

Inpatient Management of Acute Asthma Exacerbation

Version: 4

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1.0 Introduction

Asthma is a chronic inflammatory disorder characterized by variable and recurring symptoms of airflow obstruction that manifest secondary to bronchoconstriction, airway hyper-responsiveness, and airway edema, which tend to occur in response to a variety of stimuli. Asthma exacerbations are a leading cause of hospitalization in children.

The hallmark of asthma exacerbation management involves optimizing bronchodilation and decreasing airway inflammation. While these elements are generally well-practiced, there continues to be significant variability in practice which can hinder optimal management and increase the duration of acute symptoms. Furthermore, inconsistencies in asthma teaching and associated preventative recommendations that are given to families have been reported, which lead to confusion, patient and caregiver dissatisfaction, and poor asthma control. It is therefore essential that consistent and thorough asthma education be provided and prevention strategies initiated while in hospital with appropriate post discharge follow up in the community.

The recommendations presented in this guideline and the associated pathway have been created using an interdisciplinary panel of experts and key users following extensive review of the literature, existing guidelines, and benchmarking with other reputable institutions.

Objectives

In the target population, the objectives of this guideline are to:

- Streamline the medical management of inpatients admitted to Paediatric Medicine with an acute asthma exacerbation;
- Improve appropriate diagnostic testing;
- Provide optimal pharmacotherapy to prevent or minimize adverse effects of therapy;
- Achieve appropriate length of stay by establishing a standard salbutamol-weaning protocol;
- Standardize and promote effective asthma teaching using an asthma checklist;
- Ensure appropriate ongoing asthma management through initiating and adhering to an asthma action plan;
- Prevent recurrent asthma exacerbations and minimize the need for Emergency Department visits and/or hospitalizations secondary to poor asthma control by ensuring appropriate follow-up;
- Ensure appropriate targets are met for discharge to minimize readmission rates (i.e., spirometry);
- Ensure access to medications to prevent readmissions; and
- Enhance appropriate utilization of community resources and ensure appropriate follow up.

Target Users

Include, but are not limited to:

- Inpatient physicians, nurses, nurse practitioners, physician assistants, and trainees
- Respiratory Therapists
- Pharmacists
- Patients and families

2.0 Clinical Recommendations

Target Population:

- **Inclusion:** This management pathway is intended primarily for use in children age > 12 months of age. Caution should be used when applying this pathway to children < 2 years of age with wheeze in the context of a first time severe viral infection.
- **Exclusion:** special populations that may have another cause of wheezing including:
 - Congenital or acquired cardiovascular disease
 - Cystic fibrosis
 - Chronic lung disease or bronchopulmonary dysplasia
 - Immunodeficiency syndromes
 - Sickle Cell Disease
 - Multiple co-morbidities

Diagnosis:

- In school-aged children > 6 years old and adolescents, prior diagnosis of asthma using pulmonary function tests is ideal
- In children 1 to 5 years of age, the diagnosis of asthma should be considered if there is a history of ≥ 2 wheezing episodes or frequent (≥ 8 days/month) wheeze symptoms
 - Diagnosis requires documentation of or convincing parent report of signs or symptoms of airflow obstruction and improvement or reversibility of obstruction with asthma therapy and no suspicion of an alternative diagnosis

Assessment:

- Thorough history, including:
 - Previous asthma exacerbations & baseline control:
 - Number of ED visits, hospital admissions, ICU admissions
 - Number of times child received oral corticosteroids and last use
 - Baseline: use of salbutamol, nighttime symptoms, and exercise intolerance
 - Potential triggers for exacerbation i.e. cigarette smoke, food and allergies, environmental irritants
 - Current exacerbation:
 - Severity of symptoms compared to previous exacerbations
 - Current medications, use of aerochamber, and response to medication
 - Diseases aggravated by steroid therapy (diabetes, hypertension, ulcers, psychosis)
 - Social issues i.e. access to medication, exposure to irritants

<p>Physical examination including an assessment of overall severity of exacerbation:-</p> <ul style="list-style-type: none"> ▪ Vital signs and pulse oximetry ▪ Level of alertness ▪ Respiratory distress: including ability to speak in sentences, cyanosis/pallor, work of breathing, and degree/quality of wheeze and aeration) ▪ Pediatric Respiratory Assessment Measure (PRAM) score used in the Emergency Department (ED) and Respiratory Assessment Criteria (RAC) used on the inpatient unit ▪ Level of hydration <ul style="list-style-type: none"> ○ Assess for signs suggestive of complications (pneumothorax, pneumomediastinum, pneumonia) or of upper airway obstruction (croup, foreign body, etc.)
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<p>Diagnostic Tests:</p> <ul style="list-style-type: none"> • Blood work, nasopharyngeal swabs*, and chest imaging are NOT recommended for routine management of a patient with an acute asthma exacerbation <ul style="list-style-type: none"> ○ Consider checking serum potassium in patients who are receiving Ventolin Q1h or less for a prolonged period of time (6 hours or longer) ○ Consider checking blood gases in patients who are in severe respiratory distress and not improving with treatment ○ Consider nasopharyngeal swab if high suspicion for influenza with intention to start Tamiflu if positive or on patients with severe asthma for whom the asthma escalation pathway has been initiated. Consider chest imaging in patients who fail to respond to treatment in 48 hours, develop increasing oxygen requirements, develop a new fever that in is not explained by the physical examination, or have an atypical asthma exacerbation presentation without a previous chest x-ray • Spirometry should be ordered for children ≥ 8 years old once stable during admission in order to provide an objective comparison measure of lung function. If the FEV₁ < 40, consult Respiratory Medicine to ensure adequate follow up with a respirologist

<p>Alternative treatments:</p> <ul style="list-style-type: none"> • The following treatments are NOT routinely recommended for asthma management: <ul style="list-style-type: none"> ▪ Methylxanthines ▪ Chest physical therapy ▪ Mucolytics ▪ Sedation and intubation
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Management	
Basic Management	Inpatient management of an acute asthma exacerbation involves opening up the airways with bronchodilators, decreasing airway inflammation with steroids, supportive care to ensure that the patient is clinically stable, well oxygenated, and well hydrated, and the initiation of interventions (asthma prevention therapy and asthma teaching) to reduce the risk of future exacerbations.
Assessment of Asthma Severity	<ul style="list-style-type: none"> • There are no asthma severity scoring tools that have been validated for use in the inpatient setting. • Using the best available evidence, the consensus of the Guideline Committee was to use the Respiratory Assessment Criteria (RAC) adapted from the Children's Hospital of Philadelphia to assess Asthma Severity and direct pathway interventions accordingly.
Oxygen Therapy	<ul style="list-style-type: none"> • There is a lack of evidence to specify an oxygen saturation (by pulse oximetry) threshold below which supplemental oxygen is indicated. The consensus of the guideline committee using best available evidence recommends starting

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	<p>supplemental oxygen when the saturation is consistently < 90% while breathing room air when awake or < 88% while breathing room air when asleep.</p> <ul style="list-style-type: none"> • Intermittent oxygen saturation monitoring should be used for any child not requiring continuous oxygen therapy.
Bronchodilator therapy	<ul style="list-style-type: none"> • Salbutamol is the bronchodilator of choice and frequency of administration should reflect the respiratory assessment criteria. • Administration of salbutamol is recommended using a metered dose inhaler (MDI) with an appropriate-sized spacer and mask (if under 4 years old). <ul style="list-style-type: none"> ▪ Compared with a nebulizer, administration via an MDI and spacer is better tolerated, associated with decreased adverse effects, decreased length of stay, and has been found to be more effective at medication administration. Use of a nebulizer may be considered in managing patients with severe respiratory distress and impending respiratory failure who may require continuous or passive medication administration with concurrent high flow oxygen administration.
Steroid Therapy	<ul style="list-style-type: none"> • Systemic corticosteroids are essential in the treatment of the acute asthma exacerbation • Dexamethasone, Prednisone, Prednisolone, and IV Methylprednisolone are frequently used medications in the management of patients with an acute asthma exacerbation <ul style="list-style-type: none"> ▪ There is a lack of evidence to suggest that the use of any of these medications is superior to the others. The consensus of the Guideline Committee is to recommend a 2-day course of dexamethasone for the treatment of the routine acute asthma exacerbation. Considerations included were palatability, duration of treatment, half-life, side effects, and cost to families. • Inhaled corticosteroids (ICS) are not as effective as PO or IV steroids for the acute management of exacerbations and should not be used for this purpose.
Ipratropium Bromide	<ul style="list-style-type: none"> • There is no evidence to support the inpatient use of ipratropium to manage acute asthma exacerbations.
IV Magnesium Sulphate	<ul style="list-style-type: none"> • Consider the use of IV magnesium sulphate in cases of severe asthma that do not appear to be improving despite aggressive management with bronchodilator and corticosteroid therapy
Asthma Prevention Strategy	<ul style="list-style-type: none"> • ICS are critical in the long-term control of asthma symptoms and should be started or restarted at discharge following the course of systemic corticosteroids <ul style="list-style-type: none"> ▪ In line with the <i>Canadian Paediatric Society's</i> recommendations, the Guideline Committee recommends a 12-week trial of a medium daily dose of ICS ▪ In patients already on a combination ICS/LABA, continue on prescribed medication or consult Respiriology • Asthma education is a key part of prevention and is a fundamental element in inpatient management. The Guideline Committee recommends that the Asthma Teaching Checklist and Action Plan are reviewed thoroughly prior to discharge with ongoing utilization of these resources in the community with their primary care provider.
Monitoring and Progression through the Pathway:	
<ul style="list-style-type: none"> ○ Repeated clinical assessment should be conducted based on Respiratory Assessment Criteria and Bedside PEWS criteria for monitoring 	

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- Weaning of salbutamol is based on asthma severity
- Seek medical reassessment for patients who are worsening or whose symptoms persist despite aggressive management

CCRT should be consulted and the Asthma Escalation Pathway initiated for patients with severe asthma who require salbutamol < Q1hourly and/or have increasing oxygen requirements

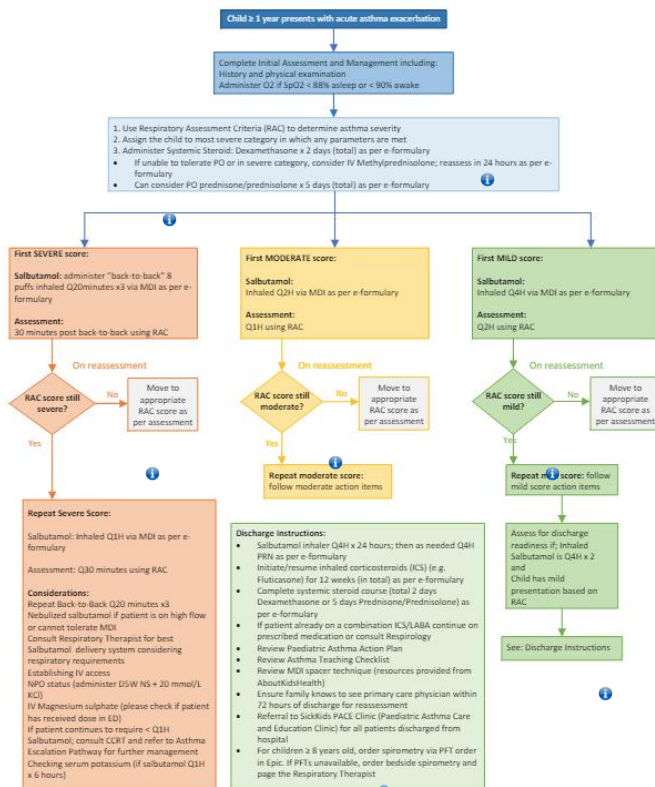
- For children ≥ 8 years old, order spirometry via PFT order in Epic. If PFTs unavailable, order bedside spirometry and page the Respiratory Therapist

Discharge and Follow Up:

- The interdisciplinary team should begin discharge planning on admission
- Discharge planning involves initiation of ICS once acute management is complete, ensuring teaching has been performed, and establishing follow up plans with an asthma action plan in place
- The Guideline Committee recommends follow up within 72 hours of discharge for reassessment of acute symptoms
- Referral to the Paediatric Asthma Care and Education Clinic (PACE) is recommended for all patients discharged from hospital

Inpatient Asthma Exacerbation Management Recommendations

INPATIENT ASTHMA EXACERBATION MANAGEMENT



History to include:

1. Medical History
2. Medication usage prior to admission
3. Asthma symptoms prior to admission
4. Triggers
5. Asthma Risk Factors
6. Current asthma exacerbation: time of onset

Full list of questions found in Policy & Procedure

Physical Exam to include:

- Assess the severity of the exacerbation
- Vital signs and pulse oximetry
- Level of alertness
- Hydration status
- Presence of cyanosis, pallor
- Respiratory distress
- Wheezing, decreased aeration
- Identify complications: pneumonia, pneumothorax, and pneumomediastinum.)
- Rule out upper airway obstruction (croup, foreign body, etc.)

Respiratory Assessment Criteria	
Severe	Mild
<ul style="list-style-type: none"> • Severely increased respiratory effort (e.g. indrawing, audible grunts, nasal flaring, tracheal tugging, accessory muscle use, sibilant expiratory wheeze) • Respiratory Rate: significantly increased for age (refer to table) • Wheeze: inspiratory and expiratory wheezing and/or absent (silent chest) • Aeration: decreased throughout lung fields • Prolonged expiration • SpO2 < 98% asleep and < 92% awake on supplemental oxygen • No difficult speaking (if developmental/age appropriate) • No change in mental status 	<ul style="list-style-type: none"> • Moderately increased respiratory effort (e.g. marked indrawing, nasal flaring) as per bedside PEAC • Respiratory Rate: moderately increased for age (refer to table) • Wheeze: audible wheeze present predominantly/intermittently • No prolonged expiration • SpO2 > 98% asleep and > 92% awake on supplemental oxygen • No difficult speaking (if developmental/age appropriate)

Age	Severe to Moderate	Moderate to Mild	Severe
≥ 1 yr - < 5 yrs	< 40	41 - 50	≥ 60
5 yrs - < 12 yrs	≤ 30	31 - 39	≥ 40
≥ 12 yrs	< 20	21 - 29	≥ 30

The following treatments are NOT routinely recommended for asthma management:

- Methylxanthines
- Antibiotics except as needed for comorbid conditions
- Cardiopulmonary physical treatment
- Muscolytics
- Sedation

For children with the following comorbidities, exercise caution when applying this algorithm; consider individual context and appropriate consultation when indicated:

- Congenital or acquired cardiovascular disease
- Cystic Fibrosis
- Chronic lung disease or bronchopulmonary dysplasia
- Immunodeficiency syndromes
- Sickle Cell Disease
- Multiple co-morbidities
- On beta blocker

The following investigations are NOT routinely recommended for acute asthma exacerbation management:

- Chest X ray (consider in patients who fail to respond to treatment in 48 hours, develop increasing oxygen requirements, develop a new fever that is not explained by the physical examination, or have an atypical asthma exacerbation presentation)
- Viral testing not recommended. Consider nasopharyngeal swabs if high suspicion for influenza with intention of starting Tamiflu if positive or in patients with severe asthma for whom the asthma escalation pathway has been initiated.

PRINTABLE VERSION OF ASTHMA CARE PATHWAY

3.0 Evaluation Plan

Evaluation Plan

- Continue to trend data for the following regarding use of RAC scoring and associated interventions:
 - Number (#) of patients admitted with acute asthma exacerbations from the Emergency Department to the Paediatric Medicine inpatient wards;
 - Average length of stay of patients admitted with acute asthma exacerbations;
 - # of patients admitted to Paediatric Medicine that required transfer to the PICU;
 - # of patients readmitted with acute asthma exacerbations within 7 days of discharge from the hospital;
 - # of patients representing to the Emergency Department within 48 hours of discharge with recurrence of asthma symptoms;

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5.0 References

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Attachments:

[Asthma Escalation Pathway September 21 2017.docx](#)

[Asthma Pathway Printable Version May 28.pdf](#)

[Asthma Exacerbation History Questions 2024.docx](#)