

Approach to Chronic Cough and Atopy

Year 3 Clerkship Guide, Family Medicine Department
Schulich School of Medicine and Dentistry

Objectives

1. Understand the principles of management for allergic conditions
2. Be able to conduct an appropriate history and physical exam for someone with a complaint of chronic cough.
3. Be able to outline a differential diagnosis for chronic cough.
4. Identify appropriate investigations for a child complaining of chronic cough.
5. Develop an approach for management of asthma.
6. Be able to distinguish between seborrheic dermatitis and atopic dermatitis.
7. Be able to identify other atopic conditions (allergic rhinitis and atopic dermatitis), order appropriate investigations for diagnosis and outline a plan for management.
8. Understand the correct management for an acute exacerbation of asthma.
9. Be able to explain and demonstrate when and how to use a puffer (see module)

Atopy refers to a genetic predisposition to the type I hypersensitivity reactions that most commonly manifest as allergic rhinitis, asthma, and atopic dermatitis.

Approach to Chronic Cough

History:

When taking a history, make sure to identify the onset and nature of the cough, including whether it is productive, if there is associated dyspnea, what the cough sounds like and if there are any other symptoms (e.g. rhinorrhea, allodynia, malaise, headache, or fever) which might indicate an infectious cause. Determine what the circumstances were at the onset of the cough, as a cough that onset while playing or eating may lead to suspicion about a foreign body in the airway. Ask about any medications that may have been taken to control the cough and whether they were effective.

It is also important to identify any social or environmental triggers that may be responsible for the cough (commonly: old carpets, smoking or mould in the home, recreational activities that require exertion, occupational chemicals or pets).

As well, ask whether the patient has ever had seasonal allergies and/or atopic dermatitis, as both are frequently found together with asthma and suggest an atopic cause for the chronic cough. A family history of asthma or other atopic disease is also a positive risk factor for asthma. The patient's past medical history should also be obtained.

Physical Exam:

A thorough physical exam for a complaint of chronic cough should include assessment of vital signs, a general assessment looking for signs of underlying chronic disease, assessment of the nasal and auditory canals, and assessment of the respiratory system.

Assess the patient for respiratory distress, cyanosis and clubbing. Examine the nasal cavities to determine if there is inflammation of the turbinates, flaring of the nares or sinus tenderness. Look in the ears to rule out acute otitis media.

Respiratory Exam

1. Vitals including O₂ Sat. – Alert? Stable?
2. Inspect: Respiratory distress? Prolonged expiration? Costal in-drawing? Accessory muscle use? Clubbing? Increased AP diameter?
3. Palpate: Lymph nodes present? Trachea deviated? Altered tactile fremitus? Asymmetric thoracic expansion?
4. Percuss: Dull? Asymmetric? Hyper-resonant?
5. Auscultate: Vesicular or bronchial sounds? Crackles? Wheezes? Rub?

**The only major finding expected on physical exam of a stable asthma patient is a wheeze.*

Physical Signs Associated with Severe Asthma:

- Inspiratory and expiratory wheeze
- Prolonged expiration
- Tachypnea
- Cyanosis
- Accessory muscle use
- Increased PA diameter and chest wall deformities (pectus carinatum) are associated with chronic changes due to asthma

Differential Diagnosis for Chronic Cough

The differential diagnosis of chronic cough generally falls under one of three categories:

1) *Post-nasal drip* 2) *Asthma* and 3) *GERD*.

In children, asthma is the most common cause, but the differential can be broken down by age as seen in the table below. In adults the order is as listed above, while ACE Inhibitors are another noteworthy cause.

Differential Diagnosis for Chronic Cough (in descending order of likelihood)

Infancy	Early childhood	Late childhood
Gastroesophageal reflux Infection Congenital malformation Congenital heart disease Passive smoking Environmental pollution Asthma	Post-viral airway hyper-responsiveness Asthma Passive Smoking GERD Foreign body Bronchiectasis	Asthma Post-nasal drip Smoking Pulmonary tuberculosis Bronchiectasis Psychogenic cough

Diagnosis of asthma

The cardinal symptoms of asthma are: **expiratory wheeze, shortness of breath, chest tightness, and cough**. The classical presentation of recurrent prolonged cough, often with breathlessness or wheeze, suggests asthma. However, the clinical picture of asthma can be quite variable. A patient history or family history of atopy is often suggestive of asthma given a history of persistent cough, dyspnea and wheeze. If both parents have asthma, the child has an 80-90% chance of inheriting the disease. If one parent has asthma, the risk is 30-40%. In *cough-variant asthma*, a non-productive cough occurring during the day or night is often the only symptom. PFTs tend to be normal in cough-variant asthma and treatment is the same as that for standard asthma. Demonstration of a favorable response to bronchodilators, clinically or by pulmonary function testing, confirms the diagnosis.

All that wheezes is not asthma!

Other causes of wheezing need to be ruled out before a diagnosis of asthma can be made. Refer if child is persistently expectorating, if there is failure to thrive, excessive vomiting, unexpected or focal clinical findings, poor response to conventional therapy, or diagnostic uncertainty.

History not consistent with Asthma

- Sudden onset of symptoms
- Coughing or wheezing with feedings
- Neonatal / early onset (< than 2-3 m)
- Neonatal requirement for ventilatory support
- Symptoms of stridor
- Vomiting / choking

Physical Exam Findings not consistent with Asthma

- Clubbing (points towards: cystic fibrosis, bronchiectasis, interstitial lung disease, congenital heart disease)
- Activity level decreased
- Failure to thrive and vomiting
- Productive cough
- Speech – hoarseness
- Stridor or choking
- Inability to speak or cry normally
- Focal lung signs
- CVS signs
- Chronic infection

Investigations for suspected asthma

No radiological work-up is required for suspected asthma. However, chest x-rays should be ordered if atypical symptoms are present, such as unilateral chest signs, hemoptysis, excessive purulent sputum or lack of response to treatment. Laboratory investigations that should be ordered include the skin-prick test and pulmonary function tests.

Skin-prick testing

The determination of specific IgE antibody by skin-prick or in vitro (RAST) tests is used to evaluate potential allergic triggers in children with asthma. It is also an appropriate investigation to conduct when a history is obtained that suggests an atopic etiology.

The prick test is the primary diagnostic procedure used to determine the cause of allergies in this country. To properly interpret prick tests, both a positive and a negative control test are needed. The negative control should be the diluent used for the allergy extracts. Positive controls are proven allergens such as histamine or glycerin that are used to detect the skin's reactivity and decrease the chance of a false negative.

Patients who are taking tricyclic antidepressants or benzodiazepines may need to discontinue use of these drugs for 7 to 14 days before testing as these drugs interfere with skin reactivity. Immunoassay is appropriate for patients in whom skin testing cannot be done (eg, those who are unable to discontinue use of interfering medications, those who have severe dermatographism or eczema, or those who have had a near-fatal reaction to an allergen). However, because of the lack of sensitivity, a negative in vitro allergen-specific IgE antibody test should not be used to justify exposure to an allergen that is clinically suspected as the cause of an anaphylactic reaction.

Pulmonary function testing

Pulmonary function tests (PFTs) are the key to the diagnosis of asthma in children older than 5. A reversible pattern of obstructive PFTs as shown by a *greater than 12% improvement in lung function* following use of a β_2 agonist (bronchodilator) is highly suggestive of asthma. However, objective measurement of pulmonary function is important not only to confirm the clinical diagnosis but to monitor asthma as well. The patient's subjective symptoms and doctor's subjective assessment correlate poorly with pulmonary function and declines in pulmonary function may predate acute deteriorations in asthma.

Spirometry testing can be accomplished in children as young as 5. A reduced FEV₁ is expected with asthma. Many asthmatics will have a normal spirogram but will show greater than 12% improvement after use of bronchodilator or a 20% decrease upon administration of a provocative methacholine or histamine challenge. Asthma is also associated with a greater than 20% difference in Peak Expiratory Flow (PEF) measurements taken 12 hours apart (in the morning and evening). However, spirometry is preferred for diagnosis because looking for >20% diurnal PEF, though easier to do, is not as sensitive in diagnosing airflow obstruction. When paired with an activity/symptom log, peak flow meters are very helpful for understanding how a patient is doing and how he or she is responding to the medication dose.

Other investigations

A chronic cough presenting with localized decreased breath sounds or rales, cyanosis, tachypnea or tachycardia should be investigated with a CXR to rule out infectious or other causes.

Peripheral blood smear and sputum examination showing eosinophilia is suggestive of allergic asthma, but unnecessary for diagnosis. In patients with compromised respiratory status, pulse oximetry and arterial blood gases may also be indicated.

Prognosis

The earlier the onset of wheeze, the better the prognosis. A 'break point' is seen at two years: most children who present before this age are asymptomatic by age 6-11 years. The usual course of asthma is as follows:

- A quarter of asthmatics become asymptomatic long-term.
- A quarter have a brief remission but relapse.
- A quarter have milder symptoms as they grow up.
- A quarter of patients continue to have symptoms without any significant remission period.

Management of Asthma

The most important component of asthma management is to develop a plan for chronic management that allows the patient to maintain a normal level of activity and prevent exacerbations. Patient education should include a written action plan (see pg 8) for acute exacerbations and a discussion regarding the etiology, severity, and appropriate follow-up for their disease.

1. Diagnosis and assessment

The first step in managing asthma is to establish the diagnosis of asthma and assess the severity of disease through history, physical findings and pulmonary function tests. Patients with moderate to severe asthma should undergo skin testing to help focus efforts on exposure limitation of potential allergens.

Severity of Asthma	Symptoms	PEF rate (% of predicted)
Very mild	Intermittent	>80%
Mild	Persistent	>80%
Moderate	Persistent	60-80%
Severe	Persistent	<60%

2. Identification of irritant exposure

The next step in management is to obtain a complete history regarding environmental allergen/irritant exposure. Allergens are important inducers of acute exacerbations of asthma and contribute significantly to the initiation and persistence of airway inflammation. It is important to emphasize that adequate asthma control involves elimination and limitation of exposure to indoor and outdoor environmental triggers.

Non-urgent referral to an allergist for allergy assessment is also warranted for most asthmatics and findings should be interpreted in light of the history provided by the patient. The allergist can counsel about environmental control and discuss treatment options such as immunotherapy.

3. Medical Management

Pharmacological control of asthma involves a continuum of therapy for patients of varying disease severity. Agents involved in achieving symptom control fall under two broad categories: fast-acting quick relief and long-term control anti-inflammatory medications.

β_2 agonists are the most commonly used quick relief agents whereas inhaled corticosteroids are the primary control agents. Inhaled corticosteroids (ICS) are taken daily while β_2 agonists are used as needed to provide relief of intermittent exacerbations. In situations of anticipated exercise, β_2 agonists should be used prior to initiation of exercise. These medications are given by inhalation whenever possible in order to increase lung delivery and decrease systemic side effects. The metered dose inhalers (MDIs) can be difficult to use correctly and all patients should be instructed on their proper use. Review the module for a demonstration.

All patients are prescribed short-acting β_2 agonists (SABA) such as salbutamol for quick relief of asthma exacerbations. If patients require the use of SABA more than 3 times a week then they should also be using a controller medication. *Patients with mild to moderate disease, even with use of*

SABA less than 3 times a week, should be started on maintenance therapy to control their asthma. The first-line medication for maintenance therapy is an inhaled corticosteroid such as budesonide. The ICS should be titrated to the lowest possible dose required to relieve persistent symptoms (i.e. lowest possible dose that achieves baseline PEF >80%).

Inhaled Corticosteroids and children

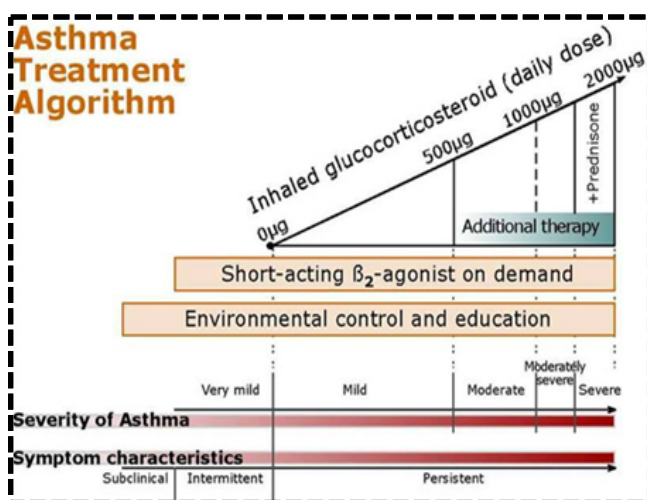
There has been some concern regarding the side effects of long-term ICS, especially in children. However, there is currently no evidence to suggest that the low dosages required to maintain adequate airway function in asthmatics lead to adverse effects such as decreased linear growth. To avoid common side effects such as sore throat, thrush and hoarseness, patients should be advised to rinse out their mouth after inhalation. A spacer may also be used to limit side effects.

In patients with moderate asthma that is inadequately controlled by 500-1000 ug daily doses of ICS, long-acting β_2 agonists (LABA) and anti-leukotrienes (zafirlukast and montelukast) may be added to ICS to achieve adequate baseline respiratory function. In patients with the most severe variants of asthma, a course of oral corticosteroids should be instituted in addition to the treatment regimen indicated for moderate asthma.

4. Acute Exacerbations

Individuals who continue to experience shortness of breath following 4 puffs of their SABA should seek emergency medical attention. Once in the ER, the primary goals of management are symptom relief and improvement in objective lung measurements. All patients presenting to the ER with an acute exacerbation of asthma undergo a severity assessment (clinical and PEF). All patients receive a titrated dose of SABA. If the exacerbation is moderate or severe (decreased O_2 sat and/or PEF < 75%) systemic corticosteroids (IV or oral) are instituted. In patients with an O_2 Sat < 94%, supplemental O_2 should be used. In addition to SABA, an anticholinergic may be added to patients presenting to the ER with a moderate to severe acute exacerbation of their asthma. For the most severe exacerbations of asthma (if patient is diaphoretic, apneic and/or cyanotic), spirometry is not indicated and rapid sequence intubation is required. For refractory cases, IV or IM epinephrine, IV salbutamol and inhaled anesthetics are recommended.

Prior to discharge, physicians should hold a discussion regarding the reason for the current exacerbation and risks/treatment of future exacerbations. Following the discussion, a clear and specific treatment plan should be devised and written out for the patient. All patients should be discharged on a course (3-7 days) of oral and inhaled corticosteroids. B_2 agonists may be used PRN in the first 48 hours after discharge as long as symptoms are being controlled. Prolonged use over the course of 7 days warrants a reassessment. All patients should see their family doctor within a week after discharge for an assessment.



Criteria for determining if asthma is controlled

Parameter	Frequency or value
Daytime symptoms	<4 days/week
Night-time symptoms	<1 night/week
Physical activity	Normal
Exacerbations	Mild, infrequent
Absent from work or school due to asthma	None
Need for a β_2 -agonist	<4 doses/week†
FEV ₁ or PEF	≥90% of personal best
PEF diurnal variation‡	<10-15%

Taken from Summary of Recommendations from the Canadian Asthma Consensus Guidelines, *CMAJ*, 2005.

Atopic Dermatitis

Presentation

The presentation of AD varies depending on patient age. In infants, the rash is symmetrical and found on the cheeks, scalp, face and extensor surfaces. Children often present with asymmetric lichenification of the flexural, eyelid, and perioral areas. In adults, the rash generally appears on flexural surfaces of forearms, hands, wrists, and feet. In all age groups, AD presents as thick, dry plaques.

To assess for atopic dermatitis:

1. Evaluate the morphology and distribution
2. Differentiate between acute and chronic manifestations of dermatitis
3. Look for evidence of superimposed infections

Expected findings for atopic dermatitis

Acute lesions: vesicles over erythematous lesions, often with a serous exudate

Subacute lesions: excoriation, scaling, erosions

Chronic lesions: lichenification

Diagnosis

The history and physical are the keys to diagnosis. A family or personal history of atopy helps confirm the diagnosis. AD may be difficult to differentiate from seborrheic dermatitis (SD), however there are some differences. SD usually onsets in infants less than 2 months old, while AD usually affects infants greater than 2 months. AD is associated with severe pruritis and dry lesions while SD is associated with greasy, scaly lesions. If allergic contact dermatitis is suspected, patch testing (allergen applied for 48 hours then removed, skin observed 20 minutes later) is indicated. If a lesion resembling atopic dermatitis involves the nipple and does not improve with topical treatment, a biopsy is indicated to rule out Paget's disease. Biopsy is also indicated in any case of dermatoses that are refractory to treatment or when diagnoses cannot be confirmed. If tinea is suspected, potassium hydroxide (KOH) testing is indicated. Skin scrapings from the lesion are placed on a slide, one-two drops of 10-20% KOH solution is added to the slide and the slide is heated to dissolve the cellular material and reveal spores characteristic of tinea.

Management

The general principles of management of all atopic conditions include patient education, allergen/irritant avoidance, and pharmacotherapy. Both medical and non-medical measures are used to provide symptom relief and cosmetic improvement for individuals with dermatitis.

Non-medical measures

Non-medical measures primarily involve the avoidance of skin irritants and ensuring appropriate skin hydration. For example, bathing in warm rather than hot water, the use of mild soaps, patting rather than rubbing the skin dry, and the use of moisturizers or emollients all help prevent excess drying of the skin. Adequate skin hydration decreases pruritus and inflammation.

Medical management

Topical corticosteroids: Medical therapy of dermatitis involves the use of topical corticosteroids. The efficacy and side effect profile of a given corticosteroid depends on the potency (ranging from Group 1-7, 1 is the most potent), vehicle (ointment > cream > lotion), anatomic area (most penetration on face, groin, and intertriginous areas; least on palms and soles) and thickness of the lesion. *The general rule is to use the least potent steroid that is effective.* Hydrocortisone and dexamethasone are the lowest potency agents whereas fluocinolone acetonide is a high potency agent.

Oral anti-histamines: Pruritus may still be present following topical steroid use. Oral OTC anti-histamines such as hydroxyzine or diphenhydramine (Benadryl) are often used to control pruritic symptoms. Claritin and Allegra are less effective but less sedating and may also be used for relief of persistent pruritus.

Immunosuppressants: In patients with a contraindication or poor response to topical steroids, tacrolimus and pimecrolimus may be used instead. These agents do not cause skin atrophy but may cause minor pruritus and erythema that resolves within a few days. Tacrolimus should be used as an ointment, whereas pimecrolimus is used as a cream. Both of these agents should not be used in patients less than two years old.

Allergic Rhinitis

Presentation

Allergic rhinitis may be seasonal or perennial, and is extremely common, affecting 20% of the population. Commonly, there is inflammation of the mucous membranes of the nose, eyes, eustachian tubes, middle ear, sinuses and pharynx. Other nasal symptoms include rhinorrhea, congestion, sneezing, and post-nasal drip. Patients with allergic rhinitis often develop sinusitis following a URTI. The hallmark symptoms of sinusitis include pain or pressure of paranasal sinus areas, ear pain/pressure, and fatigue. These patients may also complain of headache and halitosis. In addition, the rhinorrhea associated with sinusitis is usually purulent and yellow/green whereas nasal discharge in allergic rhinitis is usually watery or mucoid. Physical examination should include an examination of the skin, nasal cavity and oropharynx. A “nasal crease” is often seen in patients with allergic rhinitis. It is a horizontal crease across the lower bridge of the nose caused by repetitive upward rubbing of the nose using the palm of the hand (“allergic salute”).

Diagnosis

Allergen skin testing is the key to confirming diagnosis and guiding treatment of allergic rhinitis. It should be considered in patients with perennial symptoms and those who fail medical therapy. It is important to note that skin testing is not useful for children under the age of 3 because these children produce inadequate amount of histamine. Patients who are unable to tolerate skin testing because of pre-existing skin conditions (dermatographia, severe eczema) can undergo RAST testing. However, RAST is less sensitive and more expensive than skin testing.

If the diagnosis is unconfirmed, or symptoms are recurrent, then imaging studies may be useful. Sinus x-rays are not useful for initial evaluation (within 7 days of symptom onset). Sinus films are obtained in four views. A normal sinus series carries a negative predictive value of 90-100%. CT films have greater sensitivity and specificity than x-rays and are useful in diagnosing chronic sinusitis in cases that are refractory to treatment. If a fungal sinusitis or tumor is suspected, then MRI is the diagnostic tool of choice.

Management

Over-the-counter (OTC) antihistamine and decongestant preparations are often useful in managing allergic symptoms. Antihistamines primarily relieve symptoms of runny nose, sneezing and itching whereas decongestants alleviate nasal congestion. Second-generation antihistamines are preferable over first-generation antihistamines in order to avoid sedation. Patients should be warned about the possibility of rebound congestion, termed rhinitis medicamentosa, following improper use of decongestant nasal sprays. Rebound congestion may occur if a nasal spray is abruptly discontinued following several days of usage. Oral nasal decongestants can be associated with insomnia and palpitations.

Nasal corticosteroids provide optimal symptom management if more effective symptom relief is desired or if the patient suffers from the potential side effects of the OTC preparations. Common steroid preparations include beclomethasone (Beconase), fluticasone (Flonase), and Triamcinolone (Nasacort). Nasal steroids require a few days of use before symptom relief is achieved and need to be used regularly (1-2 sprays per nostril twice daily). Side effects of nasal steroid use include local irritation, sore throat, and nosebleed. To minimize adverse effects associated with steroid use, optimization of alternate therapy and usage of the lowest possible dose to achieve symptom control is the current standard of care.

Immunotherapy: If avoidance and pharmacotherapy do not result in adequate allergy relief then immunotherapy should be considered. The principle behind immunotherapy is to decrease an individual's sensitivity to a particular allergen through controlled exposure to it. The individual is given subcutaneous injections twice a week, which are slowly increased until a maintenance dose is achieved. Subsequent injections are spaced out to every 2-4 weeks, for a duration of 2-3 years. The injections cause a modified TH₂ response or a switch from a primarily TH₂ to a predominantly TH₁ response. Immunotherapy has been shown to be effective in individuals with certain types of respiratory allergy (ragweed, hay fever), asthma, and insect sting allergy. It is not indicated for food allergy and dermatitis.

My ASTHMA ACTION PLAN

Name _____

Doctor _____

Date _____

Doctor's Phone Number _____

GREEN LEVEL My asthma is under control.**SYMPTOMS**

- My breathing is normal.
- I have no trouble sleeping.
- I'm not coughing or wheezing.
- I can do all my normal activities.

WHAT SHOULD I DO?

I should continue using my normal medications as directed by my doctor, and re-measure my peak flow every _____ weeks / months.

PEAK FLOW

_____ to _____ (80% to 100% of your personal best)

Medication**Dose****Take it when?**

YELLOW LEVEL My asthma is getting worse.**SYMPTOMS**

- I have symptoms, like wheezing or coughing, with activity or at night. They go away when I use my reliever.
- I'm using my reliever more than ___ times a week/day.
- I can't do many of my usual activities.

WHAT SHOULD I DO?

A problem is beginning. I should increase my medication as specified below until I am in the green level for _____ days or more. **If my symptoms do not improve within 4 days, I will call my doctor.**

Medication**Dose****Take it when?**

PEAK FLOW

_____ to _____ (60% to 80% of your personal best)

RED LEVEL I am having an asthma emergency.**SYMPTOMS**

- My breathing is difficult.
- I'm wheezing often when resting.
- I'm having difficulty walking and/or talking.
- My lips and/or fingernails are blue or grey.
- My reliever does not help in 10 minutes OR is needed every 4 hours or more.

WHAT SHOULD I DO?

**I NEED TO GO TO THE HOSPITAL
EMERGENCY RIGHT AWAY.**

**I SHOULD USE MY RELIEVER AS
MUCH AS I NEED TO ON THE
WAY THERE.**

PEAK FLOW

_____ to _____ (less than 60% of your personal best)