

Cough

(See also *Harrison's Principles of Internal Medicine*, 17th Edition, Chapter 34)

Definition

- An explosive expiration that provides a normal protective mechanism for clearing the tracheobronchial tree of secretions and foreign material
- Acute cough: <3 weeks
- Chronic cough: >3 weeks

Epidemiology

- One of the most common symptoms for which medical attention is sought

Mechanism

- Cough may be voluntary or reflexive.
- Mechanism
 - Defensive reflex: Both afferent and efferent pathways are activated.
 - Afferent limb: Receptors within sensory distribution of trigeminal, glossopharyngeal, superior laryngeal, and vagus nerves are triggered.
 - Efferent limb: Recurrent laryngeal nerve and spinal nerves are activated to cause muscle contraction.
- Irritant triggers
 - Exogenous source (smoke, dust, fumes, foreign bodies)
 - Endogenous origin (upper airway secretions, gastric contents); may go unrecognized; cough can be persistent
 - Inflammation of airway from prolonged exposure can precipitate cough and sensitize airway to other irritants.
 - Gastroesophageal reflux disease (GERD)
 - Irritation of upper airway receptors or aspiration of gastric contents
 - Vagally mediated reflex mechanism secondary to acid in distal esophagus

Symptoms & Signs

History

- Valuable clues for etiology
 - Acute or chronic?
 - Symptoms of respiratory infection at onset?
 - Seasonal? Wheezing?
 - Symptoms of postnasal drip?
 - Nasal discharge
 - Frequent throat clearing
 - "Tickle in the throat"

- Symptoms of gastroesophageal reflux?
 - Heartburn or sensation of regurgitation
- Fever or sputum? If sputum present, what is its volume, character?
- Hemoptysis?
- Associated diseases or risk factors?
 - Cigarette smoking
 - HIV
 - Environmental exposures (e.g., asbestos)
- Angiotensin-converting enzyme (ACE) inhibitor?

Physical examination

- Signs of postnasal drip may be present.
 - Oropharyngeal mucus or erythema
 - "Cobblestone" appearance to mucosa
- Auscultation of the chest may demonstrate:
 - Inspiratory stridor (upper airway disease)
 - Rhonchi or expiratory wheezing (lower airway disease)
 - Inspiratory crackles (process involving pulmonary parenchyma—e.g., interstitial lung disease, pneumonia, or pulmonary edema)
- Temperature
 - Fever suggests infection (bronchitis, pneumonia).
- Check for systemic or nonpulmonary causes.
 - Heart failure
 - Primary nonpulmonary neoplasm
 - AIDS

Differential Diagnosis

Differential diagnosis

- Acute cough (<3 weeks)
 - Most often upper respiratory infection, especially:
 - Common cold
 - Acute bacterial sinusitis
 - Pertussis
 - More serious disorders, including:
 - Pneumonia
 - Pulmonary embolism
 - Congestive heart failure
- Chronic cough (>3 weeks)
 - Often due to more than one condition
 - In a nonsmoker (normal chest radiograph; no ACE inhibitor) most common causes are:
 - Postnasal drip
 - Asthma
 - Gastroesophageal reflux disease
 - In a smoker, suspect:
 - Chronic obstructive lung disease or bronchogenic carcinoma
 - Eosinophilic bronchitis in absence of asthma

Conditions associated with cough

- Airway infections, including:
 - Viral bronchitis (cough may last weeks)
 - Pertussis infection
 - Bronchiectasis, lung abscess
- Asthma
 - Cough may occur in absence of wheezing or dyspnea ("cough variant asthma")
- Neoplasm infiltrating the airway wall including:
 - Bronchogenic carcinoma
 - Carcinoid tumor
- Airway infiltration with granulomas, including:
 - Endobronchial sarcoidosis
 - Tuberculosis
- Compression of airways from extrinsic masses, including:
 - Lymph nodes
 - Mediastinal tumors
 - Aortic aneurysms
- Parenchymal lung disease, including:
 - Interstitial lung disease
 - Pneumonia
 - Lung abscess
- Congestive heart failure
- ACE inhibitors
 - Occurs in 5–20% of patients receiving these drugs
 - Onset usually within 1 week; can be delayed up to 6 months

Diagnostic Approach

Chronic cough

- Algorithm describing diagnostic approach (see Figure 1)
- Detailed history and physical examination
- Obtain chest x-ray
 - Unless on ACE inhibitor
 - First, stop medication; if cough persists, then chest x-ray
- Chest x-ray: normal
 - Avoid any irritant
 - If cough persists, evaluate and treat for three most common conditions (singly in following order or in combination):
 - Postnasal drip
 - Asthma
 - GERD
 - If cough persists, consider postinfectious cough and evaluate for uncommon conditions.
 - Sputum tests
 - High-resolution CT
 - Modified barium esophagography
 - Bronchoscopy
 - Cardiac studies
 - Treat accordingly

- If cough persists, reevaluate treatment before considering habit or psychogenic cough.
- Chest x-ray: abnormal
 - Order tests based on pretest probability.
 - Sputum cytology
 - High-resolution CT
 - Modified barium esophagography
 - Bronchoscopy
 - Cardiac studies
 - Treat accordingly

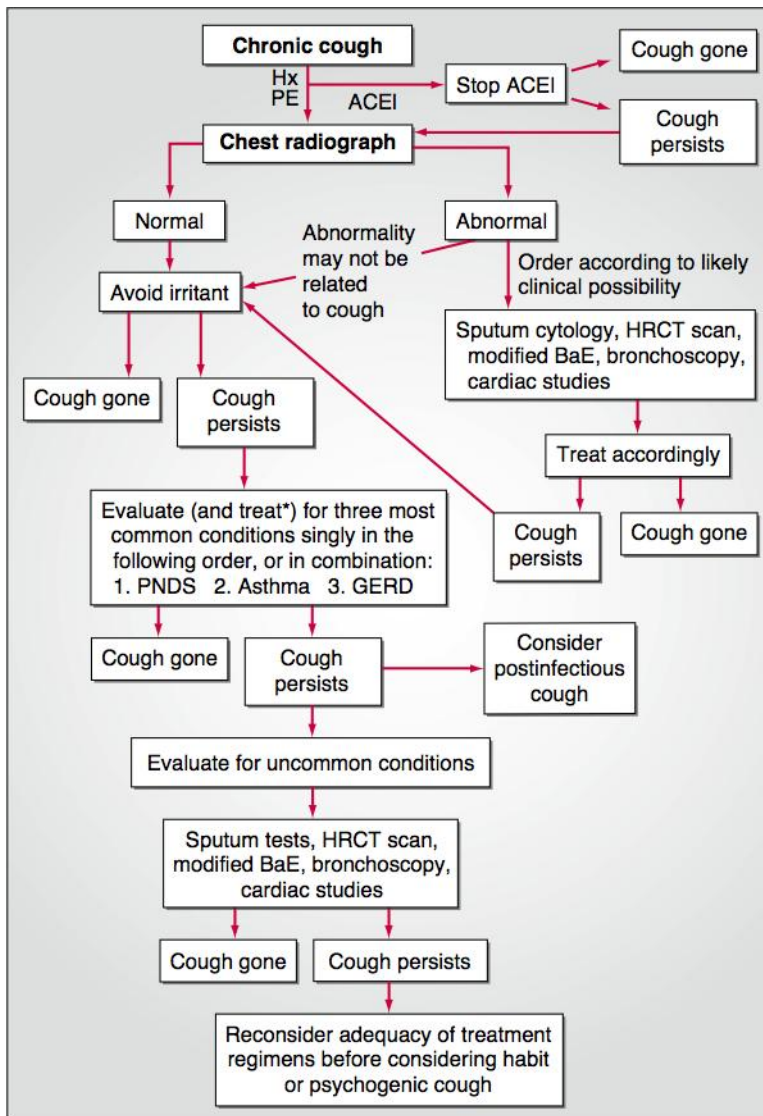


Figure 1: An algorithm for the evaluation of chronic cough. ACEI, angiotensin-converting enzyme inhibitor; BaE, barium esophagography; GERD, gastroesophageal reflux disease; HRCT, high-resolution CT; Hx, history; PE, physical examination; PNDS, postnasal drip syndrome.

*Treatment is either targeted to a presumptive diagnosis or given empirically. [Adapted from RS Irwin: *Chest* 114(Suppl):133S, 1998, with permission.]

Laboratory Tests

- Sputum: gross and microscopic examination
 - Purulent sputum suggests:
 - Chronic bronchitis
 - Pneumonia
 - Bronchiectasis
 - Lung abscess
 - Blood in sputum
 - Seen in above disorders but also with endobronchial tumor
 - Greater than 3% eosinophils on staining of induced sputum in patient without asthma suggests eosinophilic bronchitis.
 - Gram and acid-fast stains and cultures
 - To identify infectious pathogen
 - Cytology
 - May provide diagnosis or high suspicion of pulmonary malignancy

Imaging

- Chest radiography
 - Helpful in suggesting or confirming cause
 - Important potential findings include:
 - Presence of intrathoracic mass lesion
 - Localized pulmonary parenchymal infiltrate
 - Diffuse interstitial or alveolar disease
 - Area of honeycombing or cyst formation suggesting bronchiectasis
 - Symmetric bilateral hilar adenopathy seen in sarcoidosis
- High-resolution CT
 - Can confirm presence of interstitial disease
 - Frequently suggests diagnosis such as pulmonary neoplasm
 - Procedure of choice for demonstrating dilated airways and confirming diagnosis of bronchiectasis

Diagnostic Procedures

Pulmonary function testing

- To assess functional abnormalities
 - Forced expiratory flow rates
 - Reversible airflow obstruction characteristic of asthma
 - Lung volumes and diffusing capacity
 - Restrictive pattern seen with diffuse interstitial lung disease

Bronchoprovocation testing

- With methacholine or cold-air inhalation
 - To diagnose asthma when flow rates normal
 - Demonstrates hyperreactivity of airways to a bronchoconstrictive stimulus

Fiberoptic bronchoscopy

- Procedure of choice for:
 - Visualization of endobronchial tumor
 - Collecting cytologic and histologic specimens

- Inspection of the tracheobronchial mucosa can demonstrate:
 - Endobronchial granulomas often seen in sarcoidosis
 - Endobronchial biopsy or transbronchial biopsy of lung interstitium can confirm diagnosis.
 - Characteristic appearance of endobronchial Kaposi's sarcoma in patients with AIDS
- See Bronchoscopy for details

Treatment Approach

- Definitive treatment
 - Dependent on determining underlying cause
- Specific considerations
 - Elimination of exogenous inciting agent (cigarette smoke, ACE inhibitor) or endogenous trigger (postnasal drip, gastroesophageal reflux)
 - Usually effective if precipitant can be identified
 - Treat specific respiratory tract infections.
 - Bronchodilators for potentially reversible airflow obstruction
 - Inhaled glucocorticoids for eosinophilic bronchitis
 - Chest physiotherapy and other methods to clear secretions in bronchiectasis
 - Treatment of endobronchial tumors or interstitial lung disease if therapy available and appropriate

Specific Treatments

Symptomatic or nonspecific therapy

- Consider when:
 - Cause not known or specific treatment not possible and
 - Cough performs no useful function or causes marked discomfort
- Treat irritative, nonproductive cough with antitussive agent
 - Codeine (15 mg qid) or nonnarcotics such as dextromethorphan (15 mg qid)
 - Increases latency or threshold of cough center
 - Provides symptomatic relief; interrupts prolonged, self-perpetuating paroxysms
 - Ipratropium bromide (2–4 puffs qid)
 - Lacks proof of efficacy
 - Possibly inhibits efferent limb of cough reflex
- Cough productive of significant quantities of sputum should usually not be suppressed.
 - Retention of sputum may interfere with distribution of ventilation, alveolar aeration, and ability of the lung to resist infection.

Chronic, unexplained cough

- Empirical approach for both diagnostic and therapeutic purposes
 - Antihistamine-decongestant combination or nasal ipratropium spray to treat unrecognized postnasal drip
 - If ineffective, treat for asthma and then GERD

Monitoring

- Referral to a pulmonologist may be warranted after:
 - No identifiable cause is found by history, physical, and chest x-ray.
 - Patient does not respond to sequential or concurrent treatment for postnasal drip, asthma, and GERD.

- Specialized tests such as high-resolution CT, modified barium esophagography, bronchoscopy, and cardiac studies are negative.

Complications

- Exhaustion
- Cough syncope
 - Due to markedly positive intrathoracic and alveolar pressures, diminished venous return, and decreased cardiac output
 - Occasionally precipitated by paroxysms of coughing
- Chest and abdominal wall soreness
- Urinary incontinence
- Cough fractures of ribs
 - May occur in otherwise normal patients
 - Should raise possibility of pathologic fractures, seen with:
 - Multiple myeloma
 - Osteoporosis
 - Osteolytic metastases

Prognosis

- Prognosis is dependent on the underlying cause of cough.

Prevention

- Avoid smoking
- Minimize contact with people experiencing cold or flu symptoms

ICD-9-CM

- 786.2 Cough

See Also

- Asthma
- Bronchoscopy
- Chronic Obstructive Lung Disease
- Common Viral Respiratory Infections
- Community-Acquired Pneumonia
- Dyspnea
- Gastroesophageal Reflux Disease
- Hemoptysis
- Hospital-Acquired Pneumonia
- Interstitial Lung Disease
- Laryngitis and Epiglottitis
- Lung Abscess and Empyema
- Pharyngitis
- Pulmonary Function Tests
- Pulmonary Thromboembolism
- Sarcoidosis
- Thoracic Aortic Aneurysm
- Tuberculosis

Internet Sites

- Professionals
 - Pertussis, Technical Information
CDC, Division of Bacterial and Mycotic Diseases
 - Homepage
American Lung Association
- Patients
 - Cough
MedlinePlus
 - Cover Your Cough (Influenza)
Centers for Disease Control and Prevention

General Bibliography

- Gibson PG, Fujimura M, Niimi A: Eosinophilic bronchitis: clinical manifestations and implications for treatment. *Thorax* 57:178, 2002 [PMID:11828051]
- Holmes RL, Fadden CT: Evaluation of the patient with chronic cough. *Am Fam Physician* 69:2159, 2004 [PMID:15152964]
- Irwin RS: Assessing cough severity and efficacy of therapy in clinical research: ACCP evidence-based clinical practice guidelines. *Chest* 129:232S, 2006 [PMID:16428716]
- Irwin RS, Widdicombe J: Cough, in *Textbook of Respiratory Medicine*, 3d ed JF Murray, JA Nadel (eds). Philadelphia, Saunders, 2000
- Irwin RS et al: The cough reflex and its relation to gastroesophageal reflux. *Am J Med* 108:735, 2000
- Irwin RS, Madison JM: The diagnosis and treatment of cough. *N Engl J Med* 343:1715, 2000 [PMID:11106722]