

# Asthma Exacerbation: Adult & Pediatric

## Respiratory

### Clinical Decision Tools for RNs with Additional Authorized Practice [RN(AAP)s]

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## Background

Asthma is a chronic, inflammatory, obstructive disease of the airways characterized by repeated episodes of wheezing, shortness of breath, and cough due to reversible airflow obstruction and bronchial hyper-responsiveness (Brashers & Huether, 2019; Winland-Brown, Beausejour, & Porter, 2019). An asthma exacerbation is a worsening of respiratory symptoms (wheezing, breathlessness, chest tightness, and cough) in a client with a pre-existing diagnosis of asthma (Brashers & Huether, 2019; Winland-Brown et al., 2019). Exacerbations are considered a progression of asthma beyond good control of symptoms and/or are severe enough to require an increase or adjustment of current medications. Asthma is classified as mild, moderate, or severe (Winland-Brown et al., 2019). This CDT is to be used to manage exacerbations of clients previously diagnosed with asthma. The signs and symptoms of asthma exacerbation are listed according to severity, with those classified as moderate and severe requiring immediate consultation.

## Immediate Consultation Requirements

The RN(AAP) should seek immediate consultation from a physician/NP if moderate to severe asthma exacerbation (see *Classification* section) or any of the following circumstances exist:

- Pediatric Respiratory Assessment Measure (PRAM) score greater than three, refer to Objective Findings;
- infants less than six months of age;
- preterm infants up to one year of age;
- diagnosis of asthma has not been confirmed;
- acute respiratory distress, demonstrated by difficulty speaking; marked use of accessory muscles of respiration; breath sounds decreased in intensity; diffuse, high-pitched wheezes (inspiratory, expiratory, or both); and oxygen saturation by pulse oximeter (SpO<sub>2</sub>) < 90;
- agitated, diaphoretic;
- altered level of consciousness;
- no relief afforded by beta2-agonists ( $\beta$ 2-agonists); and/or

- status asthmaticus or severe bronchospasm characterized by: a "silent chest", no audible air movement (poor air entry, no wheezing) in a client with a history of asthma that presents in acute respiratory distress.

If any of the Immediate Consultation circumstances exist, the RN(AAP) should initiate continuous oximetry and seek orders from a physician/NP or refer to an applicable RN Clinical Protocol within RN Specialty Practices to authorize cardiac monitoring (if available), oxygen by non-rebreather mask, and intravenous therapy (Brashers & Huether, 2019; Interprofessional Advisory Group [IPAG], personal communication, October 20, 2019; Trottier, Chan, Allain, Chauvin-Kimoff, & Canadian Pediatric Society, 2021).

## Predisposing and Risk Factors

Predisposing and risk factors for asthma exacerbation include:

- less than five years of age;
- familial tendency (asthma or eczema);
- frequent, viral infections of the respiratory tract (especially respiratory syncytial virus (RSV) in young children);
- overcrowded housing;
- exposure to dust, mold, or poor status of housing (e.g., exposed drywall, insulation, increased humidity);
- delay in seeking medical care;
- recurrent pneumonia;
- poorly controlled asthma defined as: frequent asthma attacks (more than two per week); recent severe attack; recent visit to emergency room or admission to hospital or ICU for asthma; duration of current symptoms > 24 hours; or non-adherence to pharmacological treatment;
- exposure to environmental factors such as cigarette smoke, wood smoke, forest fires, cold air, pollen;
- medications, particularly beta-blockers, aspirin, aspirin-containing drugs or nonsteroidal anti-inflammatory drugs;
- exercise;
- psychological circumstances triggering increased emotional responses (e.g., fear, anger, crying); and/or
- atopic dermatitis (current or history of) (Richardson, 2020; Winland-Brown et al., 2019).

## Health History and Physical Exam

### Subjective Findings

The circumstances of the presenting complaint should be determined. These include:

- dry, persistent cough;
- recurrent wheeze (absence does not rule out asthma);
- recurrent episodic dyspnea or breathlessness;

- recurrent chest tightness;
- inability to talk or speaking in one-word answers;
- diaphoresis;
- reports of air hunger;
- fatigue secondary to sleep disturbance;
- poor infant feeding;
- symptoms that are worse at night or in the early morning;
- adherence and/or frequency of medication use;
- concurrent atopic symptoms or history of eczema, seasonal allergies; conjunctivitis, rhinitis and sneezing; and
- absence from school or work (Trottier et al., 2021; Richardson, 2020; Winland-Brown et al., 2019).

Assess for symptoms that worsen in relation to the following factors:

- airborne chemicals or dust;
- animals with fur or feathers;
- changes in weather;
- exercise;
- gastroesophageal reflux;
- sensitivity to acetylsalicylic acid (ASA), other nonsteroidal anti-inflammatory drugs (NSAIDs), and sulfites;
- exposure to dust mites (mattresses, furniture, carpets);
- menses;
- mold/pollen;
- night time awakening;
- smoke (tobacco, wood, etc.);
- strong emotional expression (laughing, crying hard); and
- viral infection/rhinitis/sinusitis (Winland-Brown, 2019).

The RN(AAP) should also enquire about previous admissions to hospital including life-threatening events, admissions to intensive care unit (ICU), intubation, and deterioration while on systemic steroids (Trottier et al., 2021).

## Objective Findings

Physical findings consistent with mild, moderate, and severe asthma exacerbation are:

### Classification of Asthma

Mild	Moderate	Severe
<ul style="list-style-type: none"> <li>• exertion-related dyspnea, no acute distress and normal activity;</li> <li>• normal mental status;</li> <li>• speech unaffected by symptoms;</li> <li>• cough;</li> <li>• respiratory rate normal or minimally elevated;</li> <li>• absent or minimal intercostal retractions;</li> <li>• normal heart rate;</li> <li>• low-pitched wheezes (inspiratory or expiratory, or both, or none);</li> <li>• good response to short-acting <math>\beta_2</math>-agonists;</li> <li>• SpO<sub>2</sub> &gt; 94% on room air; and</li> <li>• peak flow versus personal best is &gt; 80%.</li> </ul>	<ul style="list-style-type: none"> <li>• may appear agitated;</li> <li>• decreased activity level or infant feeding;</li> <li>• speaks in phrases;</li> <li>• intercostal and substernal retractions present;</li> <li>• dyspnea at rest (appears short of breath);</li> <li>• respiratory rate elevated;</li> <li>• tachycardia;</li> <li>• congested cough;</li> <li>• tightness of the chest;</li> <li>• audible wheeze (high pitched wheezes in all lung fields -- inspiratory or expiratory, or both);</li> <li>• nocturnal symptoms;</li> <li>• <math>\beta_2</math>-agonists needed &gt; q4h (may only provide partial relief);</li> <li>• preceding or current URTI;</li> <li>• SpO<sub>2</sub> 92-94% on room air; and</li> <li>• peak flow versus personal best is 60 to 80%.</li> </ul>	<ul style="list-style-type: none"> <li>• agitated, drowsy, or confused;</li> <li>• dyspnea at rest (interferes with conversation, speaks in single words);</li> <li>• significant accessory muscle use and may display nasal flaring;</li> <li>• wheezes audible without a stethoscope;</li> <li>• SpO<sub>2</sub> &lt; 92% on room air;</li> <li>• peak flow versus personal best is &lt; 60%; and</li> <li>• only partial relief achieved with frequent inhaled short-acting <math>\beta_2</math>-agonist.</li> </ul>

(Trottier et al., 2021; Winland-Brown et al., 2019)

After initial assessment of the pediatric patient, Trottier et al. (2021) recommend that the provider categorize disease severity using an objective clinical tool such as the Clinical Assessment Score or the Pediatric Respiratory Assessment Measure (PRAM). The PRAM is a 12-point clinical scoring rubric that is validated for children ages one to 17 years old. The total score for each of the signs is added together to determine asthma severity.

**Pediatric Respiratory Assessment Measure (PRAM):**

Signs	Score				Notes
	0	1	2	3	
Suprasternal retraction	absent	----	present	----	Visual assessment of indrawing of the skin above the sternum and between the sternocleidomastoid muscle with every breath.
Scalene muscle contraction	absent	----	present	----	Scalene muscles are located in the floor of the lateral aspect of the neck. This is a palpable assessment.
Wheezing	absent	expiratory only	inspiratory and expiratory	audible without a stethoscope	At least two auscultation zones must be affected to influence the rating.  In case of asymmetry use the two most severely affected auscultations zones for scoring purposes.
Air Entry	normal	decreased/absent at base(s)	decreased at the apex and the base	Minimal or absent	In cases of asymmetry, the most severely affected lung determines the rating.
Oxygen saturation	≥ 95%	92-94%	< 92%	----	Measured on room air. Turn off supplemental oxygen for reassessment(s).

(Adapted from BC Children's Hospital, 2015)

Interpreting total scores: 0-3 points: Mild Asthma

4-7 points: Moderate Asthma 8-12 points: Severe Asthma

## Differential Diagnosis

The following should be considered as part of the differential diagnosis:

- anaphylaxis,
- hyperventilation syndrome,
- mitral valve prolapse,
- recurrent pulmonary emboli,
- congestive heart failure,
- chronic obstructive pulmonary disease,
- acute bronchiolitis,
- hypersensitivity pneumonitis,
- habitual cough,
- tuberculosis,
- foreign body aspiration,
- viral infection,
- cystic fibrosis,
- gastroesophageal reflux disease,
- vocal cord dysfunction,
- congenital pulmonary malformations (e.g., tracheoesophageal fistula),
- bronchopulmonary dysplasia, and
- cough secondary to use of certain medications (e.g., angiotensin converting enzyme (ACE) inhibitors, beta blockers, aspirin, NSAIDs) (Richardson, 2020; Winland-Brown, 2019).

## Making the Diagnosis

The diagnosis is based on subjective and objective findings in clients with a previous diagnosis of asthma. A key feature in making the determination of asthma is the reversibility of the condition (Winland-Brown et al., 2019).

## Investigations and Diagnostic Tests

Investigation and diagnostic tests are determined in consultation with a physician/NP and may include spirometry and/or peak expiratory flow meters to measure the degree of airway obstruction (Trottier et al., 2021).

Additional tests, such as chest x-rays and blood gases, are not routinely recommended unless complications are suspected or the client does not improve with conventional therapy (Trottier et al., 2021; Winland-Brown et al., 2019). Suspicion of a concurrent infection may warrant the need for a sputum test for culture and sensitivity and a complete blood count (Winland-Brown et al., 2019).

# Management and Interventions

## Goals of Treatment

The primary goals of immediate treatment are to determine the severity of the exacerbation, relieve symptoms by reversing airflow obstruction and correcting hypoxemia, prevent complications, and prevent recurrence (Trottier et al., 2021; Richardson, 2020; Winland-Brown et al., 2019).

## Non-Pharmacological Interventions

The RN(AAP) should foster an environment that promotes relaxation, avoidance of known triggers to support effective oxygenation and effective assessment of symptoms (Richardson, 2020; Winland-Brown, 2019).

## Pharmacological Interventions

The pharmacological interventions recommended for the treatment of mild asthma exacerbation are in accordance with the *RxFiles Drug Comparison Charts* (RxFiles Academic Detailing Program, 2021) and the *Canadian Paediatric Society* (Trottier et al., 2021).

### Bronchodilators for Acute Exacerbation

Initial treatment in the clinic setting for mild exacerbation is provided in the following table. Delivery using a metered dose inhaler (MDI) with spacer is preferred to nebulizer delivery. Metered dose inhaler with spacer is more time efficient and cost effective. If medications are given by nebulizer, salbutamol and ipratropium can be mixed and administered together.

	Drug	Dose	Route	Frequency	Duration
<b>Pediatric (≤ 12 years of age)</b>					
	Salbutamol	< 20 kg = 5 puffs (100 mcg/puff) > 20 kg = 10 puffs (100 mcg/puff)	inhalation using MDI with a spacer	q20min x 3 doses	n/a
OR	Salbutamol	< 20 kg = 2.5 mg in solution > 20 kg = 5 mg in solution	inhalation via nebulizer	q20min x 3 doses	n/a
AND/ OR	Ipratropium bromide	< 20 kg = 3 puffs (20 mcg/puff) > 20 kg = 6 puffs (20	inhalation using MDI with a spacer	q20min x 3 doses maximum	n/a

		mcg/puff)			
	Drug	Dose	Route	Frequency	Duration
OR	Ipratropium bromide	< 20 kg = 0.25 mg > 20 kg = 0.5 mg	inhalation via nebulizer	q20min x 3 doses maximum	n/a
<b>Pediatric (&gt; 12 years of age) and Adult</b>					
	Salbutamol	10 puffs (100 mcg/puff)	inhalation using MDI with a spacer	q20min x 3 doses	n/a
	Salbutamol	2.5 to 5 mg in solution	inhalation via nebulizer	q20min x 3 doses	n/a
	Ipratropium bromide	6 puffs (20 mcg/puff)	inhalation using MDI with a spacer	q20min x 3 doses maximum	n/a
	Ipratropium bromide	0.5 mg in solution	inhalation via nebulizer	q20min x 3 doses maximum	n/a

Reassess and re-categorize exacerbation severity of client after initial treatment (at one hour). If a full response is achieved, prepare the client for discharge. If a partial response is achieved, or the severity has escalated to moderate or severe, the RN(AAP) must consult a physician/NP for further management.

### Bronchodilator and Inhaled Corticosteroid Discharge Treatment

The RN(AAP) should assess the client's current asthma therapy (short-acting bronchodilators [SABD], inhaled corticosteroids). If the client is using therapy as prescribed, consult a physician/NP for continuing management at home. If the client is not on maintenance therapy or not using therapy as prescribed, the RN(AAP) should ensure clients have both a bronchodilator and inhaled corticosteroid prior to discharge from the clinic. Bronchodilators include salbutamol and terbutaline. Inhaled corticosteroids include fluticasone, beclomethasone, budesonide, ciclesonide, and mometasone.



	Drug	Dose	Route	Frequency	Duration
<b>Pediatric (≤ 12 years of age)</b>					
	Salbutamol	< 20 kg = 1 puff (100 mcg/puff) > 20 kg = 2 puffs (100 mcg/puff)	inhalation using MDI with a spacer	q4h prn	4 weeks
<b>Pediatric (≥ 6 years of age) and Adult</b>					
OR	Terbutaline	500 mcg = 1 inhalation	inhalation with turbuhaler	q4h prn	4 weeks
<b>Pediatric (&gt; 12 years of age) and Adult</b>					
	Salbutamol	1-2 puffs (100 mcg/puff)	inhalation using MDI with a spacer	q4h prn	4 weeks
	Drug	Dose	Route	Frequency	Duration
<b>Pediatric (≥ 1 year to ≤ 6 years of age)</b>					
	Fluticasone	1 puffs (50 mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks
	Beclomethasone	1 puff (50 mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks
	Ciclesonide	1 puff (100 mcg/puff)	inhalation using MDI with a spacer	once daily	4 weeks
<b>Pediatric (≥ 6 years to ≤ 12 years of age)</b>					
	Beclomethasone	1-2 puffs (50mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks
OR	Beclomethasone	1 puff (100mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks

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OR	Ciclesonide	1-2 puffs (100 mcg/puff)	inhalation using MDI with a spacer	once daily	4 weeks
OR	Fluticasone	1-2 puffs (50 mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks
OR	Mometasone	1 inhalation	Inhalation using twisthaler	once daily	4 weeks
<b>Pediatric (≥ 6 months to ≤ 12 years of age)</b>					
OR	Budesonide	0.5 mg (1 mg/2 mL solution)	inhalation via nebulizer	b.i.d.	4 weeks
<b>Pediatric (&gt; 12 years of age) and Adult</b>					
	Fluticasone	1-2 puffs (125 mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks
OR	Beclomethasone	1 puff (100mcg/puff)	inhalation using MDI with a spacer	b.i.d.	4 weeks
OR	Budesonide	1 mg (1 mg/2 mL solution)	inhalation via nebulizer	b.i.d.	4 weeks
OR	Ciclesonide	1 puff (200 mcg/ puff)	inhalation using MDI with a spacer	once daily	4 weeks
OR	Mometasone	1 inhalation 200 mcg/ puff)	inhalation using twisthaler	b.i.d.	4 weeks

## Oral Steroids

Routine use of oral corticosteroids for mild exacerbations is not recommended but their use should be considered if the client is requiring repeated doses of SABD at home (Trottier et al., 2021) Consultation with a physician/NP must occur prior to administration of steroids.

## Client and Caregiver Education

The RN(AAP) provides client and caregiver education as follows:

- Counsel about appropriate use of drugs including dosages, administration techniques (e.g., use of MDI with spacer), effects, and side effects.
- Counsel on how to minimize local side effects (oral candidiasis) by careful rinsing of the mouth and gargling.
- Advise to return to the clinic if there is no response to  $\beta_2$ -agonists or the response lasts less than four hours.
- Explain strategies to prevent further attacks by identifying and avoiding precipitating factors (e.g., avoid tobacco smoke, pollens).
- Provide and/or reinforce the use of an asthma action plan (Asthma Canada, n.d.).
- Educate about prevention and early management of respiratory infections.
- Avoid foods that exacerbate symptoms.
- Avoid medications (e.g., nonsteroidal anti-inflammatory drugs) which increase the risk of exacerbations.
- Encourage annual influenza vaccine and other relevant vaccines (e.g., pneumococcal) (Richardson, 2020; Winland-Brown et al., 2019).

## Monitoring and Follow-Up

Advise follow-up in 24 hours or less if symptoms are not controlled or condition becomes worse. If symptoms stabilize, the client should be reassessed in two to four weeks. A baseline peak expiratory flow rate should be determined when the client is stable.

## Complications

The following complications may be associated with asthma exacerbation:

- hypoxia,
- pneumonia,
- respiratory distress that may progress to respiratory failure,
- atelectasis,
- pneumothorax, and
- death (Richardson, 2020).

## Referral

Refer to a physician/NP if client presentation is consistent with those identified in the *Immediate Consultation Requirements* section or no response to prescribed medications after 24 hours IPAG, personal communication, October 20, 2019).

## References

Asthma Canada. (n.d.). Asthma action plan. <https://asthma.ca/get-help/asthma-3/control/asthma-action-plan/>

BC Children's Hospital. (2015). PRAM (Pediatric respiratory assessment measure) score assessment for asthma. [https://www.childhealthbc.ca/sites/default/files/BCCH%20PRAM%20score%20for%20assessment%20for%20Asthma%20\(2\).pdf](https://www.childhealthbc.ca/sites/default/files/BCCH%20PRAM%20score%20for%20assessment%20for%20Asthma%20(2).pdf)

Brashers, V., & Huether, S. (2019). Alterations of pulmonary function. In K. McCance & S. Huether (Eds.), *Pathophysiology: The biologic basis for disease in adults and children* (8th ed., pp. 1163-1201). Elsevier.

<https://www.cps.ca/en/documents/position/management-acute-asthma-exacerbation#ref16>

Richardson, B. (2020). *Pediatric primary care* (4th ed.). Jones & Bartlett Learning. <https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1884447&site=ehost-live&scope=site>

RxFiles Academic Detailing Program. (2021). *RxFiles: Drug comparison charts* (13th ed.). Saskatoon, SK: Saskatoon Health Region.

Trottier, E. D., Chan, K., Allain, D., Chauvin-Kimoff, L., & Canadian Pediatric Society. (2021). *Managing an acute asthma exacerbation in children* [Position Statement]. <https://cps.ca/en/documents/position/managing-an-acute-asthma-exacerbation>

Winland-Brown, J., Beausejour, B., & Porter, B. (2019). Inflammatory respiratory disorders. In L. Dunphy, J. Winland-Brown, B. Porter, & D. Thomas (Eds.), *Primary care: The art and science of advanced practice nursing – an interprofessional approach* (5th ed., pp. 397-424). F. A. Davis.

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