



Written By: Dr Kajsia Heyes  
Peer Review: Dr Hermeen Dhillon

### **Objective One:**

#### **In patients presenting with an acute cough:**

- a) Include serious causes in the differential diagnosis.**
- b) Diagnose a viral infection clinically, principally by taking an appropriate history.**
- c) Do not treat viral infections with antibiotics.**

Life-threatening causes are most often in the acute cough category, <3 weeks duration

- Anaphylaxis: mucosal, skin or GI involvement, + resp compromise or hypotension
  - Have your IM epinephrine ready, it's often discussed that anaphylaxis is underdiagnosed or diagnosed later than ideal
- Foreign body aspiration: especially in kids, listen for decreased breath sounds R side since R main stem is bigger, straighter and easier to get things stuck in, check ears, nose
  - Get your portable x-ray ASAP, administer supplemental O2 as needed
- Exacerbation of asthma or COPD: pay attention to any history of respiratory disease, preceding illness and dyspnea, increased mucous or sputum production, or increased purulence
- PE: ask about a history of DVT/PE, immobilization, OCP or hormone replacement therapy use, current pregnancy, cancer, COPD, red/hot/swollen limb
- Pneumonia: productive cough, fever, dyspnea, pleuritic pain, elderly or immunocompromised
- Pneumothorax: Listen for asymmetry in air entry bilaterally. Use ultrasound to look for lung sliding. This is a clinical diagnosis and CXR should typically only be confirmatory.

#### **b) Diagnose a viral infection clinically, principally by taking an appropriate history.**

We go with the standard OPQRSTAA for this one

- Onset: URTi's and infectious causes of cough are usually gradual onset rather than immediate
- Pain: may be associated with PE, pneumonia, GERD if burning pain. Chest or pleuritic pain is not a usual symptom of a viral URTi, so if this is present, do the appropriate workup
- Quality: Productive vs. non-productive can help differentiate between inflammation and mucous production vs some other cause. Often patients can tell if the cough feels like it's coming from the throat vs deep down in the chest and lungs.
- Severity: severity of cough can be helpful in figuring out how sick the patient is



- Timing: there is no agreed on duration for differentiating acute vs chronic, but 3-8 weeks seems to be the amount of time that most resources reference
  - If the patient is coughing primarily in the mornings or at night when lying down, it may be more associated with post-nasal drip or viral URTi
  - If coughing wakes the patient up from sleep, it may be associated with asthma, or COPD or CHF
  - If it only happens during spring or summer, it may be allergy-related
- Associated symptoms:
  - Rhinorrhea, nasal congestion, headache, myalgias and a low grade fever is more convincing for viral infection
  - Dyspnea, chest pain, hemoptysis are more concerning symptoms that would require more urgent assessment
  - PMHx of chronic lung or heart disease, immunosuppression, smoking should make you more aware of a serious cause
- Aggravating/Alleviating factors:
  - What makes the cough worse?
  - What have they tried in the past and what has helped their symptoms

URTi: cough can last between 1-8+ weeks after acute infection

- If cough is predominant symptom, it may be more likely associated with influenza, mycoplasma pneumoniae, chlamydia pneumoniae and bordetella pertussis; these all have increased incidence of cough → NP swab for antigen testing/culture if suspected or high prevalence
- Reasons for cough are airway inflammation, airway hyperresponsiveness and secretions from post-nasal drip

**c) Do not treat viral infections with antibiotics. (Consider antiviral therapy if appropriate.)**

- It's best to develop your own way of discussing indications for antibiotic use with patients, but something I've seen work really well is educating the patient on how antibiotics work, they kill the bad bacteria if that is what is causing the infection, but they also kill good bacteria in your system. Good bacteria is really helpful for fighting viral infections, and so antibiotic use when it's not needed could actually do more harm than good.
- Patients may be expecting an antibiotic treatment, and be sorely disappointed if you send them home with nothing
- Uptodate recommends supportive treatment for acute viral infections, and the AAFP suggests that naproxen actually favourably affects decreasing inflammation in upper respiratory tract sensitivity to the cough receptor activation
- if the cough is lasting longer than 3-8 weeks and may be associated with upper airway cough syndrome, a few things can help



- 1st generation antihistamine-decongestants like benadryl, chlorpheniramine, dexchlorpheniramine and promethazine help reduce nasal discharge, obstruction, throat clearing, inflammation and cough
- Nasal steroid sprays and rinses can help reduce inflammation and nasal mucous production, reducing through and upper respiratory tract irritation
- Indications for antiviral therapy are influenza A or B requiring hospitalization or who have progressive, severe, or complicated illness that may affect recovery

## **2 In pediatric patients with a persistent (or recurrent) cough, generate a broad differential diagnosis**

There are a few ways to split up the long list of causes of persistent cough in peds, but one of the simplest ways is to go with the big 3 categories: upper airway, lower airway and non-pulmonary (UpToDate for following)

Upper airway causes:

- Upper airway cough syndrome: usually caused by post-nasal drip from allergic rhinitis or chronic sinusitis. This can be treated with antihistamines like reactine/cetirizine and a nasal steroid spray like nasonex/mometasone
- Post-viral inflammation: as discussed before, post-viral inflammation and cough can last for weeks to months after the initial viral infection

Lower airway causes:

- Asthma: especially in a history of atopy with eczema, seasonal allergies, a family history of the same, parents or you hear wheezing on exam, triggers for cough include cold air, exercise, sleep or allergens
- Chronic Bronchitis: think about this in a kid with a wet-moist cough who otherwise appears well and has no other specific signs or symptoms. They often resolve from a course of amoxicillin-clavulonate
- Chronic pneumonia
- Chronic TB infection: this should always be in the back of your mind if the individual is from an endemic region, they have immigrated from an endemic region, they may have been in contact with another TB positive case
- Pertussis: especially in a young child or unvaccinated child. You may hear an inspiratory “whoop” and paroxysmal cough
- Cystic Fibrosis
- Primary Ciliary Dyskinesia
- Recurrent Aspiration: especially in kids with anatomical abnormalities like cleft palate, tracheoesophageal fistulas, or significant premature birth
- Interstitial Lung Disease
- Foreign Body
- Structural – Tracheobronchomalacia



- Environmental – smoking, mold

#### Non-pulmonary

- GI – GERD: can present as cough after eating or when lying down, may have regurgitation
- Cardiac – pulmonary edema, arrhythmia
- Ears - otorespiratory reflex in which stimulation of auricular branch, often from a foreign body in the ear or auditory canal dysfunction, causes vagus nerve stimulation triggering a cough
- Tic Cough
- Medications: most commonly an ACEi, but also can occur with PPIs

### **3 In patients with a persistent (e.g., for weeks) cough:**

**a) Consider non-pulmonary causes, as well as other serious causes in the differential diagnosis.**

**b) Investigate appropriately.**

Cough can be caused by a number of different non-pulmonary issues, and we are going to go through some of the most common ones

GI - GERD: this is the 2nd to 3rd most common cause of chronic cough!

- Symptoms are retrosternal burning, burping, an acid or sour taste in mouth and cough, most prominent at night or when supine, due to chemoreceptor activation from acidic contents and mechanoreceptor activation from fluid reflux
- Consider testing for H.pylori infection or referring to GI/GenSx earlier if red flags like weight loss and dysphagia present
- Empiric treatment with a PPI like omeprazole 40mg PO for minimum 8wks to 3 months and lifestyle modifications (weight loss, smoking cessation, limit EtOH/caffeine/carbonated beverages/spicy foods, not eating within several hours of lying down, smaller/more frequent meals)
- AAFP and uptodate both recommend that if the cough has not improved after 1-2 months of PPI treatment, consider proceeding to 24h esophageal pH probe monitoring. GERD is suggested with an abnormal amount of time with esophageal pH<4 or cough occurring within minutes after reflux event

Cardiac - CHF: pulmonary congestion can leak into alveoli, irritating alveolar receptors and causing cough reflex

- Symptoms are often a “wet cough” that is productive but not mucopurulent like you often see in pneumonia or acute exacerbation of COPD. It is often accompanied by dyspnea, orthopnea, postural nocturnal dyspnea, pedal edema, decreased appetite, fatigue, and worsening exercise tolerance



- Treating the underlying volume overload and cardiac dysfunction will help the cough - lasix, fluid and salt restriction, review of cardiac medications, investigate cause of exacerbation like arrhythmias, ischemia or valvular pathology

Malignancy: cough could be from a primary or metastatic lesion in the lung or respiratory tract, the upper GI system, or the oropharynx/nasopharynx - so don't just think about lung cancer as the only cancer that can cause this symptom

- Lung cancer is <2% of chronic cough cases, and most that do present with a chronic cough are neoplasms originating in the large central airways
- Malignancy should be considered in patient, especially smokers, with new onset cough or recent change in chronic cough, a cough that persists >1 month after smoking cessation, any hemoptysis outside the setting of an airway infection, and constitutional symptoms such as unexplained weight loss, fever or night sweats, significant fatigue
- Most common primary malignancies that metastasize to lungs are breast, colorectal, kidney, head and neck, testicular, bone, sarcoma, melanoma, and thyroid

## **b) Investigate appropriately.**

The American Academy of Family Physicians has a pretty good all-encompassing figure on their "Approach to chronic cough in adult patients". History and physical exam is most important because many chronic coughs will not need investigations, but it's really important to not miss a developing lung cancer, GERD causing metaplasia, or undiagnosed CHF.

- If the cough is more likely an upper airway cough syndrome, try empiric treatment with nasal steroid spray and antihistamines
- If the cough sounds more likely to be asthma, an inhaled corticosteroid and bronchodilator could be tried as an empiric treatment, but a pre-and-post bronchodilator spirometry exam is the gold standard
- Cough that is most likely to be from smoking or an ACEi should be stopped (if possible, it's helpful to keep revisiting the smoking cessation at most visits)
- Cough associated with retrosternal burning, burping, acid taste in mouth and brought on by certain foods would be more likely from GERD - empiric treatment with a PPI is appropriate and if symptoms persist or any red flags present, further investigations like referring to our general surgery colleagues for a scope may be needed

Indications for CXR are

1. Chronic cough whereby etiology is not determined by history, physical, and empiric treatment
2. Red flags are present: dyspnea, hemoptysis, tachypnea, hypoxemia, sepsis, chest pain, weight loss, immunosuppression, significant smoking history, elderly or aspiration risk, abnormal cardiac or lung exam



- If the CXR is abnormal, CT chest should be considered; if the CXR is normal but symptoms are concerning for a serious etiology, CT chest should be ordered

Some other investigations for chronic cough, depending on your clinical suspicion for etiology, are CT, echocardiogram, PFTs, barium swallow, sinus imaging, EGD, bronchoscopy

#### **Objective Four:**

**Do not ascribe a persistent cough to an adverse drug effect without first considering other causes.**

ACE inhibitors can produce a cough in 3-20% of patients, and this is mediated by increasing the availability of kinins. The cough usually starts within 1-2 weeks of starting treatment on an ACEi, but delayed reactions can occur up to 6 months after starting.

ACEi cough will usually be a dry, non-productive cough with no associated symptoms, no recent illnesses, and it just won't seem to get better with usual empiric treatments. Consider switching these patients in an ARB and monitoring for resolution of the cough 1-4 weeks after stopping the ACEi, however the cough can persist up to 3 months (uptodate).

PPIs can also be associated with cough, but less commonly. Some medications, especially immunosuppressant medications, can be associated with interstitial lung disease that can present with a cough. These are rare, but good to be aware of.

#### **Objective Five:**

**In smokers with persistent cough, assess for chronic bronchitis and make a positive diagnosis when it is present.**

- COPD is a common respiratory condition, especially in long-term smokers, characterized by airflow limitation. It is critical to identifying this disease treating early to reduce the risk of long-term morbidity and mortality
- The 3 cardinal symptoms to watch out for in COPD are dyspnea (and especially reduced exercise tolerance due to dyspnea), chronic cough and sputum production
- Spirometry is the gold standard investigation for airway obstruction in these patients, but also consider testing for alpha-1 antitrypsin deficiency if its a young individual, a family history of respiratory issues, a non-smoker or minimal smoker