Chronic Cough in Older Adults

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Introduction
Cough is an important physiological defense mechanism that helps clear the airway of noxious substances and excess mucus or fluid. It is defined as a forced expulsive maneuver, usually against a closed glottis, and is associated with a characteristic sound.\textsuperscript{1} For most individuals, a cough is a self-limiting event associated with a common cold and of little consequence. However, chronic cough, defined as the presence of cough lasting more than eight weeks, is troublesome and can significantly affect quality of life.\textsuperscript{2} Recent studies suggest that it is also highly prevalent (occurring in approximately 12% of the general population), and estimates of the cost of treatment derived from sales data from over-the-counter antitussives run at billions of dollars.\textsuperscript{3} Data from specialized cough clinics show a preponderance of females and obese patients.\textsuperscript{3} Despite perceptions of the incurable nature of an intractable cough, specialized clinics in cough have a diagnostic success rate of 90%. However, assessment and treatment of chronic cough often requires a multidisciplinary approach.

Chronic coughing may occur because of hyperinnervation of the airways or because there are more triggers for coughing (e.g., elevated inflammatory mediator levels). In most individuals cough is a defensive mechanism against aspiration. However, among older adults with neuromuscular disease in whom the cough reflex is compromised, or among those with airway diseases, cough may become excessive and injurious (Table 1). These deleterious potential complications of cough can themselves cause considerable morbidity for a patient.

Etiology of Cough
Although the possible etiology of a chronic cough is expansive (Table 2), clinical studies have consistently shown that the majority of cases of chronic cough are attributable to three diseases in non-smoking adults who are not using an angiotensin-converting enzyme (ACE) inhibitor: one, upper airway cough syndrome (previously known as postnasal drip syndrome); two, cough variant asthma; or three, reflux disease (Table 3).\textsuperscript{4} Patients may have one or more of these conditions simultaneously. In the community, chronic cough is most likely due to chronic smoking; however, the majority of these individuals do not seek medical attention.\textsuperscript{5} The clinical studies have evaluated a wide age range of individuals, and it is the opinion of experts that the causes of chronic cough are no different in older adults than in younger adults.\textsuperscript{6}

Assessment and Management of Patients with Chronic Cough
The American College of Chest Physicians, the British Thoracic Society, and the European Respiratory Society have recently published recommended diagnostic approaches to individuals with chronic cough.\textsuperscript{1,3,7} It is recommended that physicians follow one of these diagnostic algorithms and adopt a systematic approach to all patients who have chronic cough (Figure 1). Treatment and diagnostic success rates are higher with this approach. Response to treatment can be assessed with both subjective measures (cough-specific questionnaires) and objective measurements (computerized cough counting).
Figure 1: Chronic Cough Algorithm for the Management of Adult Patients

Chronic Cough

History, examination, chest X-ray

Smoking ACE-I

Discontinue

A cause of cough is suggested

Upper Airway Cough Syndrome (UACS)
empiric treatment

Asthma
ideally evaluate (spirometry, bronchodilator reversibility, bronchial provocation challenge) or empiric treatment

Nonasthmatic Eosinophilic Bronchitis (NAEB)
ideally evaluate for sputum eosinophilia or empiric treatment

Gastroesophageal Reflux Disease (GERD)
empiric treatment

For initial treatments see box below

Investigate and treat

Inadequate response to optimal Rx

Further investigations to consider:
• 24h esophageal pH monitoring
• Endoscopic or Video Fluoroscopic Swallow Evaluation
• Barium esophagram
• Sinus imaging
• HRCT
• Bronchoscopy
• Echocardiogram
• Environmental assessment
• Consider other rare causes

Inadequate response to optimal Rx

Important general considerations
Optimize therapy for each diagnosis
Check compliance
Due to the possibility of multiple causes, maintain all partially effective treatment

Initial treatments
UACS - A/D
Asthma - ICS, BD, LTRA
NAEB - ICS
GERD - PPI, diet/lifestyle

For further detailed treatment, see respective section recommendations

Abbreviations: Rx, treatment; HRCT, high resolution CT; PPI, proton pump inhibitor; ACE-I, angiotensin-converting enzyme inhibitor; BD, bronchodilator; LTRA, leukotriene receptor antagonist; ICS, inhaled corticosteroid; A/D, antihistamine/decongestant.
Step 1
As with all medical problems, the initial assessment includes a full medical history, including characteristics of the cough, smoking, occupational, medication, and past medical history (e.g., respiratory, cardiovascular, or neurological diseases). Physical examination should concentrate on the ear, nose, and throat as well as the respiratory and neurological systems. However, in the majority of patients both history and physical examination are of limited value. Performance of a chest radiograph is recommended at this stage, and current smokers should be advised to stop smoking and offered pharmacotherapy and counseling to aid cessation.

Step 2
Angiotensin-Converting Enzyme Inhibitor-Induced Cough
In following the diagnostic algorithms the initial step in management of any patient with a chronic cough is to discontinue ACE inhibitors, even if there does not appear to be a temporal relationship between commencement of the cough and ACE inhibition. ACE inhibitor–induced cough has been reported in up to 35% of patients treated with these agents. The resolution of cough associated with an ACE inhibitor usually occurs within two weeks but may take up to three months in some individuals. Substitution with an angiotensin-II receptor blocker is recommended if necessary.

Step 3a
Abnormal Chest Radiograph
If the chest radiograph is abnormal, then management and evaluation of the patient is determined by the chest radiograph findings. This may involve referral to a specialist physician, proceeding to a computed tomography (CT) thorax or high-resolution CT, pulmonary function testing, bronchoscopy, and possible lung biopsy or echocardiogram. The management of these multiple pulmonary, extrapulmonary, or cardiovascular diseases is beyond the scope of this review.

Step 3b
Normal Chest Radiograph
If the chest radiograph is normal, then the diagnostic algorithm should be followed (Figure 1). The consensus guidelines agree that the approach to chronic cough should involve empiric treatment for the most common causes of cough rather than proceeding initially to invasive investigations. This has been found to be a more cost-effective method than performing a batch of diagnostic investigations. Following failure of empiric treatment directed at asthma, reflux disease, and upper airway cough syndrome, referral to a respiratory physician, or specialist cough clinic is advised. However, patient discomfort and distress, or lack of available diagnostic testing and patient preference may prompt earlier referral.

Upper Airway Cough Syndrome
As upper airway cough syndrome (UACS) is the most common cause of chronic cough, the recommendations are that patients should be treated empirically for this condition, especially as approximately 20% of patients are unaware of the presence of postnasal drip. Empirical treatment includes treatment with a first-generation antihistamine and a decongestant. Meta-analysis of the side effects of these first-generation antihistamines has not shown them to be more sedating than the newer generation of antihistamines; however, for older adults the antihistamines should initially be prescribed only at bedtime prior to escalating to twice-daily dosing. Decongestants (e.g., oxymetazoline hydrochloride) cause side effects including palpitations, worsening of hypertension or glaucoma, and difficulties with urination, which may be problematic for older adults. If empiric treatment fails then further investigations (including sinus imaging, skin testing, and nasal eosinophils) may be performed if the history or examination is suggestive of UACS. While CT sinus radiographs are more sensitive than plain sinus imaging, it should be noted that in a prospective study an ear, nose, throat (ENT) examination was as accurate in diagnosing UACS. The differential diagnosis of UACS may include allergic or nonallergic (NARES) rhinitis, bacterial sinusitis, and vasomotor rhinitis. Treatment of these diseases includes antibiotics for bacterial sinusitis, ipratropium bromide nasal spray and antihistamine/decongestant for vasomotor rhinitis, intranasal steroids, oral leukotriene inhibitors and nonsedating antihistamines.1,9

Table 1: Complications of Cough

<table>
<thead>
<tr>
<th>Cardiovascular</th>
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<tbody>
<tr>
<td>Arterial hypotension</td>
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<td>Rupture of subconjunctival and nasal veins</td>
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<td>Cardiac arrhythmias</td>
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<thead>
<tr>
<th>Neurologic</th>
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<tr>
<td>Cough syncope</td>
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<td>Headache</td>
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<td>Cerebral air embolism</td>
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<tr>
<td>Cerebrospinal fluid rhinorrhea</td>
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<td>Seizures</td>
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<td>Stroke due to vertebral artery dissection</td>
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<tr>
<th>Gastrointestinal</th>
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<tbody>
<tr>
<td>Gastroesophageal reflux events</td>
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<tr>
<td>Malfunction of gastrostomy button</td>
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<tr>
<td>Hydrothorax in peritoneal dialysis</td>
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<tr>
<td>Splenic rupture</td>
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<td>Inguinal hernia</td>
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<tr>
<th>Genitourinary</th>
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<td>Urinary incontinence</td>
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<tr>
<th>Musculoskeletal</th>
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<tbody>
<tr>
<td>Rupture of rectus abdominis</td>
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<td>Rib fractures</td>
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<tr>
<th>Respiratory</th>
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<tbody>
<tr>
<td>Laryngeal and tracheobronchial trauma</td>
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<tr>
<td>Exacerbation of asthma</td>
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<td>Pneumothorax, pneumomediatinum</td>
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<tr>
<th>Miscellaneous</th>
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<tbody>
<tr>
<td>Petechiae and purpura</td>
</tr>
<tr>
<td>Disruption of surgical wounds</td>
</tr>
<tr>
<td>Increased emotional upset</td>
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<tr>
<td>Decrease in quality of life</td>
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</table>
Chronic Cough

Step 4
Asthma/Nonasthmatic Eosinophilic Bronchitis

Asthma is one of the most common etiologies (24–29%) of chronic cough in adult nonsmokers. It may present solely with a chronic cough and without other symptoms such as wheeze or dyspnea: this is referred to as cough variant asthma (CVA). Despite a heightened cough sensitivity reflex, individuals with CVA often do not have increased bronchial hypersensitivity and therefore pulmonary function tests and reversibility testing may be normal. In this instance, methacholine challenge testing should be performed to document bronchial hyperresponsiveness. A negative methacholine inhalation challenge (MIC) test essentially rules out asthma but does not exclude nonasthmatic eosinophilic bronchitis (NAEB). Empiric treatment may be undertaken in patients unable to perform testing. The treatment of CVA is first, inhaled bronchodilators; second, inhaled corticosteroids; and third, leukotriene antagonists. Resolution of symptoms may take up to eight weeks, and for some individuals with a severe cough the introduction of a high-dose proton pump inhibitor taken 30–60 minutes before meals, for at least eight weeks, and to be continued for three months following resolution of the cough.

Step 5
Reflux Disease

Patients who do not respond fully to treatment in Steps 1–4 should next be treated for reflux disease. The reported prevalence of reflux disease is 5–41%.12 Treatment at an earlier stage could be considered if patients have prominent reflux symptoms. Even patients who do not have prominent reflux symptoms should be treated with antireflux therapy with a proton pump inhibitor. Several mechanisms are proposed for reflux-related cough including microaspiration of gastric content, esophageal motor dysfunction, and a vagally mediated esophageal reflex stimulated by volume reflux. Esophageal pH-monitoring can be performed if available, though caution is advised as it may not indicate patients who will respond to antireflux therapy.12 Recommendations for treatment are for high-dose proton pump inhibitor taken 30–60 minutes before meals, for at least eight weeks, and to be continued for three months following resolution of the cough. Resolution of cough associated with reflux is slow and may take approximately six months.1 For nocturnal acid reflux breakthrough, the addition of a H2 blocker may be necessary. The addition of a prokinetic agent such as metoclopramide may be necessary for some patients. For all patients, the discontinuation of medications that may exacerbate reflux should be attempted, and clinicians should advocate adherence to lifestyle changes including elevation of the head of the bed, smoking cessation, weight reduction, and avoidance of foods and drinks that relax the lower esophageal sphincter (e.g., coffee, peppermint, chocolate, alcohol, and citrus fruits). Furthermore, the treatment of concomitant obstructive sleep apnea may also ameliorate reflux symptoms. Unfortunately, treatment duration for individual patients is extremely variable, and some patients have reflux disease that is refractory to treatment. For these patients antireflux surgery could be considered once other causes of cough have

### Table 2: Common Causes of Cough in Patients with a Normal Chest Radiograph

<table>
<thead>
<tr>
<th>Upper Airway Cough Syndrome (UACS)</th>
<th>Asthma syndromes</th>
<th>Reflux disease</th>
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<tbody>
<tr>
<td>Cough variant asthma</td>
<td>Gastroesophageal reflux</td>
<td>Gastroesophageal dysmotility</td>
</tr>
<tr>
<td>Eosinophilic bronchitis</td>
<td>Laryngopharyngeal reflux</td>
<td>Laryngopharyngeal reflux</td>
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### Table 3: Differential Diagnosis of Chronic Cough

<table>
<thead>
<tr>
<th>Drug-induced cough</th>
<th>Upper Airway Cough Syndrome</th>
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<tr>
<td>Allergic rhinitis</td>
<td>Asthma syndromes</td>
</tr>
<tr>
<td>Chronic sinusitis</td>
<td>Cough variant asthma</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>Chronic bronchitis</td>
</tr>
<tr>
<td>Reflux disease</td>
<td>Eosinophilic bronchitis</td>
</tr>
<tr>
<td>Zenkers diverticulum</td>
<td>Post infectious</td>
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### Respiratory disease

Cough variant asthma

### Chronic aspiration

Foreign body

- Tracheobronchial tree
- Laryngopharynx
- Sinonasal
- External auditory canal

Neurogenic

- Traumatic vagal injury
- Post-upper respiratory infection neuropathy

Middle ear pathology

Cardiovascular disease

- Congestive heart failure
- Pulmonary infarction
- Thoracic aortic aneurysm

Thyroid disorders

Psychogenic
Chronic Cough

been excluded, and investigations such as 24 hour esophageal pH-monitoring, esophageal manometry, and barium meal have been performed.\textsuperscript{1}

**Step 6**

**Additional Investigations**

At this stage, additional investigations such as high-resolution computed tomography (HRCT) to look for interstitial pulmonary disease or bronchiectasis, bronchoscopy to investigate for endobronchial lesions, or oropharyngeal swallowing studies should be considered. It is impossible to discuss all of these etiologies of cough in detail, but in the next section I highlight some other causes of chronic cough that should be considered in the older adults or that need clarification.

**Chronic Aspiration Due to Oropharyngeal Dysphagia**

Chronic cough may be an indicator of oropharyngeal dysphagia.\textsuperscript{13} Oropharyngeal dysphagia should be considered for any older adult patient but especially for those patients with the medical conditions listed in Table 4 who complain of chronic cough related to feeding. Those patients should be sent for an oropharyngeal swallowing evaluation either by video-fluoroscopic swallow (VES) evaluation or fiberoptic endoscopic evaluation of swallowing (FEES).\textsuperscript{14} Management of oropharyngeal dysphagia requires a multidisciplinary approach with the involvement of nursing, speech, and language pathology, as well as dietetics, physiotherapy, occupational therapy, and physicians.\textsuperscript{15}

**Postinfectious Cough**

Postinfectious cough should only be considered for adults with a recent history of an upper respiratory infection and a normal chest radiograph in whom a cough has been present for greater than two weeks but less than eight weeks. If a cough is present for longer than eight weeks other etiologies of the cough should be sought. If both Bordetella pertussis and bacterial sinusitis have been ruled out in these patients empiric treatment with inhaled ipratropium bromide may be beneficial.\textsuperscript{16}

**Psychogenic/Habit Cough**

Psychogenic or habitual cough is diagnosed more frequently among the pediatric population than among the adult population. The consensus guidelines suggest that this diagnosis should be made with extreme caution and only following extensive evaluation to rule out other medical conditions in particular genetic tic disorders. In the event that psychiatric therapy fails, a diagnosis of unexplained (idiopathic) cough is a preferred diagnosis.\textsuperscript{17} Proposed criteria for the determination of psychogenic cough have not been properly validated and their clinical utility is uncertain.\textsuperscript{18}

**Idiopathic Cough**

Unexplained cough is a diagnosis of exclusion, and the incidence in clinical studies varies widely, constituting up to 20% of referrals to cough clinics. However, some of these patients may have a failure of treatment rather than a lack of diagnosis. Prior to making such a diagnosis a thorough investigation and treatment of the patient should be performed,\textsuperscript{19} preferably at a specialist clinic. Unexplained cough occurs predominantly in middle-aged women at the time of menopause and is associated with lymphocytic inflammation of the airways.\textsuperscript{1} There is no recommended treatment; however, a recent case report documented the symptomatic improvement of five patients with gabapentin, although the proposed method of action is unclear.\textsuperscript{20}

**Cough Suppressant Therapy**

While medication that is aimed at specific etiology of cough is successful, nonspecific antitussive agents are generally ineffective or poorly tolerated due to side effects. This medication is recommended for short-term use only. Such agents include levodropropizine, moguisteine, codeine, or dextromethorphan for chronic bronchitis. In patients with known lung cancer dihydrocodeine and hydrocodone are recommended.\textsuperscript{21}

**Conclusion**

Chronic cough is a common complaint in all age groups. Older adults are well represented in most of the clinical studies. Further research studies need to be performed to clarify the prevalence, etiology, and success of treatment of

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**Table 4: Medical Diagnoses Associated with Chronic Aspiration**

<table>
<thead>
<tr>
<th>Medical Diagnoses</th>
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<tbody>
<tr>
<td>Cerebrovascular disease</td>
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<tr>
<td>Seizure disorder</td>
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<tr>
<td>Vocal cord paralysis</td>
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<tr>
<td>Parkinson’s disease</td>
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<tr>
<td>Amyotrophic lateral sclerosis</td>
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<tr>
<td>Alzheimer’s disease</td>
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<tr>
<td>Cervical spine injury</td>
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**Key Points**

- Chronic cough is defined as cough lasting more than eight weeks.
- It causes significant deterioration in quality of life.
- Evaluation and management of cough should be performed following a diagnostic algorithm.
- Concomitant evaluation for complications of cough is important.
- No patient with a troublesome cough should continue on an angiotensin-converting enzyme inhibitor.
- Smoking is one of the most common causes of persistent cough.
chronic cough among older adults; however, adhering to the current diagnostic algorithms is likely to lead to the successful management of chronic cough in the majority of older patients. The diagnosis of idiopathic cough should be made with caution and only following a thorough work-up of the patient to exclude other causes of cough. Ongoing research on cough sensory receptors may allow for the development of more specific therapies for cough suppression, and newer investigative tools such as induced sputum and exhaled breath condensate may help to clarify the diagnostic dilemma of chronic cough.

No competing financial interests declared.

References