



Cough

● Objectives:

- Define Cough
- Know the Mechanism of Cough
- Know the Causes of Cough
- Know the Side Effects of Cough
- Manage How To Approach A Patient With Cough

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[Color index : **Important** | **Notes** | Extra]

● Resources:

- 435 slide 434 team
- Talley “ clinical examination”



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"Medicine is an art, nobody can deny it."

• What is cough?

- A Cough is a **forced expulsive maneuver, usually against a closed glottis** and is associated with a characteristic sound.¹
- *Cough is the most frequent symptom of respiratory diseases* and is caused by **stimulation of sensory nerves** in the mucosa of the **pharynx, larynx, trachea** and **bronchi**.
- It is a vital **protective mechanism**.²
- Normal cough is lost in patients with respiratory muscle paralysis or vocal cord palsy.³
- **Intrathoracic pressure increases** up to 300 mmHg (**might reduce venous return to the heart and cut off blood supply to the brain**).
- Expiratory velocity reaches 500 mph
 - **It is good for:**
 1. Attracting attention !!
 2. Signaling displeasure !!
 3. **Protecting the airway from pathogens, particulates, food, other foreign bodies.**
 4. **Clearing the airways of accumulated secretions, particles** “ Helps clear mucus “

• Impaired Cough reflex:

Consequences:
- Aspiration of oropharyngeal or stomach contents (Bacteria, food, other)
- Acute airway obstruction
- Pneumonia “infection”
- Lung abscess
- Respiratory failure ARDS
- Bronchiectasis “ due to repeated aspiration”
- Pulmonary fibrosis “ scarring”

• Complications:

- Headache
- Dizziness
- Musculoskeletal pain
- Syncope
- Urinary incontinence “not uncommon”
- Rib fracture.

19.5 Cough		
Origin	Common causes	Clinical features
Pharynx	Post-nasal drip	History of chronic rhinitis
Larynx	Laryngitis, tumour, whooping cough, croup	Voice or swallowing altered, harsh or painful cough Paroxysms of cough, often associated with stridor
Trachea	Tracheitis	Raw retrosternal pain with cough
Bronchi	Bronchitis (acute) and COPD Asthma Eosinophilic bronchitis Bronchial carcinoma	Dry or productive, worse in mornings Usually dry, worse at night Features similar to asthma but AHR absent Persistent (often with haemoptysis)
Lung parenchyma	Tuberculosis Pneumonia Bronchiectasis Pulmonary oedema Interstitial fibrosis	Productive (often with haemoptysis) Dry initially, productive later Productive, changes in posture induce sputum production Often at night (may be productive of pink, frothy sputum) Dry and distressing
Drug side-effect	ACE inhibitors	Dry cough

¹ See the last page, another helpful table from Talley.

² A change in the character of a chronic cough may indicate the development of a new and serious underlying problem.

³ usually as a result of lung cancer infiltrating the left recurrent laryngeal nerve.

● **Mechanism of Cough:**  [Physiology of Coughing](#)

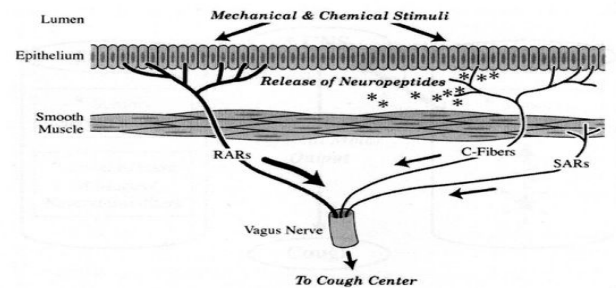
You have an **Afferent** and an **Efferent** Pathway:

- **Afferent Pathway:** stimulation of sensory nerves in the mucosa of the airway tract

which could be:

- **Mechanical Stimuli** (e.g. trauma, cancer, foreign body, stick at the back of the throat) or,
- **Chemical Stimuli** (e.g. strong smells, noxious gases, dust) or,
- **Both** (e.g. Regurgitation).
- The **major** afferent pathway is the **Vagus nerve**. “ Others include: Glossopharyngeal, phrenic and trigeminal “.

- Stimuli arise from: **Ear, pharynx, larynx, lungs, tracheobronchial tree, heart, pericardium or esophagus.**

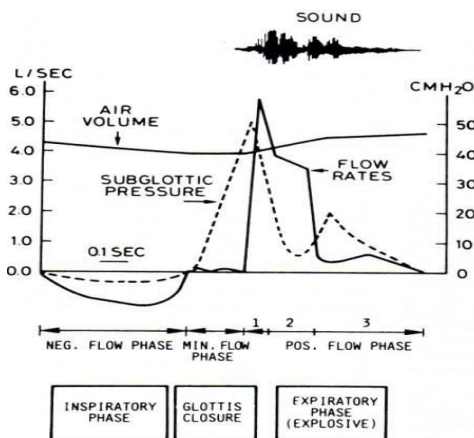


- **Efferent Pathway:**

It has **4 Phases**:

1. Inspiratory Phase: **Inspiratory gasp**
2. Compressive Phase: **Valsalva Maneuver** (**Glottis is closed**). (**Valsalva requires closed airway, therefore patients with paralyzed cords can't cough very well**).
3. Expiratory Phase: **Expiratory blast as cords abduct**. (**When the glottis opens and all of a sudden everything comes out**). (**expiratory blast requires functional expiratory muscles, it can reach 500 mph, that's why if it was an infectious cough there would be a public health concern**).
4. Relaxation Phase: **post-tussive prolonged inspiration**.

★ 434 team:



- Mechanical or chemical stimuli will stimulate cough receptors in pharynx, larynx, etc. which will send afferent impulses through the vagus nerve to the cough center (NTS) in the medulla oblongata.

Efferent impulses will go to the effector muscles: **Respiratory muscle, Larynx muscle & Bronchial smooth muscle**. Which will initiate the 4 phases.

1. **Inspiratory phase:** By taking a deep breath in → stretching expiratory muscles → increasing lung pressure- flow rates and subglottic pressure are negative
2. **Compressive phase:** The glottis closes respiratory muscles contract → more increase in lung pressure- negative flow rates come to a state of equilibrium and negative subglottic pressure increases exponentially.
3. **Expiratory phase:** The glottis will open → air is pushed out → due to high pressure inside the lungs.
4. **Relaxation Phase.**

- **Classification of cough:**

Three categories of cough. (**depending on duration**)

1. **Acute Cough:** (= < 3 weeks)

- **Differential Diagnosis:**

- ❖ **Upper Respiratory Tract Infection:**

Viral syndromes, sinusitis viral/ bacterial⁴.** Cause exacerbation of chronic lung disease e.g. Asthma⁵, COPD. ** (most common)

- ❖ **Pneumonia (acute infection)**⁶
- ❖ **Left ventricular Heart Failure**
- ❖ **Foreign Body Aspiration**
- ❖ **pulmonary embolism**
- ❖ **Throat-clearing⁷ secondary to laryngitis or pharyngitis**

- **Epidemiology:**

- Symptomatic URTI:
- 2-5 adults/year • 7-10 children/year
- 40-50% will have cough, - 20% consult GP.
- Self-medication is common, - Resolves within 2 weeks.

- **Management:**

- ◆ **Identify high risk groups:**

Acute Cough could be the 1st indicator of serious diseases e.g. Lung cancer, TB, Foreign body, Allergy, Interstitial Lung disease “Chronic cough always preceded by acute cough”. (Main concern is TB so the patient won't infect other people).

- ◆ **RED FLAGS in Acute Cough:**

- ◆ **Treatment of Simple Acute Cough:**

- Benign course - reassure the patient.
- Cough can distress.
- Patients report OTC (over-the-counter) medication helpful.
- Voluntary cough suppression linctuses⁸/ drinks. (Sometimes might not be helpful because they only sooth the back of the throat and encourage the pt. to voluntarily suppress the cough).
- Suppression of cough - dextromethorphan, menthol, sedating antihistamine and codeine.

Symptoms	Signs
- Hemoptysis	- Tachypnea
- Breathlessness	- Cyanosis
- Fever (viral infection)	- Dull Chest
- Chest Pain	- Bronchial Breathing
- Weight Loss	- Crackles
THINK Pneumonia, Lung cancer, LVF Get a Chest X-Ray (CXR)	

⁴ Resulting in post nasal drip.

⁵ Worse at night.

⁶ Associated with fever.

⁷ Read

⁸ a syrupy or sticky preparation containing medicaments exerting a local action on the mucous membrane of the throat.

★ Management of cough should **focus on treating the underlying condition** if possible. If this fails to bring about the desired response, antitussive drugs may be effective:

Dextromethorphan	Menthol	Sedating Antihistamines	Codeine or Pholcodine
e.g. Benylin (non-drowsy) (Opioid Derivative) - high dose 60mg - <u>Beware of combinations</u> e.g. paracetamol⁹ - Very effective.	- Steam inhalation - Effect on reflex “receptors” → <u>short lived</u>	- cause drowsiness “unlike dextromethorphan” - For nocturnal cough - Suppress the cough center in the medulla.	- Not better than dextromethorphan - <u>More side effects</u> (not recommended) - (Needs prescription and mainly for patients w/ cancer or severe cough)

2. Sub-Acute Cough: (3-8 weeks)

○ Differential Diagnosis:

- **Post infectious (viruses are cytolytic, meaning that they actually damage the airways and it takes time to come back to normal)**
- Bacterial Sinusitis
- Asthma
- Start of Chronic Cough
- Don't want to miss lung cancer or any other serious disease.

○ Actions:

- Examine Chest
- **Chest X-Ray** if signs or smoker
- Measure of **airflow obstruction**

• i.e. Peak flow¹⁰ –one off • Peak flow – serial • Spirometry

○ Post Infectious Cough:

- A cough that begins with an acute respiratory tract infections and **is not complicated by pneumonia** (normal lung exam & normal CXR).
- Resolve without treatment
- **Causes Postnasal drip or Tracheobronchitis**

3. Chronic Cough: (>= 8 weeks) (Chronic will start as acute)

Chronic cough is always preceded by acute cough.

(in chronic cough if the patient's FEV1/FVC ratio*normally between 80-100* is less than 70% then its airway obstruction (e.g. COPD); if it's more than a 100% then its airway restriction (e.g. interstitial lung disease¹¹ like pulmonary fibrosis).

Duration of Cough in URTI (Sub-acute Cough - Post viral cough):	
End of Week	% Coughing
3	58%
4	35%
5	17%
6	8%

* Primary Care Setting
 * No antecedent or chronic lung disease
 - Jones FJ and Stewart MA, Aust Family Physician Vol. 31, No. 10, October 2002.

⁹ Acetaminophen and dextromethorphan is a combination medicine used to treat cough and pain or fever caused by the common cold or flu.

¹⁰ Measures how fast you can breathe out

¹¹ Dry cough

- **Triggered by:**

“Change in temperature, scent, sprays, aerosols and exercise”: indicates Increased cough reflex sensitivity which is **not only seen in Asthma**. This might be seen in **GERD, infection** “Bordetella pertussis infection” and **ACEI**.

- **Epidemiology:**

Associations with:

Smoking (Dose Related)	Pollutants (Particulate PM ₁₀)- occupation	Environmental Irritants (e.g. Cat dander)	Asthma ¹²	Reflux ¹³	Obesity	IBS	female
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◆ **Mnemonic: GASPS AND COUGH**

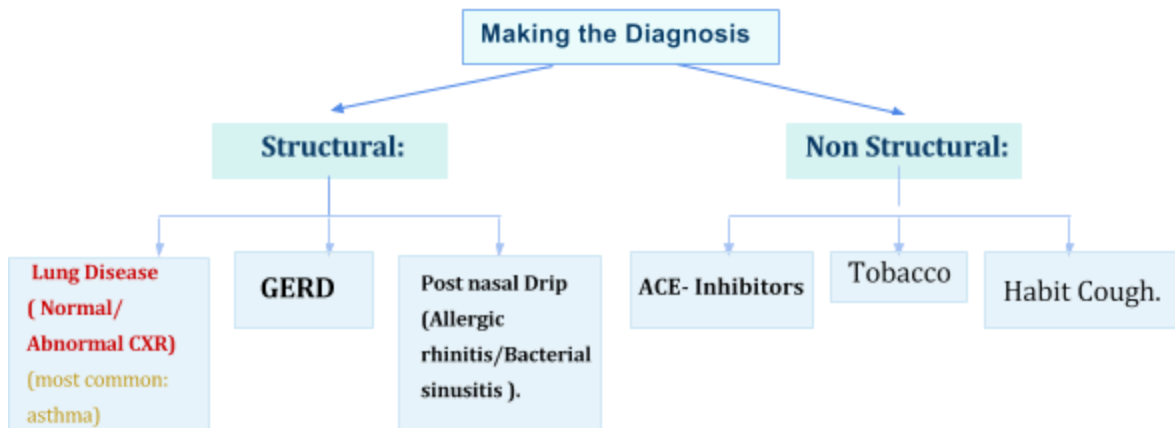
- **G**astroesophageal reflux disease, **A**sthma, **S**moking/chronic bronchitis, **P**ost-infection, **S**inusitis/post-nasal drip
- **A**ce-inhibitor, **N**eoplasm/lower airway lesion, **D**iverticulum (esophageal)
- **C**ongestive heart failure, **O**uter ear, **U**pper airway obstruction, **G** I-airway fistula, **H**ypersensitivity/allergy

- **Investigating:**

- **Purpose:** a. To exclude structural disease b. To identify cause
- **Method:** History & Examination including **occupation** (what are they exposed to) & **Spirometry**.

ALWAYS GET A CHEST X RAY IN CHRONIC COUGH.

- **Making the Diagnosis: “Common differentials”**



- **ACE Inhibitors: (non structural):**

- **Incidence:** 5-20%
- **Onset:** one week to six months (patient may not remember when the cough started)
- **Mechanism:**



- **Treatment:** switch to **angiotensin II Receptor Blockers (ARBs)** (switch if they have **cardiac or renal problems** but if they're **On it for HTN** then give them any other HTN drug).

¹² Remember **cough-variant asthma** in which asthma present with cough only.

¹³ require ambulatory oesophageal pH monitoring or a prolonged trial of anti-reflux therapy

○ **Post-Nasal Drip: (Structural¹⁴):**

Symptoms:	Causes:	Options:
<ul style="list-style-type: none"> • Something dripping • Frequent throat clearing • Nasal congestion • Posture 	<ul style="list-style-type: none"> • Allergic rhinitis • Non-allergic rhinitis • Vasomotor rhinitis • Chronic bacterial sinusitis 	<ul style="list-style-type: none"> • Exclude/ treat infection • <u>Nasal steroid</u> for 8/52 • Sedating <u>anti histamines</u> • <u>Anti leukotrienes</u> e.g. montelukast • <u>Saline lavage</u> • <u>ENT opinion</u>

○ **Lung Disease : (Structural):**

Including Tobacco.

Favoring Lung Disease:-

- Shortness of breath
- Wheeze
- Sputum production
- Hemoptysis
- Chest signs e.g. crackles

○ **GERD: (Structural):**

- **Incidence:** Accounts alone or in combination for **10-40%** of chronic cough.
- **Mechanism:**
 1. Aspiration to larynx/trachea.
 2. Acid in distal esophagus stimulates Vagus & cough reflex.

(patients might not have any reflux symptoms or any heartburns).

Cough features:	GI Symptoms:	Causes:	Investigations:	Treatment:
<ul style="list-style-type: none"> - Throat clearing (if they have reflux in the back of the throat it'll become inflamed & they'll always feel like there's something stuck in there) - Worse at night "wakes pt. from sleep"/ <u>rising</u> - <u>On eating</u> - Reflex Hypersensitivity 	<p><i>If Aspiration is the main mechanism:</i></p> <ul style="list-style-type: none"> - Heart burn - Water brash/ sour taste - Regurgitation - Morning hoarseness <p><i>(because of the acid causing irritation)</i></p> <p><i>If Vagal is the main mechanism:</i></p> <p><u>NO GI SYMPTOMS.</u></p>	<p>Reflux may be due to medications or foods that reduce lower esophageal sphincter pressure and increased reflux</p> <ul style="list-style-type: none"> • Medications: <ul style="list-style-type: none"> - Theophylline - Oral β adrenergic agonists - NSAIDS - Ascorbic Acid - Ca Channel blockers • Food: <ul style="list-style-type: none"> - Chocolate, Caffeine, Peppermint, Alcohol, Fat 	<ul style="list-style-type: none"> • Esophageal pH monitoring for 24h (+diary) (<u>95% sensitive & specific</u>) • Ba swallow (<u>not sensitive enough</u>) • Endoscopy (<u>may confirm but false -ve rate</u>) <ul style="list-style-type: none"> - Endoscopy can show GERD, but cannot confirm it as the cause of cough. • CXR normal or hiatus hernia • spirometry normal. 	<ul style="list-style-type: none"> • Trial of Therapy: <ul style="list-style-type: none"> - high dose twice daily PPI for min of 8 weeks - (+/- prokinetic e.g. domperidone or metoclopramide) (<u>increases gastric emptying leading to less reflux</u>) - Eliminate contributing drugs - Baclofen rarely (<u>to relax the muscle</u>) * improves in 75-100% of cases.*

● **Chest X-Ray & Differentials of Cough:**

Normal CXR	Abnormal CXR
<ul style="list-style-type: none"> - GERD - Post nasal drip - Smokers cough/ Chronic bronchitis - Asthma, COPD and Bronchiectasis (these can also have abnormal CXR) - Foreign body (if radiolucent) 	<ul style="list-style-type: none"> - Left Ventricular failure - Lung cancer - Infection/ TB - Pulmonary fibrosis - Pleural effusion

lung cancer



¹⁴ nasal congestion / discharge

● **A man presents to you with cough:**

- What would you like to know?:

Questions to Ask	Follow up:
Onset?	- Recent or long standing?
Duration?	- Chronicity: - pertussis, TB, Foreign Body, Asthma, Drugs, Bronchiectasis, ILD
Character?	- Brassy ¹⁵ ? - Pressure on the trachea? Change in character of chronic cough should make you consider other pathology.
Nocturnal?	- Asthma - Also Early morning (Why? Because there is a circadian rhythm.. -In reflux it will be later in the morning whenever the patient wakes up *12-3 p.m* -In asthma it will be early morning *12 midnight a.m-3a.m*)
Precipitating Factors?	- Usually in Asthma - Emotion, Weather (Wind, Rain, Cold), Dust, Allergies, Exercise, Drugs
Relieving Factors?	- Avoidance of precipitating factors
Sputum?	- Presence? Assess color , Volume, Consistency , Pattern - Consider: Infections, COPD, CF, Bronchiectasis - chronic cough + large volume purulent sputum (green or yellow) may be due to bronchiectasis or lobar pneumonia, - Foul-smelling + dark-colored sputum indicates lung abscess with anaerobic organism. - Pink frothy secretion from the trachea occurs in pulmonary oedema.
Heamoptysis? (will be covered elsewhere)	- Presence? - Color , Volume, Consistency , Pattern
Association?	- Breathlessness - Sputum - Chest pain - Wheeze - Hoarseness - Post nasal drip

¹⁵ loud metallic barking cough associated with subglottic edema

Cough > B PRODUCTIVE

Blood in sputum? (f yes, how much?)

Productive cough "phlegm"?

Recent travel?

Odor?

Duration?

URI (Runny nose, Conjunctivitis, Sore throat, Nasal congestion)

Color of sputum?

TB exposure (Last PPD/ Night sweats/ Weight loss)

Infection

Volume of sputum (How many teaspoons?)

Energy nss "Fatigue" (If yes ask for how long?)

- **NOTE:**

- ◆ Don't forget to offer Cup of Water or a Tissue if the patient is coughing,
- ◆ Ask to see patient's tissue if he/she is holding one to check for blood,
- ◆ Ask if tried quit smoking in past, if not educate.

LIST 9.2 Differential diagnosis of cough based on its duration

Acute cough (<3 weeks duration): differential diagnosis

Upper respiratory tract infection

- Common cold, sinusitis

Lower respiratory tract infection

- Pneumonia, bronchitis, exacerbation of COPD
- Irritation—inhalation of bronchial irritant (e.g. smoke or fumes)

Chronic cough: differential diagnosis and clues

COPD—smoking history

Asthma—wheeze, relief with bronchodilators

Gastro-oesophageal reflux—occurs when lying down, burning central chest pain

Upper airway cough syndrome—history of rhinitis, postnasal drip, sinus headache and congestion

Bronchiectasis—chronic, very productive

ACE inhibitor medication—drug history

Carcinoma of the lung—smoking, haemoptysis

Cardiac failure—dyspnoea, PND

Psychogenic—variable, prolonged symptoms, usually mild

ACE = angiotensin-converting enzyme; COPD = chronic obstructive pulmonary disease; PND = paroxysmal nocturnal dyspnoea.

DDx of Cough (Summary)

TABLE 9.1 Differential diagnosis of cough based on its character

Origin	Character	Causes
Nasopharynx/larynx	Throat clearing, chronic	Postnasal drip, acid reflux
Larynx	Barking, painful, acute or persistent	Laryngitis, pertussis (whooping cough), croup
Trachea	Acute, painful	Tracheitis
Bronchi	Intermittent, sometimes productive, worse at night	Asthma
	Worse in morning	Chronic obstructive pulmonary disease (COPD)
	With blood	Bronchial malignancy
Lung parenchyma	Dry then productive	Pneumonia
	Chronic, very productive	Bronchiectasis
	Productive, with blood	Tuberculosis
	Irritating and dry, persistent	Interstitial lung disease
	Worse on lying down, sometimes with frothy sputum	Pulmonary oedema
ACE inhibitors	Dry, scratchy, persistent	Medication-induced

Cases

1. What is the most common and frequent cause of Acute cough?
 - a. COPD.
 - b. URTIs.
 - c. Left ventricular heart failure.
 - d. Foreign body aspiration.
2. A 30 years old patient came to the ER complaining of cough for the last five days , breathlessness , chest pain and crackles. In this situation which of the following will you consider as first step?
 - a. Chest X-ray.
 - b. Cough suppressants.
 - c. Reassure the patient.
 - d. Spirometry.
3. A 55 years old female patients was diagnosed with hypertension Four months ago and she started an ACE-inhibitor course . She presented to the clinic with history of dry cough for the last one month , what is the best treatment option:
 - a. Switch to proton pump inhibitors (PPIs)
 - b. Switch to Angiotensin II Receptor Blockers (ARBs).
 - c. Switch to Dextromethorphan.
 - d. Continue on the current treatment.
4. Which of the following conditions will appear normal on X-ray in chronic cough?
 - a. Asthma.
 - b. Lung cancer.
 - c. Pleural effusion.
 - d. TB.
5. A 45 year old woman complains of sudden onset of a non- productive cough and shortness of breath. Examination of the chest is unremarkable. Respiratory rate = 25, Pulse = 95. T = 98.2° F. In this setting which of the following is high in your differential diagnosis:
 - a. Pulmonary embolism
 - b. Myocardial infarction
 - c. Asthma
 - d. Pneumonia

6. A cough made worse in recumbent position suggests:
- a. Pulmonary embolism
 - b. Asthma
 - c. Gastroesophageal reflux
 - d. Subdiaphragmatic abscess
7. Most common cause of a chronic slightly productive cough in the adult population is:
- a. Asthma
 - b. Chronic bronchial inflammation
 - c. Heart failure
 - d. None of the above

Answers : 1-B , 2-A , 3-B , 4-A , 5- A , 6- C , 7- B