Care Process Model

Asthma and Acute Exacerbation in Children
What is Multidisciplinary Care?

Multidisciplinary care is agreed upon, interdisciplinary, patient-centered, disease-focused, care delivery systems that are informed by a series of evidence-based care process models. Multidisciplinary care supports the achievement of the BIG(GER) Aim systematically across the continuum of care.

What is a Care Process Model (CPM)?

Care Process Models ensure that all care delivered by a hospital and its caregivers is medically necessary, the leading edge in medical science and the appropriate treatment intensity. Put into effect, these models will systemize treatment processes across all hospitals and practices, improving consistency as well as effectiveness. This CPM summarizes Mission Health’s tiered approach to care in the patient presenting with symptoms of asthma and acute exacerbation in children.

What are the benefits of a CPM?

- Reduces variation
- Utilizes the best practice from literature and expert opinion
- Improves care delivery process
- More readily exposes errors
- Variation study informs revisions to CPMs

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WHY FOCUS ON ASTHMA AND ACUTE EXACERBATION IN CHILDREN?

Asthma is one of the most common diagnoses for pediatric admissions, and the use of a clinical pathway has been shown to reduce length of stay, use of bronchodilators, and cost, as well as improve discharge coordination.¹

Goals of the CPM:

- Implementation of standardized, evidence-based management of acute asthma exacerbations with emphasis on aggressive management on presentation to prevent hospitalization.
- If hospitalization is necessary, focus on standardized, evidence-based care with early transition to MDI and improved discharge process.
- Improved patient and family education across the system for successful transition to home to prevent future ED visits and/or readmissions.
- Identify patients who would benefit from specialty referral and multidisciplinary care through pediatric pulmonology, the Regional Disease Management Program and/or allergy.

INCLUSION AND EXCLUSION CRITERIA

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion Criteria</th>
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<tr>
<td>• Children between 2 and 18 years of age with a diagnosis of asthma, reactive airway disease or who have high probability of asthma based on clinical presentation</td>
<td>• Children in the ICU or with impending respiratory arrest</td>
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<td>• For children between 1 and 2 years of age, the asthma CPM may be used at the discretion of the attending physician</td>
<td>• Children with bronchiolitis or who do not respond to bronchodilators</td>
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<td>• Children with underlying conditions such as congenital heart disease, cystic fibrosis, chronic lung disease, or immunodeficiency syndromes</td>
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ACUTE MANAGEMENT ON PRESENTATION TO EMERGENCY DEPARTMENT, URGENT CARE OR AMBULATORY OFFICE

Initial Assessment for all Locations of Care:

- Focused history and physical examination. The history should include assessment of risk factors for severe asthma exacerbations (e.g. frequent courses of systemic steroids, frequent ED visits, admissions, or prior intubations), asthma triggers, and current medications including frequency of beta-agonist usage. A more detailed history and physical exam may be performed once treatment is initiated.

- Severity of the asthma exacerbation should be documented at every visit and used to guide management. The patient should be evaluated frequently to assess response to treatment and assessment will include exam and pulse oximetry.

ED Management of Asthma Exacerbation:

**Mild-Moderate Exacerbation** (defined as mild to moderate work of breathing with intermittent to diffuse wheezing):
- Administer oxygen to keep oxygen saturations greater than 90%
- Initiate Albuterol and Atrovent via nebulizer:
  - For children **less than or equal to** 20kg give 2.5mg albuterol/0.5mg Atrovent q20 minutes as needed up to 3 doses
  - For children greater than 20kg give 5mg albuterol/0.5mg Atrovent q20 minutes as needed up to 3 doses
- Consider systemic steroids (see appendix for oral systemic steroid options)
- Reassess after albuterol treatments for admission criteria
- Discharge to home if stable with 24-48hr PCP follow-up and Parent Education

**Moderate-Severe Exacerbation** (defined as moderate to severe Work of Breathing (WOB) with diffuse wheezing and poor air movement):
- Administer oxygen to keep oxygen saturations greater than 90%
- Initiate Albuterol and Atrovent via nebulizer:
  - For children **less than or equal to** 20kg start 10mg albuterol/1.5mg Atrovent continuous for 1hr
  - For children greater 20kg start 20mg albuterol/1.5mg Atrovent continuous for 1hr
  - Load with systemic steroids (see appendix for systemic steroid options)
- Reassess after 1hr for admission criteria; Follow inpatient algorithm if admitted
- If not meeting admission criteria, discharge to home if stable. Recommend albuterol q4hrs for 24hrs and systemic steroids for 3-5 days upon discharge. Recommend 24hr PCP follow up and Parent Education prior to discharge.
ED Management of Asthma Exacerbation: (continued)

- **Life Threatening Exacerbation** (defined as severe WOB with diminished to no air movement):
  - Administer oxygen or respiratory support to keep oxygen saturations greater than 90%
  - Initiate albuterol and Atrovent via nebulizer:
    - For children less than or equal to 20kg start 20mg albuterol/1.5mg Atrovent continuous
    - For children greater than 20kg start 30mg albuterol/1.5mg Atrovent continuous
  - Load with systemic steroids (see appendix for systemic steroid options); consider IV methylprednisolone or IM dexamethasone
  - Consider adjuvant medications (i.e. SQ/IM epinephrine, IV magnesium sulfate) based on response to initial treatment
  - Reassess after 1hr of continuous treatment
  - Proceed with admission to Peds or PICU pending reassessment at 1hr for ongoing management
Urgent Care or Ambulatory Management of Acute Asthma Exacerbation:

- **Mild-Moderate Exacerbation** (defined as mild to moderate work of breathing with intermittent to diffuse wheezing):
  - Administer oxygen to keep oxygen saturations greater than 90%
  - Give 1 dose of albuterol and reassess. May give up to 3 doses every 20 minutes up to 1 hr if needed for full response
  - For children less than or equal to 20 kg give 2.5 mg albuterol as needed up to 3 doses
  - For children greater than 20 kg give 5 mg albuterol as needed up to 3 doses
  - Consider systemic steroids (see appendix for oral systemic steroid options)
  - Reassess after albuterol treatments for admission criteria
  - Discharge to home if stable with 24-48 hr PCP follow-up and Parent Education

- **Moderate-Severe Exacerbation** (defined as moderate to severe WOB with diffuse wheezing and poor air movement):
  - Administer oxygen to keep oxygen saturations greater than 90%
  - Administer albuterol every 20 minutes up to 3 doses with 1-3 doses of Atrovent based on acuity and response to treatment
  - For children less than or equal to 20 kg give 2.5 mg albuterol and 250 mcg Atrovent as needed up to 3 doses
  - For children greater than 20 kg give 5 mg albuterol and 500 mcg Atrovent as needed up to 3 doses
  - Load with systemic steroids (see appendix for systemic steroid options)
  - Reassess after 1 hr for admission criteria; Follow inpatient algorithm if admitted
  - If not meeting admission criteria, discharge to home if stable. Recommend albuterol q4 hrs for 24 hrs and systemic steroids for 3-5 days upon discharge. Recommend 24 hr PCP follow up and Parent Education prior to discharge including asthma action plan.

- **Life Threatening Exacerbation** (defined as severe WOB with diminished to no air movement):
  - Administer oxygen or respiratory support to keep oxygen saturations greater than 90%.
  - Initiate Continuous Albuterol at 0.5 mg/kg/hr with Atrovent if available. If continuous nebulization not available, proceed with 3 doses of albuterol/Atrovent back-to-back
  - Load with systemic steroids (see appendix for systemic steroid options); consider IV methylprednisolone or IM dexamethasone if available
  - Consider adjuvant medications if available (i.e. SQ/IM epinephrine, IV magnesium sulfate) based on response to initial treatment
  - Call 911 for transport
  - Consider direct admission to Peds or PICU if stable after initiation of albuterol/Atrovent. Call Mission Direct (877-MISSION) for direct admission.

**Criteria for admission**

- Requiring supplemental oxygen to keep O2 saturations greater than 90% or other respiratory support
- Persistent respiratory distress with decreased air movement on auscultation after 3 albuterol treatments
- Inability of guardians or caretakers to continue necessary care at home or return to medical care if needed
Inpatient Care of Acute Asthma Exacerbation:

Ongoing Treatment

- Metered dose inhalers or aerosolized bronchodilators and corticosteroids begun in the ED or ambulatory setting will be continued after transfer to the inpatient unit based on PRAM scoring. *(see Algorithm’s)*

- **Medications:**
  - Bronchodilators:
    - **Albuterol:**
      - May be administered via MDI or nebulizer based RT assessment.
      - There are several analyses that have shown equal clinical efficacy of medication administration via MDI and nebulizer in children. Early transition to MDI when hospitalized should be explored to increase opportunities for demonstrating proper medication administration and self-management, thereby increasing caregiver competence and confidence in use of MDI for home use. Self-management training has been shown to reduce readmissions and ED visits in the literature and should be promoted in the hospital setting for successful transition to home.
    - **Ipratropium (Atrovent):**
      - Has not been shown to provide further benefit *after* the child is hospitalized; therefore, it is not a standard therapy to be considered in the inpatient management of acute exacerbations.

- **Systemic corticosteroids:**
  - Systemic corticosteroids should be continued after transfer from the ED. Dosages in excess of 1mg/kg/day of prednisone or prednisolone have been associated with adverse behavioral effects in children. There is data to suggest that 1mg/kg/day can provide equivalent pulmonary benefit with decreased adverse effects. However, steroid responsiveness is variable. Some patients may require up to 2mg/kg/day.
  - Steroid therapy following an acute exacerbation is typically 5 days, but may be given for 3 to 10 days. Studies indicate there is no need to taper the systemic corticosteroid dose when given up to 10 days. Any previous IV doses may be considered as part of the total steroid dose.
  - There is no advantage for intravenous administration over oral therapy, provided gastrointestinal function is intact.

- **Inhaled corticosteroids (ICS)**
  - Consider continuing home ICS while hospitalized. This may not necessarily contribute to better acute management but may foster good habits for better long term asthma control.
  - Strongly consider initiating ICS for patients with persistent asthma if not already receiving.
  - For patients with persistent asthma who are already on ICS the respiratory therapist will:
    - Assess compliance
    - Assess technique
  - Use a stepwise treatment approach to determine indication and dosage of ICS (NAEPP 2007) as well as consideration of adding a second agent such as montelukast or a long acting beta-2 agonist in combination with an ICS.
Inpatient Care of Acute Asthma Exacerbation: (continued)

Ongoing Treatment

- **Medications**: (continued)
  - Adjunctive Therapies
    - Magnesium Sulfate
      - Consider if patient has minimal or no response to albuterol and corticosteroids or if patient has a severe to life threatening exacerbation. Dose: 50 mg/kg/dose IV, administered over 20 minutes, max dose 2 grams.
      - Other adjunctive therapies to consider if patient has poor response to the above therapies include epinephrine IM and terbutaline IV or SQ.
    - Treatments to avoid:
      - Methylxanthines, antibiotics (unless needed for comorbid conditions), aggressive hydration, chest physiotherapy, and mucolytics.

Monitoring

- Oxygen saturations should be monitored continuously for patients requiring supplemental oxygen. Patients requiring no supplemental oxygen for over an hour and receiving albuterol less than every 2hrs should have only intermittent pulse oximetry.
- Peak expiratory flow (PEF) may be assessed on admission and daily until discharge in children greater than 5 years of age, if they are capable of performing.

Oxygen Therapy

- Supplemental oxygen will be weaned as tolerated to keep oxygen saturations above 90%.

Worsening or Failure to Improve

- If a patient is not improving after 12hrs of care, they should be reassessed and their treatment plan altered as needed. Consider obtaining a chest x-ray and/or venous or capillary blood gas, and administering additional albuterol or an additional dose of systemic corticosteroid. If status does not improve, consider transfer to a higher level of care.
- If a patient is decompensating:
  - Administer albuterol every 10-20 minutes x 3 or give continuously over 1hr, then reassess. Patients may receive q2hr treatments for 6-8hrs or 1hr of continuous albuterol on the floor. Treatments longer than this duration require transfer to the PICU.
  - Consider adjunctive medications, including epinephrine IM and magnesium sulfate IV
  - Consider giving an additional dose of systemic corticosteroid
  - Ensure patient has IV access established
  - Obtain a chest x-ray and blood gas
Inpatient Care of Acute Asthma Exacerbation: *continued*

Pulmonology Consultation
- If at least one of the following criteria are met, the patient should have a pulmonology consultation if available (please provide advanced notice and avoid consulting on the day of anticipated discharge when possible):
  - Admission or transfer to the PICU
  - Evidence of poorly controlled asthma — including repeat hospitalizations, frequent ED visits, or more than two courses of systemic corticosteroids in prior year
  - Less than 4 years of age
  - Diagnosis of asthma in question
  - Need for additional expertise regarding education, adherence, or complications of therapy
  - Other complicating conditions, including sinusitis, severe rhinitis, or gastroesophageal reflux

Asthma Education
- Asthma education should be ordered for all patients upon admission. Education will include the following categories: asthma triggers, medication usage, symptoms, and when to seek medical attention. Education will be completed by a respiratory therapist trained in asthma education and documented in the electronic medical record. The teach-back method should be employed to ensure that families understand what they are being taught.
- A transition to home management plan of care should be completed in the chart and given to the patient prior to discharge.

Discharge Planning
- Planning for discharge should begin at the time of admission.
- Patients should be seen by their primary care provider, within 24-48hrs after discharge. The follow-up appointment should be scheduled, prior to discharge.
- For those patients who may benefit from a consultation with pediatric pulmonology, but they were not evaluated by pediatric pulmonology in the hospital, an outpatient referral by the primary care provider should be recommended.
- A referral to our Regional Asthma Disease Management Program may be made if there is opportunity for improved asthma control in the outpatient setting.
- For those patients who may benefit from an allergy referral, an outpatient referral may be made by their primary care provider.
- Discharge summary and action items should be listed for receiving provider.
Inpatient Care of Acute Asthma Exacerbation (continued)

Asthma Education

- **Discharge Criteria**
  - Resolution of respiratory distress.
  - Oxygen saturation greater or equal to 90% without supplemental oxygen for at least 4hrs.
  - Albuterol frequency spaced to every 4hrs.
  - All necessary education completed by respiratory therapist, physicians, and pharmacist.
  - Asthma Transition Home Plan completed.
  - Caregivers can appropriately monitor symptoms and treat accordingly.
# MEDICATION MANAGEMENT OF ACUTE ASTHMA EXACERBATION

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<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td><strong>Short-acting β-agonist</strong></td>
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<tr>
<td>Albuterol</td>
<td>Can be given as MDI or nebulizer 2.5mg to 5mg every 20 minutes PRN for 3 doses, then 1-4hrs PRN per PRAM scoring algorithm (&lt;20kg 2.5mg; ≥20kg 5mg)</td>
<td>Albuterol is the agent of choice for treatment of acute asthma exacerbations. Dose and frequency should be modified based on clinical response.(^6,8)</td>
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<tr>
<td>Nebulizer solution</td>
<td>0.5 mg/kg/hr by continuous nebulization for 6hrs (PICU only)</td>
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<tr>
<td>(2.5 mg/3mL, 5 mg/mL)</td>
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<tr>
<td>Albuterol MDI</td>
<td>4-8 puffs every 20 minutes for 3 doses, then every 1 to 4hrs as needed per PRAM scoring algorithm (&lt; 20kg 4puffs; ≥20kg 8puffs)</td>
<td>In mild to moderate exacerbations, MDI plus spacer is as effective as nebulized therapy with appropriate administration technique. Add mask in children unable to manage an MDI device.</td>
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<tr>
<td>(90 mcg/puff)</td>
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<td></td>
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<tr>
<td><strong>Anticholinergic</strong></td>
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</table>
| Ipratropium solution for nebulization | ED and Urgent Care/Ambulatory use only on presentation  
Children ≤ 20kg:  
250mcg (0.25 mg) every 20 minutes for 3 doses, then as needed  
Children > 20kg:  
500 mcg (0.5 mg) every 30 minutes for 3 doses, then as needed  
May be given in conjunction with albuterol in doses of 0.5-1.5mg based on weight per algorithm | Ipratropium has shown efficacy (when added to SABA and corticosteroid therapies) in preventing hospitalizations for children with exacerbations where FEV1 is <50% of predicted. However, it has not been shown to provide further benefit after the child is hospitalized; therefore, it is not a standard therapy to be considered in the inpatient management of acute exacerbations.\(^4,6\) |

Ipratropium has shown efficacy (when added to SABA and corticosteroid therapies) in preventing hospitalizations for children with exacerbations where FEV1 is <50% of predicted. However, it has not been shown to provide further benefit after the child is hospitalized; therefore, it is not a standard therapy to be considered in the inpatient management of acute exacerbations.\(^4,6\)
# MEDICATION MANAGEMENT OF ACUTE ASTHMA EXACERBATION (continued)

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<tr>
<th>Medication</th>
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<tbody>
<tr>
<td><strong>Systemic Corticosteroids</strong></td>
<td></td>
<td>Dosages in excess of 1mg/kg of oral prednisone or prednisolone have been associated with adverse behavioral effects in children, whereas 1mg/kg provides equivalent pulmonary benefit with decreased adverse effects for children with exacerbations of mild persistent asthma.⁵</td>
</tr>
<tr>
<td><em>Prednisolone solution</em> (Orapred)</td>
<td>Oral:</td>
<td>Dosages in excess of 1mg/kg of oral prednisone or prednisolone have been associated with adverse behavioral effects in children, whereas 1mg/kg provides equivalent pulmonary benefit with decreased adverse effects for children with exacerbations of mild persistent asthma.⁵</td>
</tr>
<tr>
<td>Prednisone tablet</td>
<td>Loading dose: 2mg/kg once (Max 60mg)</td>
<td>Dosages in excess of 1mg/kg of oral prednisone or prednisolone have been associated with adverse behavioral effects in children, whereas 1mg/kg provides equivalent pulmonary benefit with decreased adverse effects for children with exacerbations of mild persistent asthma.⁵</td>
</tr>
<tr>
<td></td>
<td>Maintenance dose: 1 mg/kg PO once daily or BID x 3-5 days (Max 60mg daily)</td>
<td>Dosages in excess of 1mg/kg of oral prednisone or prednisolone have been associated with adverse behavioral effects in children, whereas 1mg/kg provides equivalent pulmonary benefit with decreased adverse effects for children with exacerbations of mild persistent asthma.⁵</td>
</tr>
<tr>
<td>Dexamethasone (Decadron)</td>
<td>0.5-0.6mg/kg PO/IV/IM once (some patients require a second dose of Dexamethasone the following day)</td>
<td>Dosages in excess of 1mg/kg of oral prednisone or prednisolone have been associated with adverse behavioral effects in children, whereas 1mg/kg provides equivalent pulmonary benefit with decreased adverse effects for children with exacerbations of mild persistent asthma.⁵</td>
</tr>
<tr>
<td>If unable to tolerate PO or in status asthmaticus:</td>
<td>IV methylprednisolone: Loading dose: 2mg/kg IV once</td>
<td>Oral steroid therapy following a hospitalization or ED visit is typically 5 days, but may be given for 3 to 10 days. Studies indicate there is no need to taper the systemic corticosteroid dose when given up to 10 days. Any previous IV doses may be considered as part of the total steroid dose.</td>
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<tr>
<td>Methylprednisolone (Solumedrol)</td>
<td>Maintenance dosing: 1-2mg/kg/day in 1-2 divided doses (Note: 1mg/kg Q6hr is indicated for status asthmaticus and should rarely be used outside of the ICU)</td>
<td>Oral steroid therapy following a hospitalization or ED visit is typically 5 days, but may be given for 3 to 10 days. Studies indicate there is no need to taper the systemic corticosteroid dose when given up to 10 days. Any previous IV doses may be considered as part of the total steroid dose.</td>
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<td></td>
<td>Oral dexamethasone: 0.6 mg/kg PO once daily for 1-2 days (max 16 mg/dose)</td>
<td>Oral steroid therapy following a hospitalization or ED visit is typically 5 days, but may be given for 3 to 10 days. Studies indicate there is no need to taper the systemic corticosteroid dose when given up to 10 days. Any previous IV doses may be considered as part of the total steroid dose.</td>
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<tr>
<td></td>
<td>IM/IV dexamethasone: 0.6 mg/kg single dose (max 15 mg)</td>
<td>Oral steroid therapy following a hospitalization or ED visit is typically 5 days, but may be given for 3 to 10 days. Studies indicate there is no need to taper the systemic corticosteroid dose when given up to 10 days. Any previous IV doses may be considered as part of the total steroid dose.</td>
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## MEDICATION MANAGEMENT OF ACUTE ASTHMA EXACERBATION (continued)

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<tr>
<th>Medication</th>
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<tr>
<td>Magnesium sulfate IV</td>
<td>Bolus: 50 mg/kg/dose (25-75 mg/kg/dose; max 2 grams)</td>
<td>Recommended for adjunctive use for patients who have life-threatening exacerbations and those whose exacerbations remain in the severe category after 1 hr of intensive conventional therapy. In patients with acute exacerbation who have been maximized on standard therapy, intravenous magnesium sulfate has been shown to reduce hospitalizations and to improve lung function without significant side effects.</td>
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<tr>
<td><strong>Inhaled Corticosteroids</strong></td>
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<tr>
<td>budesonide (PULMICORT) nebulizer</td>
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<td>fluticasone (FLOVENT HFA)</td>
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<td>fluticasone-salmeterol (ADVAIR)</td>
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<tr>
<td>fluticasone-salmeterol (ADVAIR-HFA)</td>
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<tr>
<td>beclomethasone (QVAR)</td>
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<td></td>
<td>Nebulizer: 0.25 to 0.5mg every 12hrs</td>
<td>Continue home medication while hospitalized.</td>
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<td>Consider initiating ICS for patients with persistent asthma if not already receiving.</td>
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<td>All corticosteroid inhalers:</td>
<td>Use stepwise treatment approach to determine indication and dosage of inhaled corticosteroid.</td>
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<td>Give in divided doses twice daily</td>
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<td></td>
<td>44 mcg inhaler</td>
<td>Combination LABA/corticosteroid inhalers require a trial of an inhaled corticosteroid first.</td>
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<td>110 mcg inhaler</td>
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<td>220 mcg inhaler</td>
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<td>All corticosteroid inhalers:</td>
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<td>Give in divided doses twice daily</td>
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<td>100 – 50 inhaler</td>
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<td>250 – 50 inhaler</td>
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<td>500 – 50 inhaler</td>
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<td>45 – 21 mcg inhaler</td>
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<td>115 – 21 mcg inhaler</td>
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<td>230 – 21 mcg inhaler</td>
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<td>40 mcg/act inhaler</td>
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<td>80 mcg/act inhaler</td>
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<tr>
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<tr>
<td>Adjunctive Oral Therapy</td>
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<tr>
<td>Montelukast (SINGULAIR)</td>
<td>1 tablet orally at bedtime:</td>
<td>Singulair (montelukast) may be used as adjunct therapy to an inhaled corticosteroid.</td>
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<td>4 mg chew tablet or granules (1–5 yrs)</td>
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<td>5 mg chew tablet (6–14 yrs)</td>
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<td></td>
<td>10 mg tablet (15 yrs)</td>
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<tr>
<td>Cetirizine (Zyrtec)</td>
<td>2-5 years: 2.5mg suspension</td>
<td>Non-sedating antihistamine may be used as adjunct therapy to an inhaled corticosteroid (if allergy symptoms present).</td>
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<td>&gt;5 years: 5 – 10 mg tablet or suspension</td>
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Care Process Model

ALGORITHM'S

Initial treatment (If not already done in ED / Urgent Care):
- 3 inhaled bronchodilator treatments q20min or 1 continuous nebulizer for 1 hour (See Ambulatory algorithms for details)
  - Obtain PRAM Score, proceed to algorithm below
- Give supplemental O2 if O2sat < 90%

Very Mild
PRAM (1-2)

Q-4hr / Q2hr PRN albuterol

PRAM < 3?
Yes
Prep for discharge
Continue q4hr x 24hr, then follow up with PCP
No
PRAM 3-4?
Yes
Return to Moderate Phase
No
Return to Mild Category

Mild
PRAM (3-4)

Q2hr / Q1hr PRN albuterol
Consider systemic steroids

PRAM < 3?
Yes
Proceed to Very Mild Phase
No
Proceed to Moderate Phase

Moderate
PRAM (5-6)

Q2hr/0.1hr PRN albuterol
Start and/or continue systemic steroids

PRAM < 5?
Yes
Proceed to Mild Phase
No
Proceed to Severe Phase

Severe
PRAM (9-12)

Albuterol nebs q20min x 3 or continuous albuterol 0.20 mg/hr for 1 hour
Consider SQ/IM opt IV map sulfate
Start and/or continue systemic steroids

If PRAM is still 9-12, consider transfer to PICU

Criteria for PICU Consultation / Transfer:
- Requiring q2hr albuterol longer than 6-8 hours
- Requiring more than 1 hr of continuous albuterol nebulizer

Discharge Planning:
Discharge Criteria:
- Must be off oxygen for at least 4 hours
- Tolerating PO without difficulty
- Not requiring albuterol more than every 3-4 hours

Additional Items for Discharge:
- Initiation of maintenance therapy if meets criteria
- Completion of asthma action plan
- Asthma teaching with promotion of spacer / mask

Albuterol Dosing:
- For <20kg, give 2.5mg neb / 4 puffs
- For ≥ 20kg, give 5mg neb / 8 puffs

Atrovent / ipratropium Dosing:
- 500mcg (0.5mg) neb

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**EMERGENCY DEPARTMENT**

**Initial Assessment:**
History and PE with oxygen saturations and PEF if available

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**Mild-Moderate**
(Mild to Moderate WOB with intermittent to diffuse wheezing; Dyspnea interferes with activity; PEF 40-69%)
- Oxygen to keep sats > 90%
  - ≤ 20kg: 2.5mg albuterol/0.5mg Atrovent q20 pm x 3 doses
  - >20kg: 5mg albuterol/0.5mg Atrovent q20min x 3
  - Consider systemic steroids

- Reassess after albuterol treatments for admission criteria. Discharge to home if stable with PCP follow-up and Parent Education

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**Moderate to Severe (Moderate to severe WOB with diffuse wheezing and poor air movement; Dyspnea at rest and interferes with conversation; PEF 25-40%)**
- Oxygen to keep sats > 90%
  - ≤ 20kg: 10mg albuterol/1.5mg Atrovent continuous x 1hr
  - > 20kg: 20mg albuterol/1.5mg Atrovent continuous x 1hr
  - Load with systemic steroids

- Reassess after 1 hour; May Repeat
- Reassess for admission criteria. Follow inpatient algorithm if admitted.
- If not meeting admission criteria, discharge to home if stable.
- Recommend albuterol q4hrs for 24hrs and systemic steroids for 3-5 days with 24hr PCP follow-up and Parent Education

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**Life Threatening**
(Severe WOB with diminished to no air movement; Too dyspneic to speak; PEF <25%)
- Oxygen to keep sats > 90%
  - ≤ 20kg: 15mg albuterol/1.5mg Atrovent continuous
  - >20kg: 30mg albuterol/1.5mg Atrovent continuous
  - Load with systemic steroids; consider IV methylprednisolone or IM dexamethasone
  - Consider adjunct medications

- Reassess after 1 hr; May Repeat
- Admission to Peds or PICU pending reassessment at 1hr
METRICS

These metrics are to serve as important elements in the creation of the templates in the electronic medical record and will be collected and reported as they become available in our information systems.

The following metrics will be used by Mission Health as a measure of the quality care we provide. These measures are based on national standards of care and signal critical points in the care of adolescents with asthma.

**Average Length of Stay (LOS):** Calculated by dividing the sum of inpatient days by the number of patient admissions with a diagnosis of appendicitis.

**Average Cost per Case:** Calculated by dividing the sum of costs for patients with a diagnosis of appendicitis by total number of patient admissions

**Albuterol doses:**

**Ipratropium (Atrovent) doses:**

**Steroid dosing:**

**CXR use**

**PICU admissions**

**# of kids who receive asthma education**

**# of kids who receive asthma action plan**

**Readmissions within 10 days**

**No X-ray for those who already have asthma diagnosed and treating at home**

**ED visits that result in admission/ED visit diagnosis of asthma**

**Of the Pts that have ED visit with asthma how many doses of albuterol and atrovent + which steroid and dose of steroid, did they get x-ray or not? (will help member hospitals too) Note: new diagnosis would have x-ray**
RESOURCES

Includes patient education and patient engagement materials

Search Cerner Depart
REFERENCES


ADDITIONAL REFERENCES


ADDITIONAL REFERENCES (continued)

## APPENDIX – PEDIATRIC RESPIRATORY ASSESSMENT MEASURE²

<table>
<thead>
<tr>
<th>Signs</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suprasternal Retractions</td>
<td>Present</td>
<td></td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Scalene Muscle Contraction (Neck Accessory Muscles)</td>
<td>Present</td>
<td></td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>Air Entry</td>
<td>Absent OR Minimal</td>
<td>Widespread decrease</td>
<td>Decreased at bases</td>
<td>Normal</td>
</tr>
<tr>
<td>Wheezing</td>
<td>Silent check with</td>
<td>Inspiratory and</td>
<td>Expiratory Only</td>
<td>Absent</td>
</tr>
<tr>
<td>Oxygen Saturation in room air. (If an oxygen take off</td>
<td>minimal air entry</td>
<td>Expiratory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for 2 minutes OR until O₂ sat is &lt; 92%, whichever</td>
<td>OR Audible without</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>occurs first)</td>
<td>stethoscope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;92%</td>
<td>92-94%</td>
<td>&gt;95%</td>
<td></td>
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</tbody>
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