Prevent Emphysema Now!

Information for Physicians on the Diagnosis and Treatment of COPD

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National Lung Health Education Program
www.NLHEP.org

National Lung Health Education Program (NLHEP)

TEST YOUR LUNGS– KNOW YOUR NUMBERS

FEV$_1$ What is your FEV$_1$?

What is your FEV$_6$?

FEV$_6$ (FVC)

Forced Vital Capacity in six seconds

Introduction

One of the greatest challenges facing primary care physicians as well as medical specialists today is the growing problem of chronic obstructive pulmonary disease (COPD).

The National Lung Health Education Program (NLHEP) healthcare initiative is designed to identify and to treat patients in the early stages of emphysema and related chronic bronchitis. Together, emphysema and chronic bronchitis are known as chronic obstructive pulmonary disease (COPD). Approximately 120,000 Americans die of COPD each year! In 2000, more women than men died of COPD. COPD is now the fourth most common cause of death in the U.S.A. It is the only disease among the top five killers in America that continues to rise in the number of annual sick days and deaths.

By contrast, great progress has been made in reducing the number of people who become sick or who die from major diseases, such as heart attack, stroke, and many cancers, largely because of early identification and treatment programs.

The NLHEP initiative is directed to both primary care physicians and to patients. Many medical societies and governmental agencies within the United States sponsor the NLHEP. Financial support for the NLHEP comes from unrestricted grants from the pharmaceutical and medical equipment industries. The NLHEP enjoys a partnership with the American Association for Respiratory Care (AARC), a professional organization representing 130,000 respiratory care professionals.

Together, the NLHEP and the AARC are attacking COPD, a common disease tat results in suffering and early death. Please learn how you can help prevent emphysema! We aim to reduce the social and the economic impact of this important problem. We believe that through education to the public by professional and governmental agencies, the problem of COPD can finally be prevented and solved. Please visit our web sites (nlhep.org, aarc.org, and nepp.org) for current information.

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Making the Diagnosis of COPD

Undiagnosed COPD

A recent large population-based study, the third National Health and Nutrition Examination Survey (NHANES III), found that a large proportion of patients with COPD have not been diagnosed. This is true despite these patients manifesting symptoms of cough, excess mucus, dyspnea on exertion, or wheeze — the cardinal signs and symptoms of COPD. Even patients with moderate to advanced stages of disease may not be diagnosed, and accordingly, do not receive treatment. Today we have a powerful armamentarium to use for patients found to have early-stage COPD. These therapies can prevent progression into advanced stages of the disease. The catastrophe of developing emphysema with its life threatening implications, the need for oxygen and possibly surgery, and its tremendous impact on healthcare costs, make early diagnosis and intervention imperative.

We now recognize that spirometry is a simple expression of a complex process. Like blood pressure, spirometry has many determinates, as summarized in Table 1.

Who Should be Tested?

A consensus report of the National Lung Health Education Program (NLHEP) Spirometry Committee recommends simple spirometric testing for **all smokers age 45 years or older. Testing should also be done in anyone with chronic cough, excess mucus, dyspnea on exertion, or wheeze**. These are the major symptoms of COPD, which includes a spectrum of diseases: asthmatic bronchitis, chronic bronchitis, and emphysema. It is the emphysema component of this spectrum that leads to the greatest impairment and disability. In addition, anyone with a family history of emphysema or chronic bronchitis should have a spirometric test as a part of their initial evaluation. Knowing simple lung function values provides a baseline by which subsequent changes can be evaluated.

Table 1

BLOOD PRESSURE (Sphygmomanometry)	LUNG FUNCTION (Spirometry)
120/80	3.0 FEV_1/4.0 FVC
Cardiac output	Elastic recoil
Peripheral vascular resistance	Small airways resistance
Blood volume	Large airways resistance
Blood viscosity	Interdependence
Renin-angiotensin axis	Muscular effort and coordination

How to Test?

Spirometry measures airflow over time. It is most commonly expressed as two numbers that represent volume expired from the lungs. The forced vital capacity (FVC), is the amount of air that can be blown out of fully inflated lungs. This is the volume test. The forced expiratory volume in one second (FEV_1) is the amount of air blown out in the first second of the forced vital capacity. The FEV_1 is the flow test. The ratio between the two (FEV_1/FVC), should be more than 70%. If the FEV_1/FVC ratio is less than 70%, this is a strong indicator of early airflow obstruction. It is a harbinger of further rapid decline often leading to disabling emphysema.

The determinants of expiratory airflow are illustrated in Figure 1. Expiratory airflow is a function of pressure against resistance. The pressure is generated by elastic recoil and the resistance of the conducting airways. Spirometry is an effort-dependent test. It takes effort by the patient to fill the lungs completely and a complete uninterrupted effort to empty the lungs. Normal lungs empty in about six seconds.

It is now known that the forced expiratory volume in six seconds (FEV_6), is an excellent surrogate for FVC. Thus, doing a six-second expiratory maneuver is more pleasant for the patient and more convenient for the tester. Newer spirometers are now available that use the two parameters: FEV_1 and FEV_6. Predicted values for FEV_6 have been validated and published (see Hankinson and Swanney).

These new office spirometers are small and thus portable. They are inexpensive, easy to use, and accurate. Such a spirometer is illustrated in Figure 2.

Figure 1

Factors Associated with Expiratory Airflow

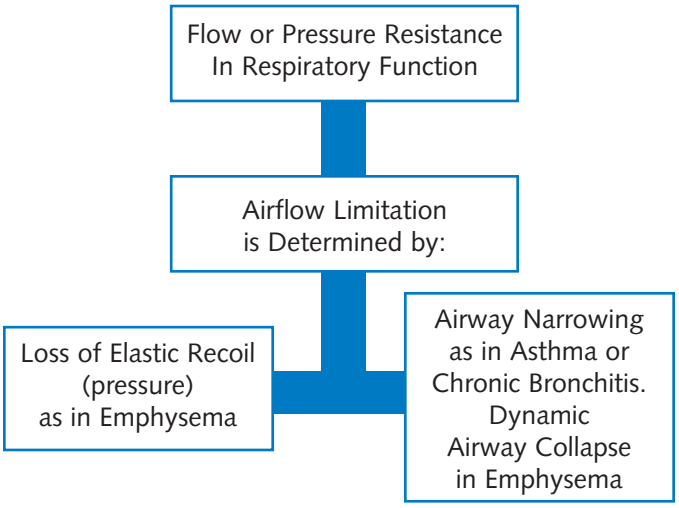


Figure 2

Simple hand-held spirometers are inexpensive, accurate, and easy to use.

Who Should be Treated?

Of course, all smokers should stop smoking, but patients who are developing airflow obstruction have an absolutely critical need to really stop smoking. Methods of smoking cessation and other therapies useful in early stages of COPD can change the course of the disease.

In the Lung Health Study, for example, patients with airflow obstruction who stopped smoking actually had an improvement in FEV_1 followed by only a slight decline over a five-year follow-up period. By contrast, those patients who continued to smoke had a much more rapid deterioration (see Figure 3). However, in the Lung Health Study, no patient died of COPD within the first five years of follow-up. The most common cause of death was lung cancer, followed by heart attack, and stroke (see Table 2). Thus, finding spirometric abnormalities in heavy smokers is a strong signal to look for other diseases, such as lung cancer and to institute therapies, such as the control of blood pressure and abnormal lipid,s to reduce the risk of heart attack and stroke.

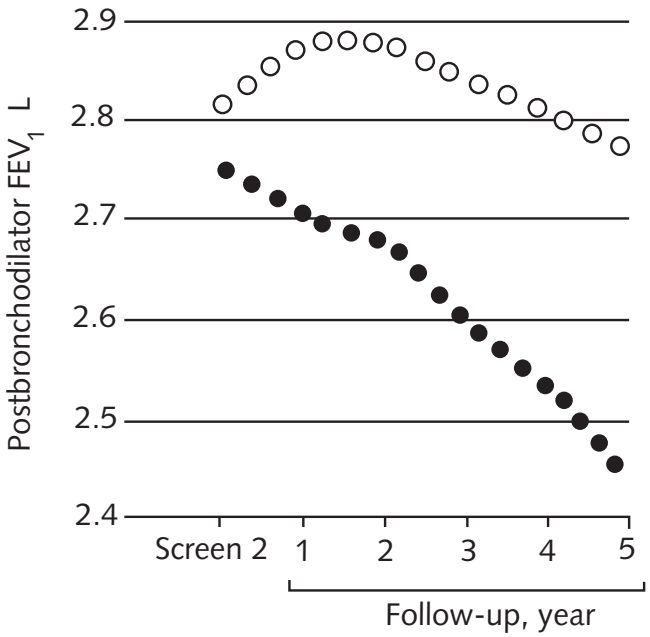


Figure 3

Effect of smoking cessation on FEV_1 over time, as seen in the Lung Health Study. Mean postbronchodilator forced expiratory volume at 1 second (FEV_1) for participants in the smoking intervention and placebo group who are sustained quitters (o), and those who continued to smoke (●). The two curves diverge sharply after baseline.

Table 2

Causes of Death Within Five Years in the Lung Health Study.

Cause of Death	*Smoking Intervention & Ipratropium*	*Smoking Intervention & Placebo*	*Usual Care*	*Total*
Lung cancer	18	20	19	57
Cardiovascular disease	18	7	12	37
Other	18	17	20	55
Total	**54**	**44**	**51**	**149**

Adapted from: Anthonisen NR, Connett JE, Kiley JP, Altose MD, Bailey WC, Buist AS, et al: Effects of smoking intervention and the use of an inhaled anticholinergic bronchodilator on the rate of decline of FEV_1. The Lung Health Study. *JAMA* 1994;272:1501. Total enrolled: 5,887 persons.

Suggested Treatment

Smoking cessation has been proven to improve lung function and to increase life span. It has also been shown to lessen the risk of heart attack and stroke, and, after years of no smoking, the risk of lung cancer declines. A practical method in smoking cessation is briefly presented below (Table 3) and discussed further on the next page.

The most important stop-smoking intervention is serious counseling about the importance of stopping smoking and the development of a cessation plan. Picking a quit date is key. Nicotine replacement should be started on the quit date. Nicotine replacement products available over-the-counter or by prescription are listed in Table 3.

Table 3

Drugs Used for Smoking Cessation. (Food and Drug Administration [FDA], Approved):

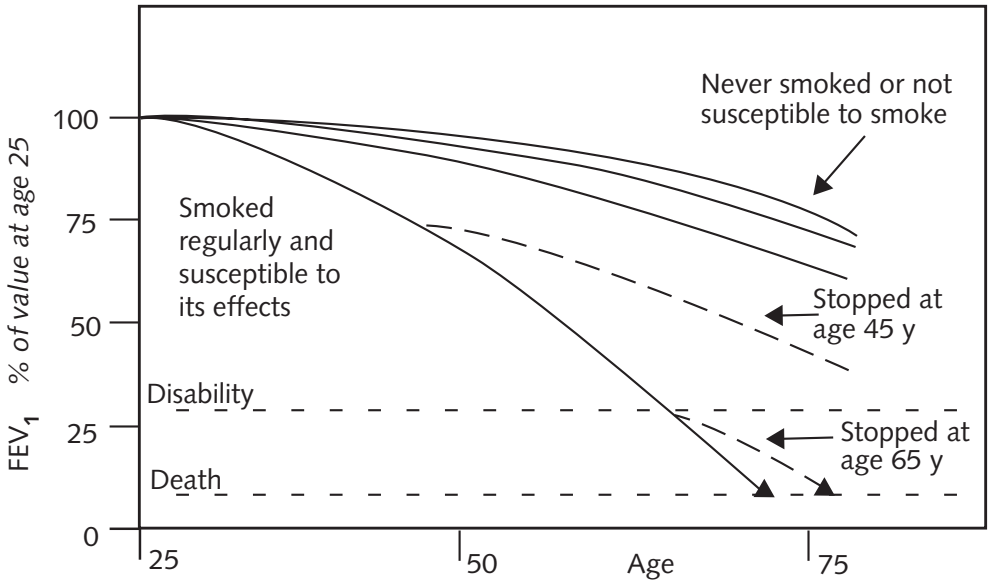
Drug and Method of Administration	*Unit Dose*	*Dose Interval*
Nicotine polacrilex (oral) * Fifteen to 30 pieces may be chewed over 24 hours.	2 - 4 mg	Every 1 - 2 hours*
Transdermal nicotine patch	21, 14, and 7 mg 15, 10, and 5 mg 22 and 11 mg	Over 24 hours Over 16 hours Over 24 hours
Nasal nicotine spray	0.5 mg/inhalation/nostril hourly or p.r.n. dosing	8 - 40 mg/day in
Nicotine inhaler	10 mg/inhaler	Inhale for 20 minutes 6 - 16 times/day
Nicotine lozenge	2 mg	Every 1-2 hours
Bupropion sustained-release tablets (Zyban®)	150 mg	150 mg for 3 days, then 300 mg/day (Start 2 wks before quit date)
Also Useful:		
Clonidine transdermal patch One patch changed		0.2 mg weekly for 3 to 10 weeks
Nortriptyline tablets	25, 50, and 75 mg	Maximum dose of 75 to 100 mg per day, treated for 8 to 12 weeks

Suggested Treatment (cont.)

The non-nicotine product, bupropion, is at least as effective as nicotine replacement in smoking cessation. When nicotine replacement and bupropion are used together, up to a 35.5% biologically proven quit rate can be achieved at one year, compared to a 15.6% success rate with no pharmacologic interventions. When medication is successful, cessation usually occurs within two weeks. Re-treatment is appropriate up to seven or eight times for those who fail. Start bupropion two weeks before quit date to help insure success in quitting.

The retardation of decline in FEV_1 over 30 years has been demonstrated (see Figure 4). Even patients who stopped smoking at age 65 had a survival benefit. Thus, it is never too late to stop smoking, but it is far better to stop at a young age and before advanced emphysema develops.

Figure 4



The effect of smoking cessation on decrement in FEV_1 (dotted oblique lines), compared with patients who have never smoked or who are not susceptible to cigarette smoke (upper solid lines), and also compared with patients who stopped smoking late and are deteriorating from the harmful effects of cigarette smoke. The percent FEV_1 when the disability most commonly occurs (approximately 30%), and where death occurs (approximately 10%), are indicated on the dotted horizontal lines. The percent of predicted FEV_1 at age 25 is on the vertical axis and age on the horizontal axis.

From: Peto R, Speizer FE, Cochrane AL, Moore F, Fletcher CM, Tinker CM, et al: The relevance in adults of air-flow obstruction, but not of mucus hypersecretion, to mortality from chronic lung disease. Results from 20 years of prospective observation. *Am Rev Respir Dis* 1983;128:492.

Other Therapy

Influenza virus vaccine should be given every Fall to anyone with airflow obstruction. This is particularly important for people over the age of 50. Pneumococcal vaccine should be given at least once in a lifetime and probably repeated every six years. Today, two new products, oseltamivir (Tamiflu™), and zanamivir (Relenza®), can modify the clinical course of both influenza A and B. Amantadine and Ranitidine are effective only in A strains of influenza.

Inhaled bronchodilators reduce symptoms and improve lung function in the majority of patients with early-stage disease. Ipratropium is the first step in therapy. Beta agonists such as albuterol are also of significant value. Ipratropium and albuterol are available in the same metered-dose inhaler (Combivent®). Salmeterol (Serevent) and formoterol (Foradil) are long-acting bronchodilators and, when used twice daily, are useful alternatives. Other novel bronchodilators are soon to be released; including tiotropium (Spivera®) a 24-hour anti-cholinergic to be released in the U.S.A. in the near future. Salmeterol (Serevent®) and formoterol (Foradil) are both compatible with the use of ipratropium. Together, both medications may improve lung function and mitigate symptoms. All patients must learn the proper technique for using metered-dose inhalers and newer inhalation devices coming to the market, for use in the delivery of anticholinergics, beta agonists, combinations, and corticosteriods.

Inhaled corticosteriods have not been shown to alter the rate of decline in FEV_1 in at least five randomized, controlled, clinical trials. However, inhaled budesonide, fluticasone, and triamcinolone have all been shown to improve symptoms and to reduce the consumption of healthcare resources in patients with severe COPD. A reduction of bone density was found during the conduct of one of these trials. Thus, any symptomatic benefits should be weighted against potential systemic side effects in the long-term.

The empiric use of antibiotics is well established in the management of acute exacerbations of chronic bronchitis. Bacterial invasion is often present following a cold, when there is increased cough, increased sputum volume, and the appearance of sputum purulence (i.e., yellow or green). These common invaders, the aerobes, are *H. influenzae, S. pneumonia, C. pneumoniae,* and *M. pneumoniae*. These agents are effectively treated with macrolides, fluoroquinolones, second generation cephalosporins, trimethoprim sulfa, or doxycycline when given empirically for five to seven days. A sputum culture is not necessary.

Oral corticosteriods, (i.e., 40 mg prednisone per day, or equivalent) given for a short period of time, (i.e., approximately 7-14 days), can attenuate the degree of acute airflow obstruction during exacerbations and can often abort the progression to a severe exacerbation of COPD, thus

Table 4

Therapy for COPD

Maintenace Management	
• Stop Smoking	Quit date, nicotine replacement, bupropion
• Inhaled Bronchodilators	Anticholinergics Beta Agonists Combinations
• Inhaled Corticosteroids (in advanced COPD)	
Exacerbations	
• Antibiotics	Broad spectrum
• Corticosteroids	Systemic prednisone
• Inhaled Bronchodilators	(See list above)

diminishing the need for hospitalization (see Table 4 above).

Future Directions

It is now known that the inflammatory mediators involved in the pathogenesis of COPD, which lead to airway inflammation and destruction of alveolar walls, are different from those involved in asthma. A number of new pharmacologic entities are being produced to deal with early-stage disease. Longer-acting anticholinergic drugs, mucoregulators, and immunomodulators are on the horizon and are soon to be released. But, even today, great progress is being made in slowing the course of disease in patients with early stages of COPD and related disorders through early identification and intervention. This is why the early identification of airflow obstruction by the routine use of simple office spirometry is of paramount importance. It is in this arena that the primary healthcare practitioner will play a leading role.

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Selected Resources

WEBSITES

American Association for Respiratory Care (AARC)
www.aarc.org

National Emphysema Prevention Program (NEPP)
www.nepp.org

National Lung Health Education Program (NLHEP)
www.nlhep.org

US COPD Coalition
www.uscopd.com

MEDICAL ARTICLES

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MEDICAL BOOKS

Simple Spirometry for Frontline Practitioners
SnowdriftPulmonaryConference.org
Snowdrift Pulmonary Conference, Inc.
899 Logan Street, Suite 203
Denver, CO 80203
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Appendix A

Pulmonary Function Reimbursement (as of 6/03)

Indication	ICD 9 CM Code
Shortness of Breath	786.09
Cough	786.2
Chronic Bronchitis	491.
Emphysema	492.
Asthma	493.
COPD	496.
Pre-operative Respiratory Exam	V72.82
History of Tobacco Use	V15.82

Description	CPT Code	Average Reimbursement
Spirometry	94010	$30
Bronchospasm Evaluations	94060	$57
Maximum Voluntary Ventilation	94200	$18
Respiratory Flow Volume Loop	94375	$37

NOTES

Printing and distribution have been made possible by educational grants from:

Bayer

Boehringer Ingelheim

gsk GlaxoSmithKline

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The National Emphysema Foundation

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Revised 6/03