Cough is one of the cardinal symptoms of respiratory tract disorders and could be a manifestation of a serious non-respiratory tract disease. Cough is generated by an integrated mechanism between the central nervous and respiratory systems. The triggering factor of the above integration is an initial irritant, which stimulates the cough reflex and, hence, the mechanism of cough will take place. Persistent cough in a non-smoking adult is considered one of the most common presentations to physicians practicing in hospital or primary care settings and can be caused by many disorders. The objective of this article is to highlight a practical approach for the primary care physicians to the initial management of cough.

Key Words: Cough, Primary Care, Saudi Arabia.

INTRODUCTION
Cough is a defensive mechanism designed to rid the conducting passages of mucus and foreign material. It is an essential expeller that protects the airways from the adverse effects of inhaled noxious substances and also serves to clear the retained secretion. It is also defined as an expulsive expiration, which provides a means of clearing the tracheobronchial tree of secretions and foreign bodies.

Coughing may be initiated voluntarily or reflexively. Cough is one of the most common symptoms for which the patient seeks medical attention. It is commonly caused by pulmonary as well as extra-pulmonary disorders and can interfere with a person’s sleep, studies, professional and social activities. The incidence of cough in the USA is 14-23%. It is considered the most common presenting symptom worldwide for...
which patients seek medical attention and use health-care resources. A study done in Riyadh City, the capital of Saudi Arabia, revealed that medications for cough have accounted for 53.4% of all prescriptions by the primary health care physicians.

Two categories of cough are known. Acute, lasting for less than three weeks and chronic, lasting for three to eight weeks or longer. These are not mutually exclusive. The causes of each are variable. Acute cough is most commonly transient as in common cold but it can occasionally be associated with a potentially life threatening condition such as pulmonary embolism, congestive heart failure and pneumonia. Acute cough can persist and become a chronic problem.

The chronic form can be due to more than one condition. It has been shown that chronic cough may be due to single cause from 38 to 82% of the time and to multiple causes from 18 to 62% of the time. Multiple-caused cough has been due to three diseases in as much as 42% of the time. Whether cough is dry or productive, the most common causes of chronic cough in non-smoker adults in almost all age groups for which patients seek medical attention are: Post-nasal dripping syndrome (PNDS), Asthma, and Gastroesophageal reflux disease (GERD). In a non-smoking adult who has normal chest radiograph, chronic cough is likely to be due to PNDS in 35% of the cases, asthma 20-25% and GERD 20% of the cases.

The etiological diagnosis of cough has basically been produced by the following: inflammatory, mechanical, chemical and thermal stimulation of the cough receptors. Inflammatory stimuli are initiated by edema and hyperemia of the respiratory mucus membrane as in bacterial or viral bronchitis, common cold, and excessive cigarette smoking. It may also be caused by irritation from an exudative process such as postnasal drip and gastric reflux. Mechanical stimuli are produced by inhalation of a particle matter such as dust particles or by compression of the airways by pressures or tension on this structure. Lesions associated with airway compression may be extramural or intramural. Chemical stimuli may result from inhalation of irritant gases including cigarette smoke, chemical fumes, and adverse effect of certain drugs. Thermal stimuli may be produced by inhalation of either very hot or cold air. In general the diagnosis of the cause of cough depends not only on an analysis of the cough itself but on the other symptoms and physical signs and the chest radiograph.

Complications may be produced by the coughing mechanism including: (1) Paroxysm of coughing may precipitate syncope which is called syncopal cough (2) Strenuous cough may produce rupture of emphysematous bleb, rib fractures and costochondritis. The most common complications are exhaustion, feeling of self-consciousness, symptoms of insomnia, lifestyle change, musculoskeletal pain, hoarseness, excessive perspiration and urinary incontinence which may interfere with the patient’s life or compromise his living status.

The objective of this article is to develop a method of analyzing, and managing cough as a commonly encountered symptom in primary health care using guidelines and algorithmic approach.

**METHODS**

Different approaches have been proposed in the evaluation of a patient with a cough. One of the most useful diagnostic protocols used to evaluate patients with cough is based upon analyzing it and the associated symptoms. The investigator has developed a diagnostic/management algorithm which may be helpful in guiding primary health care
COPD=Chronic Obstructive Pulmonary Disease; PNDS=Post-Nasal Drip Syndrome; GERD=Gastroesophageal Disease  
URTI=Upper Respiratory Tract Disease; CHF=Congestive Heart Disease; ACE=Angiotensin Converting Enzyme

**Figure 1:** Algorithm illustrating various steps in the management of cough
The algorithm is divided into two parts; one for acute cough and the other for chronic cough. The part for acute cough is developed entirely by the author. The part for chronic cough has been compiled and modified from different texts (Figure). The investigator suggests a stepwise logical sequence for analyzing cough and managing it accordingly composed of four steps. These are: Step 1: History and physical examination, with or without chest x-ray. Step 2: Elimination of irritants and observation for four weeks. If step 1 was not suggestive of the diagnosis, bedside spirometry with bronchodilator, and/or sinus x-rays. Step 3: Test for gastroesophageal reflux study (even in the absence of upper gastrointestinal symptoms), i.e. pH monitoring, and barium swallow, if the above steps were negative. Step 4: Referral to Pulmonologist for bronchoscopy, and further work-up. If step 3 was not conclusive.

Certain tests have been proposed in addition to the history and physical examination in evaluating chronic cough. These tests are the following: (1) Chest radiograph, (2) Sinuses radiograph, (3) Methacholine inhalation challenge, (4) Barium esophagography, (5) Barium esophageal pH, (6) Bronchoscopy. The sensitivity of each has been studied. Chest radiograph was 100% sensitive with 54-76% specificity with positive predictive value (PPV) of 36-38% and negative predictive value (NPV) of 100%. Sinuses radiograph has showed a sensitivity of 97-100%, specificity of 75-79%. PPV of 57-81% and NPV of 95-100%. The methacholine inhalation test has showed a sensitivity of 100%, NPV of 100%, specificity of 67-71% and the PPV between 60-82%. Barium esophagography showed sensitivity from 48-92% with specificity of 42-76%. The PPV was 30-60% and NPV from 63-93%. Esophageal pH showed sensitivity of 100%, NPV of 100%, specificity between 66-100% with PPV of 89-100%. The last is bronchoscopy which showed sensitivity of 100%, NPV of 100%, specificity between 90-92% and PPV of 50-89%.

Cough due to cigarette smoking or ACE inhibitor should substantially improve or disappear within four weeks of cessation of smoking or discontinuation of the ACE inhibitor. Therefore, in the absence of abnormal chest radiograph, no additional laboratory tests should be ordered until response to cessation of smoking or discontinuation of the ACE inhibitor for four weeks has been assessed.

SUGGESTED APPROACH FOR MANAGEMENT

Definitive treatment of cough depends on determining its precise cause and then initiating specific therapy for the underlying cause. When this is done, specific therapy is usually effective as in smoking cessation, antibiotic therapy of specific bacterial infection, or eliminating gastroesophageal reflux. Symptomatic or non-specific therapy of cough should be considered when: (1) the cause of cough is not known or specific treatment is not possible. (2) The cough performs a useful function and needs to be encouraged, and represent potential hazard or causes marked discomfort. The advantage of prescribing an antitussive in patients with irritant, non-productive cough was claimed to be used as suppression of cough by increasing the latency or threshold of the cough center. Such antitussives are Codeine (50mg qid) or non-narcotics such as Dextromethorhane (15mg qid). These drugs provide useful symptomatic therapy by interrupting prolonged self-perpetuating paroxysm. When secretions are tenacious and thick, adequate hydration, expectorant and humidification of
the air with an ultrasonic nebulizer with or without Ipratropium Bromide (25-50ug) as class of bronchodilator treatment to be given as inhalation therapy. The protussive group such as cough enhancing agents designed to increase the cough effectiveness can be useful, eg Amiloride 10mmol/L, Aerosol OD.

CONCLUSION
Recognition of the importance of cough in clinical medicine is of great significance especially in primary care setting in order to solve the patient’s symptom or maintaining the patient’s self-esteem. Identifying clinical relevant issues on the cause of cough, and then analyzing it as trial of the proper management might help in solving the problem of the patient. The development of algorithmic approach to such a common problem might facilitate the management of cough in a busy primary care clinic. Such an approach is reported to have lead to proper management in 99.5% of the cases.

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Correction
The statement in the acknowledgment of the December issue on page 11 contains an error. It shall be read as follows: “The Journal accepts paper from many disciplines. It would not have been possible to evaluate or edit these submissions without the professional and punctilious contributions from many experts. The Editorial Board is indebted to the following reviewers who reviewed the manuscripts of Volume No.6, 1999, each of whom has reviewed from one to several manuscripts.