

DEFINITION

Asthma is a chronic inflammatory disease of the airways characterized by repeated episodes of wheezing, shortness of breath, and cough due to reversible airflow obstruction and bronchial hyper-responsiveness. In this situation, the client has a pre-existing diagnosis of asthma.

Exacerbations are considered a progression of asthma beyond good control of symptoms and/or severe enough to require an increase in medication.

Pediatric includes 1 to 17 years, 11 months, 29 days of age.

IMMEDIATE CONSULTATION REQUIRED IN THE FOLLOWING SITUATIONS

- Acute respiratory distress (moderate to severe exacerbation) as indicated by:
 - Difficulty speaking (unable to complete sentences)
 - Marked use of accessory muscles of respiration
 - Breath sounds decreased in intensity
 - Diffuse, high-pitched wheezes (inspiratory, expiratory or both)
 - SpO₂ < 90%
- Agitated, diaphoretic, and lethargic
- No prior relief afforded by β₂-agonists
- Status asthmaticus: beware of the silent chest (poor air entry, no wheezing) in a client with a history of asthma that presents in acute respiratory distress

CAUSES

Although the exact cause is unknown, three principle triggers for exacerbation of asthma have been identified:

1. Allergies and environmental factors
 - a. Allergens may include inhaled substance (e.g., molds, pollens, dust, animal danders, cosmetics, tobacco smoke).
 - b. Medications, particularly beta-blockers, aspirin, or aspirin containing drugs.
2. Infections
 - a. Upper respiratory tract infections (URTIs) are common precursors to an asthma attack.
 - b. Viral infections commonly precede an asthma attack.

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- i. In children < 6 years of age, wheezing episodes are commonly associated with a viral respiratory illness.
 - ii. In children < 2 years of age, the respiratory syncytial virus (RSV) is commonly associated with wheezing.
3. Psychological factors
- a. Stressful events at work or home or a series of crises may precipitate an asthma attack. Many times, the stressor is overlooked or dismissed.

Inflammation of the airways contributes to bronchial hyperreactivity, airflow limitation, and the resultant signs and symptoms of asthma: wheezing, breathlessness, chest tightness, and cough.

PREDISPOSING AND RISK FACTORS

- Severe or recurrent RSV infection
- Recurrent pneumonia
- Familial tendency
- Poorly controlled asthma
 - Frequent asthma attacks (> 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
 - Non-adherence to pharmacological treatment (inhaler usage)
- Long delay in seeking medical care
- Overcrowded housing
- Dust/mold/poor status of housing (e.g., exposed walls, insulation, increased humidity)
- Environmental factors such as cigarette smoke, wood smoke, forest fires, cold air
- Exercise
- Emotions (e.g., fear, anger, crying)
- Allergens
 - Recent exposure to known allergens (e.g., pollen)
 - Eczema (current or history of)
 - Frequent nose rubbing (crease across nose)
 - Watery eyes and nose

HISTORY

Table 1

Elements to Consider when Assessing Asthma Exacerbation

<p>History</p>	<ul style="list-style-type: none"> • Cough • Recurrent wheeze (absence does not rule out asthma) • Recurrent episodic dyspnea • Recurrent chest tightness • Compliance and/or frequency of medication use • Absence from school • Admission to hospital
<p>Symptoms worsen in relation to specific factors</p>	<ul style="list-style-type: none"> • Airborne chemicals or dust • Animals with fur or feathers • Changes in weather • Exercise • Gastroesophageal reflux • Sensitivity to ASA, NSAIDs, and sulfites • Dust mites in house (mattresses, furniture, carpets) • Menses • Mold/pollen • Night time (client awakens) • Smoke (tobacco, wood, etc.) • Strong emotional expression (laughing, crying hard) • Viral infection/rhinitis/sinusitis

Note. Adapted from *Primary care: The art and science of advanced practice nursing* (4th ed.), p. 249, by L. M. Dunphy, J. E. Winland-Brown, B. O. Porter, & D. J. Thomas, 2015, Philadelphia: F.A. Davis.

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PHYSICAL FINDINGS

Determining Severity

The severity of asthma is determined by the frequency and chronicity of symptoms, the presence of persistent airflow limitations, and the medication needed to maintain control of the condition.

Mild Exacerbation

- Exertion-related dyspnea, no acute distress
- Cough
- Respiratory rate normal or minimally elevated
- Low-pitched wheezes (inspiratory or expiratory, or both, or none)
- Good response (usually) to short-acting β_2 -agonists

Moderate Exacerbation

- Dyspnea at rest
- Congested cough
- Tightness of the chest
- Nocturnal symptoms
- β_2 -agonists needed > q4h
- Preceding or current URTI
- Allergy history
- Symptoms over previous 2-4 weeks
- Frequency of bronchodilator use (> 2 times per week)
- Activity level changes (e.g., missed work, sedentary activity)
- Hospital admissions for acute exacerbations
- Short of breath
- Respiratory rate elevated
- Some use of accessory muscles of respiration
- Audible wheeze
- High-pitched wheezes in all lung fields (inspiratory or expiratory, or both)
- β_2 -agonists provide only partial relief

Severe Exacerbation

- Signs and symptoms as per those indicated in the “Immediate Consultation Required in the Following Situations” section

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- Consultation with a physician/RN(NP) is recommended for treatment plan and evacuation
- Partial relief achieved with frequent inhaled short acting β_2 -agonists

The following table provides further clarification:

Table 2

Pediatric Respiratory Assessment Measure (PRAM):

Signs	0	1	2	3
Suprasternal indrawing	Absent		Present	Indrawing
Scalene retractions*	Absent		Present	Retractions
Wheezing	Absent	Expiratory	Inspiratory and expiratory	Audible without stethoscope
Air Entry	Normal	Decreased/absent at bases	Decreased widespread	Absent
Oxygen	> 95%	92-95%	< 92%	

Interpreting total scores:

0-4 points: Mild Asthma

5-8 points: Moderate Asthma

9-12 points: Severe Asthma

* Scalene retractions suprasternal retractions

Note. Adapted from *First Nations and Inuit health: Pediatric clinical guidelines for nurses in primary care*, p. 10-6, by Health Canada, 2011, Ottawa, ON: Author.

DIFFERENTIAL DIAGNOSIS

The younger the child, the greater likelihood that a diagnosis other than asthma may explain current wheezes. Wheezing does not always mean asthma, while asthma may be present without wheeze.

- Allergy

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- Aspiration
- Bronchiolitis
- Bronchopulmonary dysplasia
- Congenital anomalies/disease (e.g., heart, intrathoracic)
- Cystic fibrosis
- Foreign body aspiration
- Gastroesophageal reflux
- Immune system disorders
- Pertussis
- Tuberculosis
- Recurrent viral lower respiratory infection

COMPLICATIONS

- Restrictions in physical activity
- Psychological impact of chronic illness
- Localized bronchiectasis
- Status asthmaticus
- Death

INVESTIGATIONS AND DIAGNOSTIC TESTS

- Pulse oximetry
- Peak Expiratory Flow (PEF) - can be attempted in an older child, if he or she is not too distressed

MAKING THE DIAGNOSIS

- Suspect asthma exacerbation in the presence of signs and symptoms listed under Physical Findings. An exacerbation that leads to the emergency department (or clinic in an emergent/urgent situation) is an indication of inadequate long-term asthma control or inadequate plans for handling exacerbations.

MANAGEMENT AND INTERVENTIONS

Goals of Treatment

- Relieve symptoms (reverse airflow obstruction, correct hypoxemia)
- Prevent complications (early bronchodilators and systemic corticosteroids)

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- Prevent recurrence (adjust baseline therapy)

Appropriate Consultation

Consult a physician/RN(NP) for:

- any child with previously undiagnosed (suspected) asthma with symptoms, such as:
 - Breathlessness
 - Chest tightness
 - Wheezing
 - Cough
- any child with known asthma who is experiencing severe acute symptoms.
- any child receiving long-term prophylaxis whose symptoms are not well controlled with the current medication regimen.

Non-Pharmacological Interventions

Education

- Education is an important part of the successful management of asthma and should be provided to all parents/caregivers and clients.

Allergen and trigger avoidance

- Prevention/management of respiratory infections
- Avoidance of tobacco smoke and smoking
- Minimize exposure to pollens (from trees, grass, weeds) and outdoor mold
- Indoor mold
 - Fix all leaks and eliminate water sources associated with mold growth
 - Attempt to keep indoor humidity at less than 50%
- Animal dander
 - Remove animals from the home or keep animals out of the client's room
 - Air ducts should be covered with a dense filter (e.g., HEPA air cleaner)
 - Vacuum frequently
- House dust mites
 - Essential to encase mattress and pillows in an allergen-impermeable cover and wash bed sheets, pillow cases, and blankets weekly in hot water
 - Wash stuffed toys
 - If possible, remove carpets from the bedroom and avoid lying or sleeping on

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- upholstered furniture
- Cockroaches
 - Use poison bait or traps to control
 - Do not leave food or garbage exposed
 - Fix leaky faucets and pipes
- Food
 - Avoid sulfites and other foods that exacerbate symptoms
- Medications
 - Avoid ASA and NSAIDS as risk of exacerbation is high with use of these medications

Client Self-Monitoring

- Consider use of PEF monitoring if compliance is indicated
- No study has shown improved outcomes with PEF monitoring and compliance has been poor

Use of inhalation devices

- Review proper use of inhalers and spacers

Pharmacological Interventions

In a case of acute asthma, it is strongly recommended that consultation take place with a physician/RN(NP) to determine the treatment plan prior to giving any medication to a child.

The two primary agents used in the treatment of acute asthma exacerbations are inhaled beta agonists and systemic glucocorticoids. Additional agents are used as needed depending upon the severity of the exacerbation.

Inhaled bronchodilators (β_2 -agonists)

- Salbutamol (Ventolin) 100 mcg/puff MDI (metered dose inhaler) with spacer (AeroChamber) 6-10 puffs/dose q20 minutes x 3 doses
- Or
- Nebulized salbutamol (Ventolin) q20 minutes x 3 doses:
 - Children < 10 kg: 1.25-2.5 mg/dose
 - Children 11-20 kg: 2.5 mg/dose

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- Children > 20 kg: 5 mg/dose

If a full response is achieved, consult a physician/RN(NP) for continuing management at home:

- Salbutamol by MDI 1-2 puffs q2-4h prn for relief depending on severity
- Salbutamol by nebulizer as per weight in kg, q2-4h for relief depending on severity
- And
- Prednisone 1-2 mg/kg/day orally for 3-5 days to a maximum dose of 60 mg. No tapering required.

For those who are of adult dimension (usually > 12 years of age), the following may be added to treatment with MDI or nebulizer:

- Prednisone 30-60 mg/day orally for 7-14 days. No tapering required.

If a partial response is achieved, consult a physician/RN(NP). In consultation, it may be decided to:

- Continue the β_2 -agonists q20 minutes as above and add the following:
 - Ipratropium bromide (Atrovent) MDI 5 puffs/dose q1h (same dose for all weights)
 - Or
 - Ipratropium bromide (Atrovent) 250 mcg by nebulizer q1h
 - And
 - Prednisone 1-2 mg/kg/day orally daily for 5 days (maximum dose of 50 mg)
 - Or
 - MethylPREDNISolone (SoluMEDROL) 2 mg/kg bolus IV (to a maximum dose of 125 mg) then 0.5 mg/kg q6h. Initial dose may be given prior to consultation with a physician/RN(NP).

The RN(AAP) will ensure clients have the following medications prior to discharge from the clinic. If the client does not have, the RN(AAP) will prescribe and dispense:

- Fluticasone (Flovent) MDI and spacer 50 micrograms/puff, 1-2 puffs bid for 1 month
- Salbutamol (Ventolin) MDI and spacer 100 micrograms/puff, 1 puffs qid for 1 month

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Client and Caregiver Education

Home management of asthma exacerbation is an integral part of asthma management. It is recommended that there is a written action plan which includes guided self-management. An Action Plan based on symptoms and use of the “stop light” analogy is recommended and is available at:

http://www.asthma.ca/adults/control/pdf/AsthmaActionPlan_ENG.pdf

- Provide instructions (preferably written) to the parents or caregiver on symptoms and signs of respiratory distress.
- Advise parents or caregiver to bring the child back to the clinic if there is no response to β_2 -agonists or the response lasts < 2 hours.
- Counsel about appropriate use of drugs including dosages, administration techniques (e.g., use of MDI with spacer), effects, and side effects.
- Explain strategies to prevent further attacks by identifying the precipitating factor and counselling parents to avoid such factors.
- Prophylactic medication regimen as required.
- If any change in pharmacologic therapy is initiated, reassess the client in 1-4 weeks.

Monitoring and Follow-Up

- Monitor ABCs, pulse oximetry, hydration, and level of consciousness while awaiting transport or discharge.

Referral

Child is critically ill (moderate to severe airway obstruction with respiratory distress)

- Poor response to emergency therapy: needs more than 3 or 4 salbutamol (Ventolin) treatments, post-treatment SpO₂ < 95% on room air.
- Consider non-urgent consult with physician regarding Pulmonary Function Testing (PFT).

DOCUMENTATION

- As per employer policy

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