 90%

Algorithms are not intended to replace providers' clinical judgement or to establish a single protocol. Some clinical problems may not be adequately addressed in this guideline. As always, clinicians are urged to document management strategies.

Last revision May 2014

**The Barbara Bush
Children's Hospital**
At Maine Medical Center



Risk Factors for Acute Decompensation and Mortality

The following are some of the risk factors that increase the potential for acute decompensation and mortality for patients with acute asthma exacerbations. These issues should be reviewed with the patient during the initial history. More conservative treatment for patients with any of the following risk factors is advised.

- Previous severe exacerbation (e.g. intubation or ICU admission for asthma)
- Two or more hospitalizations for asthma in the past year
- Three or more ED visits in the past year for asthma exacerbations
- Hospitalization or ED visit for asthma in the past month
- Recent course of oral corticosteroids
- Using > two canisters of short-acting beta₂-agonist (e.g. albuterol) in the past month
- Difficulty perceiving the severity of asthma symptoms in the context of an exacerbation
- Cardiovascular disease
- Chronic lung disease
- Major psychosocial problems
- Chronic psychiatric disease

Co-Morbidities Associated with Acute Asthma Exacerbations

A number of medical conditions are associated with acute asthma exacerbations. Treatment of these co-morbidities shortens the duration of acute asthma exacerbations, and long-term therapy, when appropriate, may prevent future exacerbations. Consider diagnosis and treatment of the following conditions in patients with acute asthma exacerbations.

Allergic Rhinitis
Sinusitis
Otitis media

Pneumonia
Gastroesophageal reflux

Patient Education

Patient education is essential during acute asthma exacerbations and for management of chronic asthma. Educational efforts for all patients and families should begin prior to discharge with emphasis on:

- Basic facts about asthma
- Roles of medications
- Skills using inhalers, nebulizers, peak flow meters, and spacer devices
- Environmental control measures
- Action plans – home and school
- If patient is in a smoking environment, encourage a smoking cessation program -- 800-207-1230, The Maine Tobacco Helpline. For MMC inpatients, consider referral to Becky Hitchcock, RN at the Center for Tobacco Independence by ordering “Tobacco Counseling” in Maine Medical Center’s SCM.

Mild Exacerbation

These patients rarely require inpatient treatment for asthma. When classifying severity, consider therapy received prior to hospital encounter and response to initial treatments.

Assess patient. Obtain T, P, R, weight, and height upon admission. Obtain FEV₁/peak flow if ≥ 5 y old.

- Patient is alert and oriented, speaks in sentences, is dyspneic only with activity, may have slight expiratory wheezing, and is tachypneic; and/or,
- FEV₁/peak flow $\geq 70\%$ of predicted or personal best; and/or,
- O₂ saturation $> 95\%$ (O₂ saturation not usually necessary).

Administer nebulized albuterol 2.5 mg or albuterol MDI, 2 - 8 puffs, with valved holding chamber (spacer) q 3 - 4 hours.

Check pulse, respirations, chest exam, and FEV₁/peak flow 1 hour after inhaled treatment completed.

If patient does not improve

Follow guideline for **Moderate Exacerbation**

If patient improves:

- Response sustained 60 minutes after last treatment
- No wheezing, no shortness of breath
- Normal physical exam

Discharge home with the following:

- Inhaled albuterol q 4 - 6 hours for 24 - 48 hours and, then, q 4 - 6 hrs *prn* or as directed by healthcare provider
- If the patient has recently been on systemic corticosteroids, consider treatment with oral corticosteroids 0.5 - 1 mg/kg q 12 hours for 3 - 10 days (usual maximum dose 60 mg/day in children < 12 y old; maximum dose 80 mg/day in adults). Consider tapering for patients requiring > 6 days of oral corticosteroids.
- Continue controller medications
- If not on inhaled corticosteroids, consider initiating treatment prior to discharge

Follow-up by phone or office visit with primary care provider within 1 - 5 days.

Moderate Exacerbation

Assess patient. Obtain T, P, R, weight, and height upon admission. Obtain FEV₁/peak flow if ≥ 5 y old.

- Patient is agitated, not playful, and speaks in phrases. Patient is using accessory muscles, may have loud wheezing, and is tachypneic; and/or,
- FEV₁/peak flow 40 - 69 % of predicted or personal best; and/or,
- O₂ saturation 90 - 95% (O₂ saturation not usually necessary).

Administer nebulized albuterol 2.5 mg or MDI 2 - 8 puffs, with valved holding chamber (spacer) q 1 - 3 hours. May consider adding ipratropium.

Corticosteroids (oral – prednisone or equivalent) 1 - 2 mg/kg up to a maximum 60 mg in children, if not given prior to hospitalization. Consider IV steroids if patient cannot tolerate oral medication. Continue systemic steroids 0.5 - 1 mg/kg q 12 hours (usual maximum dose 60 mg/day in children < 12 y old; maximum dose 80 mg/day in adults). Consider tapering for patients requiring > 6 days of corticosteroids.

Frequent vital sign monitoring, including pulse and respirations. Monitor FEV₁/peak flow BID if ≥ 5 y old.

If the patient smokes or is in contact with a smoking environment, consider a urine cotinine level

Consider chest x-ray, if unequal breath sounds, high fever, or sudden decline in status

Good Response

- FEV₁ or PEF ≥ 70%
- Sustained response 60 minutes after treatment
- No dyspnea or oxygen requirement
- Normal physical exam

- Wean inhaled albuterol to q 3 - 4 hours
- Continue systemic corticosteroids 0.5 - 1 mg/kg q 12 hours for 3 - 10 days (usual maximum dose 60 mg/day in children < 12 y old; maximum dose 80 mg/day in adults). Consider tapering for patients requiring > 6 days of systemic corticosteroids.
- Continue controller medications
- If not on inhaled corticosteroids, consider initiating treatment prior to discharge

Incomplete Response

- FEV₁ or PEF 40 - 69 %
- Mild to moderate symptoms

- Continue treatment with nebulized albuterol q 1 - 3 hours
- Continue systemic corticosteroids 0.5 - 1 mg/kg q 12 hours for 3 - 10 days (usual maximum dose 60 mg/day in children < 12 y old; maximum dose 80 mg/day in adults). Consider tapering for patients requiring > 6 days of systemic corticosteroids.
- Consider other diagnoses
- Continue controller medications
- If not on inhaled corticosteroids, consider initiating treatment prior to discharge

Poor Response

- FEV₁ or PEF < 40%
- Severe symptoms
- Drowsy, confused

Follow guideline for [Severe Exacerbation](#) and admit to PICU

Severe Exacerbation

Assess patient. Obtain vital signs, weight, and height upon admission. Consider FEV₁/peak flow if ≥ 5 y old. FEV₁/peak flow may be difficult or impossible to measure due to significant dyspnea and cough. Further, FEV₁/peak flow may not be appropriate in very severe cases of obvious airway compromise or cyanosis.

- Patient is breathless at rest. Dyspnea interferes with conversation (e.g. speaks in words). Patient is using accessory muscles, has suprasternal retractions, may or may not have loud wheezing (throughout inhalation and exhalation), and is tachypneic; and/or,
- FEV₁/peak flow $< 40\%$ of predicted or personal best; and/or,
- O₂ saturation $< 90\%$.

Administer oxygen to keep saturation $\geq 90\%$. Administer moderate to high dose nebulized albuterol plus ipratropium q 1 - 3 hours or albuterol continuously. BAN (breath actuating nebulizer) is recommended to increase delivery of nebulized medications in severe exacerbations.

Corticosteroids (oral – prednisone or equivalent) 1 - 2 mg/kg up to a maximum of 60 mg in children, if not given prior to hospitalization. Consider IV steroids if patient cannot tolerate oral medication. Continue systemic steroids 0.5 - 1 mg/kg q 6 - 12 hours (usual maximum dose 60 mg/day in children < 12 y old, maximum dose 80 mg/day in adults).

Frequent vital sign monitoring, including pulse, respirations, and continuous pulse oximetry. Once improvement established, monitor FEV₁/peak flow BID if ≥ 5 y old.

If the patient smokes or is in contact with a smoking environment, consider a urine cotinine level

Consider chest x-ray, if unequal breath sounds, high fever, or sudden decline in status

Good Response

- FEV₁ or PEF $\geq 70\%$
- Sustained response 60 minutes after treatment
- No dyspnea or oxygen requirement
- Improved physical exam

- Consider hospitalization
- Refer to [“Pediatric Asthma – Inpatient Clinical Practice Guideline; Moderate Exacerbation”](#)

PICU Admission Criteria

- Intubated or pending intubation
- pCO₂ greater than 45
- Requiring more than 50% FiO₂
- Requiring nebulized therapies more frequently than q 2 hours
- Altered mental status
- Acute pneumothorax
- Use of adjunctive therapies – heliox, terbutaline, magnesium

Incomplete Response

- FEV₁ or PEF 40 - 69%
- Mild to moderate symptoms

- Arrange for hospitalization
- Continue supplemental oxygen
 - Continue nebulized albuterol and ipratropium q 1 - 3 hours (while in ED) or albuterol continuously at 0.15 - 0.5 mg/kg/hr (maximum of 10 - 15 mg/hr). Ipratropium may be useful q 4 - 6 hours during first 24 hours of hospitalization.
 - Continue systemic corticosteroids 0.5 - 1 mg/kg q 6 - 12 hours for 3 - 10 days (usual maximum dose 60 mg/day in children < 12 y old; maximum dose 80 mg/day in adults). Consider tapering for patients requiring > 6 days of systemic corticosteroids.
 - Consider other diagnoses
 - Continue controller medications
 - If not on inhaled corticosteroids, consider initiating treatment prior to discharge

Poor Response

- FEV₁ or PEF $< 40\%$
- pCO₂ ≥ 45 mm Hg
- Severe symptoms
- Drowsy, confused

Admit to PICU - With orders for:

- Supplemental oxygen
- Nebulized albuterol and ipratropium q 1 - 2 hours (while in ED) or continuously at 0.15 - 0.5 mg/kg/hr (maximum of 10 - 15 mg/hr). Ipratropium may be useful q 4 - 6 hours during first 24 hours of hospitalization.
- Systemic corticosteroids 0.5 - 1 mg/kg q 6 - 12 hours
- Consider arterial line for serial ABGs
- Continue controller medications as appropriate
- Consider adjunctive therapies

