Asthma vs. COPD

If spirometry confirms airway obstruction, the main differential diagnoses are COPD and asthma.

- Dyspnea, chronic cough and sputum production in an adult with a history of smoking or exposure to noxious particles or gases favors COPD.
- A history of childhood wheezing, atopic symptoms and diurnal variation in peak flows (as established by monitoring at home twice daily for 2 weeks) in an adult who coughs, wheezes or is short of breath favors a diagnosis of asthma.
- An improvement in FEV\textsubscript{1} after bronchodilator of 12\% (200ml) of exhaled air favors a diagnosis of asthma, but that can sometimes occur in COPD, so some experts favor an increase of 400 ml after treatment trial to be certain of asthma as the diagnosis.
- A reduced DLCO (diffusing capacity) favors the diagnosis of COPD.
- If there is uncertainty, consider a therapeutic trial of predni solitude 30 mg daily for 2 weeks or of inhaled corticosteroids for 2-4 weeks. A marked improvement in FEV\textsubscript{1} (> 400 ml) favors the diagnosis of asthma.

From Spirometry for Health Care Providers  GOLD  2006

How Often to Use Spirometry

For COPD

- Initially for diagnosis
- Periodically to track decline in lung function, although useful information about lung function decline is unlikely from spirometry measurements performed more than once a year.
- If there is a substantial increase in symptoms or a complication.
- Other pulmonary function tests (diffusing capacity (DLCO), inspiratory capacity, lung volumes) are not needed routinely but can be especially valuable in resolving diagnostic uncertainties.

From GOLD Guidelines 2006

For Asthma

The Expert Panel recommends the following frequencies for spirometry measurements:

- at the time of the initial assessment
- after treatment is initiated and symptoms and PEF* have stabilized, to document attainment of (near) "normal" airway function
- during a period of progressive or prolonged loss of asthma control
- at least every 1-2 years to assess the maintenance of airway function. These spirometry measures should be followed over the patient’s lifetime to detect potential for decline and rate of decline of pulmonary function over time.

From NHLBI Guidelines 2007

* PEF (peak expiratory flow) measurement is used to follow lung function at home in some patients with asthma; it is not a substitute for spirometry in the diagnosis of asthma.

A normal ratio of FEV\textsubscript{1}/FVC is 0.8 for adults 20-39 years old, 0.75 for adults 40-59 years old, 0.7 for adults 60-80 years old; a post-bronchodilator value less than 0.7 indicates airflow limitation and the possibility of COPD.

FEV\textsubscript{1} is influenced by age, sex, height and ethnicity, and is best considered as a percentage of the predicted normal value. Normal adults without airflow limitation have an FEV\textsubscript{1} > 80\% predicted.

Why Do Spirometry for COPD and Asthma?

- Spirometry is needed to make a firm diagnosis of asthma and COPD and to distinguish between the two. This is important because treatment of COPD is different from asthma.
- Together with the presence of symptoms, spirometry helps determine COPD and asthma severity and can be a guide to specific treatment steps.
- A normal value for spirometry effectively excludes the diagnosis of clinically relevant COPD.
- The lower the percentage predicted FEV\textsubscript{1}, the worse the subsequent prognosis.
- FEV\textsubscript{1} in persons with COPD and asthma declines over time and faster than in healthy adults. Spirometry can be used to monitor disease progression over the long term.
What You Need to Perform Spirometry

Most guidelines recommend the use of spirometers that provide a real-time trace to help assess the quality and repeatability of blows. 2 types commonly used in clinical practice:

- **Electronic desktop spirometers** are compact, portable and usually quick and easy to use; they have a real-time visual display and hardcopy printout. Some require regular calibration; they maintain accuracy over years.
- **Smaller, inexpensive hand-held spirometers** provide a numerical record of blows but no printout. These are good for simple screening and accurate for diagnosis, but do not give much indication of how well the patient performed the maneuver.

In those with real-time displays, 2 forms of traces can be viewed (see graphs next page). One is a plot of volume exhaled vs. time. The other is a plot of flow (L/sec) vs. volume (L). Both plots are useful, but the latter is most helpful in diagnosing airways obstruction.

Most spirometers require electrical power to permit operation of the motor and/or sensors. Some battery operated versions are available that can dock with a computer to provide hard copy.

**It is essential to learn how your machine is calibrated and when and how to clean it.**

How to Perform Spirometry

Spirometry is best performed with the patient seated. Patients may be anxious about performing the tests properly, and should be reassured. Careful explanation of the test, accompanied by a demonstration, is very useful. The patient should:

1. Breathe in fully
2. Seal their lips around the mouthpiece
3. Force the air out of the chest as hard and fast as they can until their lungs are completely “empty”
4. Breathe in again and relax

Exhalation must continue until no more air can be exhaled, must be at least 6 seconds, and can take up to 15 seconds or more. Recent use of a bronchodilator may influence the results, so inquire about and record the time of last use.

Like any test, spirometry results will only be of value if the expirations are performed satisfactorily and consistently. Both FVC and FEV1 should be the largest value obtained from any of 3 technically satisfactory curves and the FVC and FEV1 values in at least 2 of these three curves should vary by no more than 5% or 100 ml, whichever is greater. The FEV1/FVC is calculated using the maximum FEV1 and FVC from technically acceptable (not necessarily the same) curves.

Those with chest pain or frequent cough may be unable to perform a satisfactory test and this should be noted.