

# Lung function in health and disease

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# Types of lung function tests include

- Spirometry.
- Gas diffusion.
- Body Plethysmography.
- Inhalation challenge test.
- Exercise stress test.

- **Spirometry:**
  - It is the measurement of the speed and the amount of air that can be exhaled and inhaled.
- **Body Plethysmography test:**
  - The patient is required to sit in an airtight chamber that resembles a small telephone booth. Inside the chamber is an affixed spirometer, which is used to determine the flow properties of the patient.
- **Cardiopulmonary Stress Testing**
  - Used for evaluation of dyspnea that is out of proportion to findings on static pulmonary function tests
- **Diffusing Capacity of Lung for Carbon Monoxide**
  - To evaluate the presence of possible parenchymal lung disease
- **Pulse Oximetry**
  - The principle is measurement of O<sub>2</sub> saturation by spectrophotometry

**Spirometer**



**Plethysmography**



# Spirometry



- Spirometry is a method to record volume movement of air into and out of the lungs.
- Spirometry is a simple most commonly used test to:
  - Assess the lung performance
  - Measure the physiological parameters:
    - Lung volumes
    - Capacities
    - Flow rate
  - Differentiate between the obstructive and restrictive lung conditions
  - Play a critical role in the diagnosis, differentiation and management of respiratory diseases.

# Physiological conditions affecting lung functions

- Age
- Gender
- Height
- Weight
- Ethnic group
- Pregnancy

# Indications of Spirometry

- Based on clinical features / abnormal lab tests
- **Symptoms:**
  - Dyspnea
  - Cough
  - Sputum production
  - Chest pain
- **Signs:**
  - Cyanosis,
  - Clubbing
  - Chest deformity
  - Diminished chest expansion
  - Hyperinflation
  - Diminished breath sounds
  - Prolongation of expiratory phase & crackles
- **Arterial blood gas analysis:** Hypoxemia, hypercapnia
- **Abnormal chest X Ray.**

# Indications of Spirometry

- To detect respiratory disease in patients presenting with symptoms of breathlessness, and to distinguish respiratory from cardiac disease.
- To diagnose or manage asthma
- To diagnose and differentiate between obstructive and restrictive lung disease.
- To conduct pre-operative risk assessment before anesthesia
- To measure response to treatment of conditions which spirometry detects



# Indications of Spirometry

- Describe the course of diseases affecting PFTs
  - **Neuromuscular diseases:** Guillain Barre Syndrome, Myasthenia gravis
  - **Pulmonary diseases:** Obstructive airway diseases, Interstitial lung diseases
  - **Adverse reactions:** Drugs with known pulmonary toxicity [Pulmonary fibrosis]

# Indications of Spirometry

- **To assess the therapeutic interventions:**
  - Bronchodilator therapy
  - Steroid treatment for asthma
  - Chronic obstructive lung disease
  - Interstitial lung disease

# Indications of Spirometry

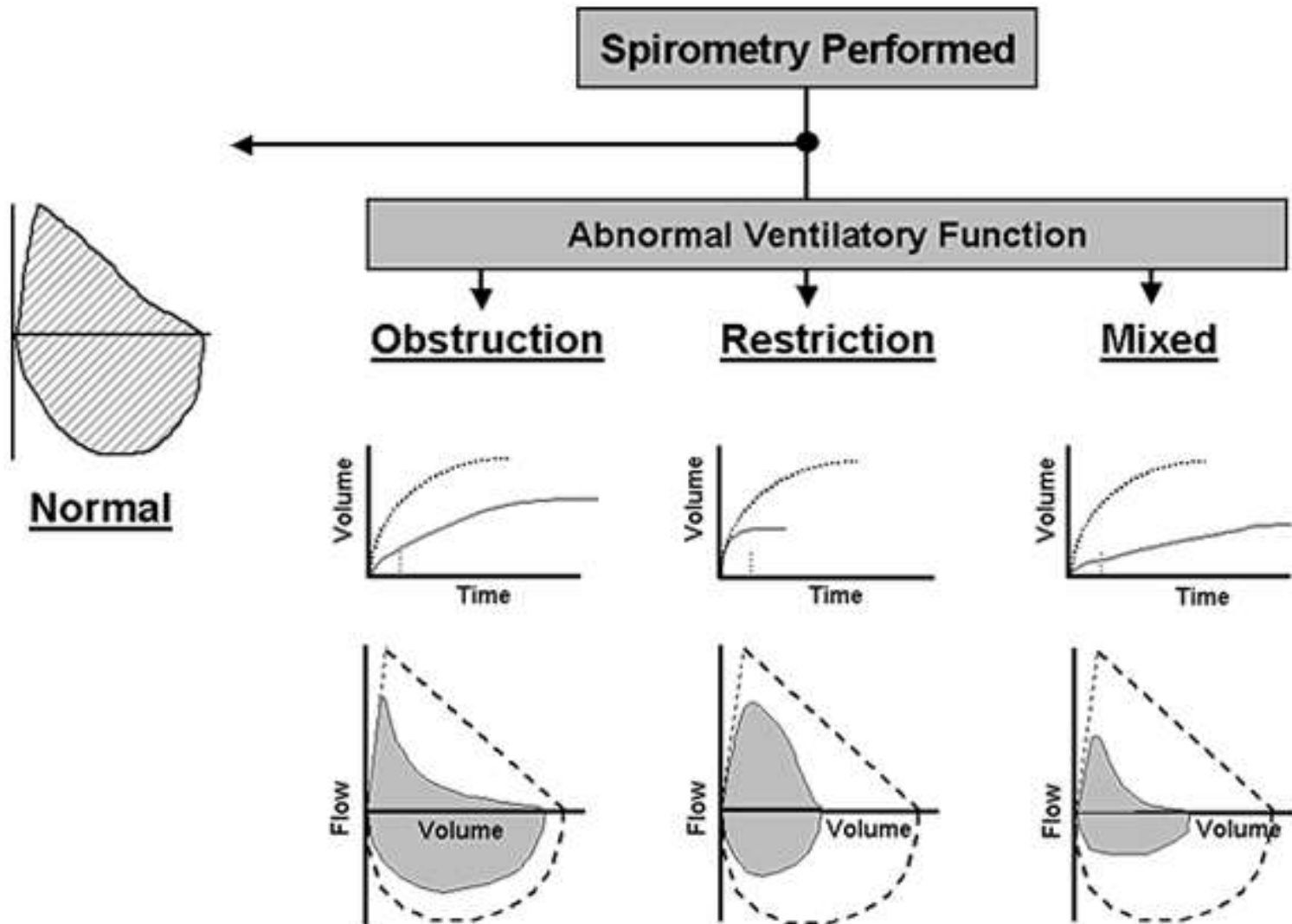
## **PRE OPERATIVE INDICATIONS**

- To determine the suitability of patients for anesthesia
- To assess the risk for surgical procedures known to affect lung function.

# Results classification

- Normal
- Obstructive
- Restrictive
- Combined

# Assessment of spirometry



# Maintaining accuracy

- The most common reason for inaccurate results:
  - Inadequate or incomplete inhalation.
  - Additional breath taken during the test
  - Lips not sealed around the mouth piece.
  - Slow start to forced exhalation
  - Some exhalation through the nose.
  - Coughing.

# Smoking and Spirometry

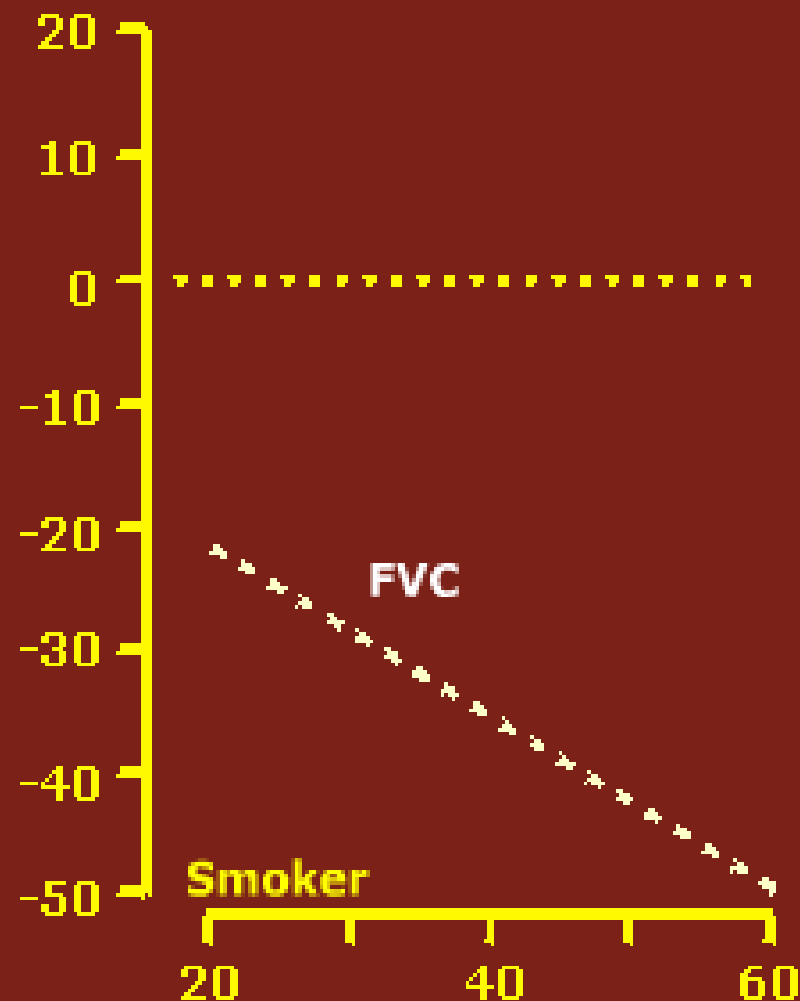
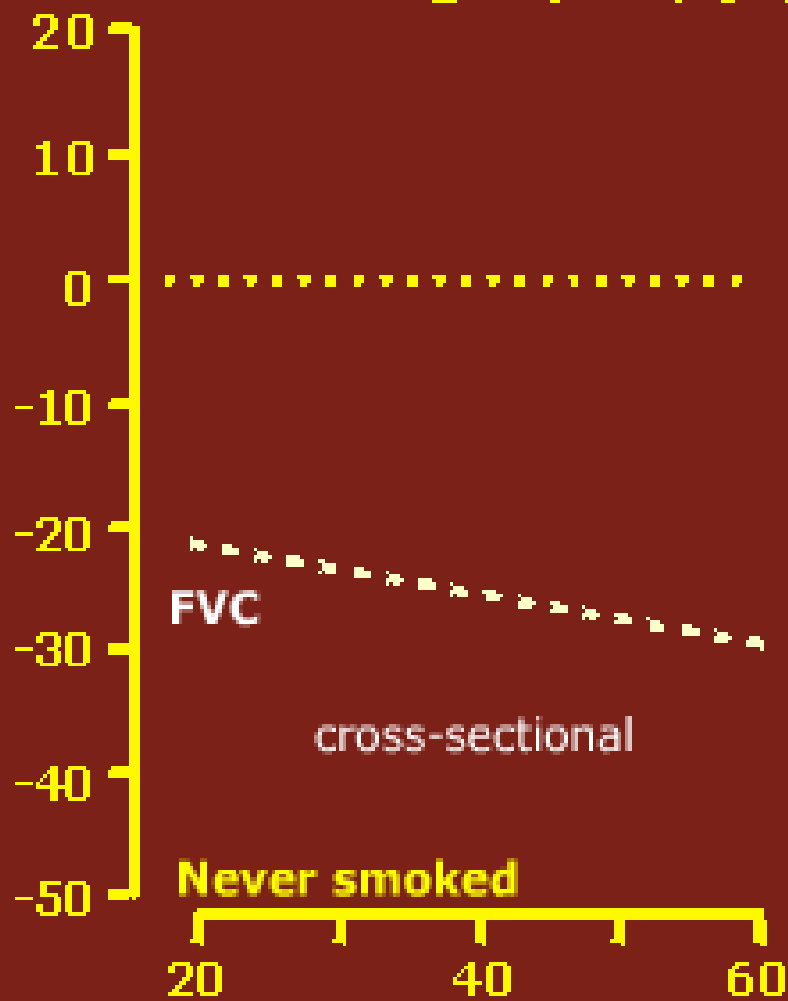
## Effect of smoking on lung function:

- **Non Smoker:** In normal healthy non smoker subject after the age of 30 the expected decline in Lung function parameter [FEV1] is 25–30 ml/ year
- **Smoker:** The average rate of decline of lung function in smokers as measured by Forced Expiratory Volume in 1 sec [FEV1] is 60-70 ml / year

# SMOKERS AND SPIROMETRY

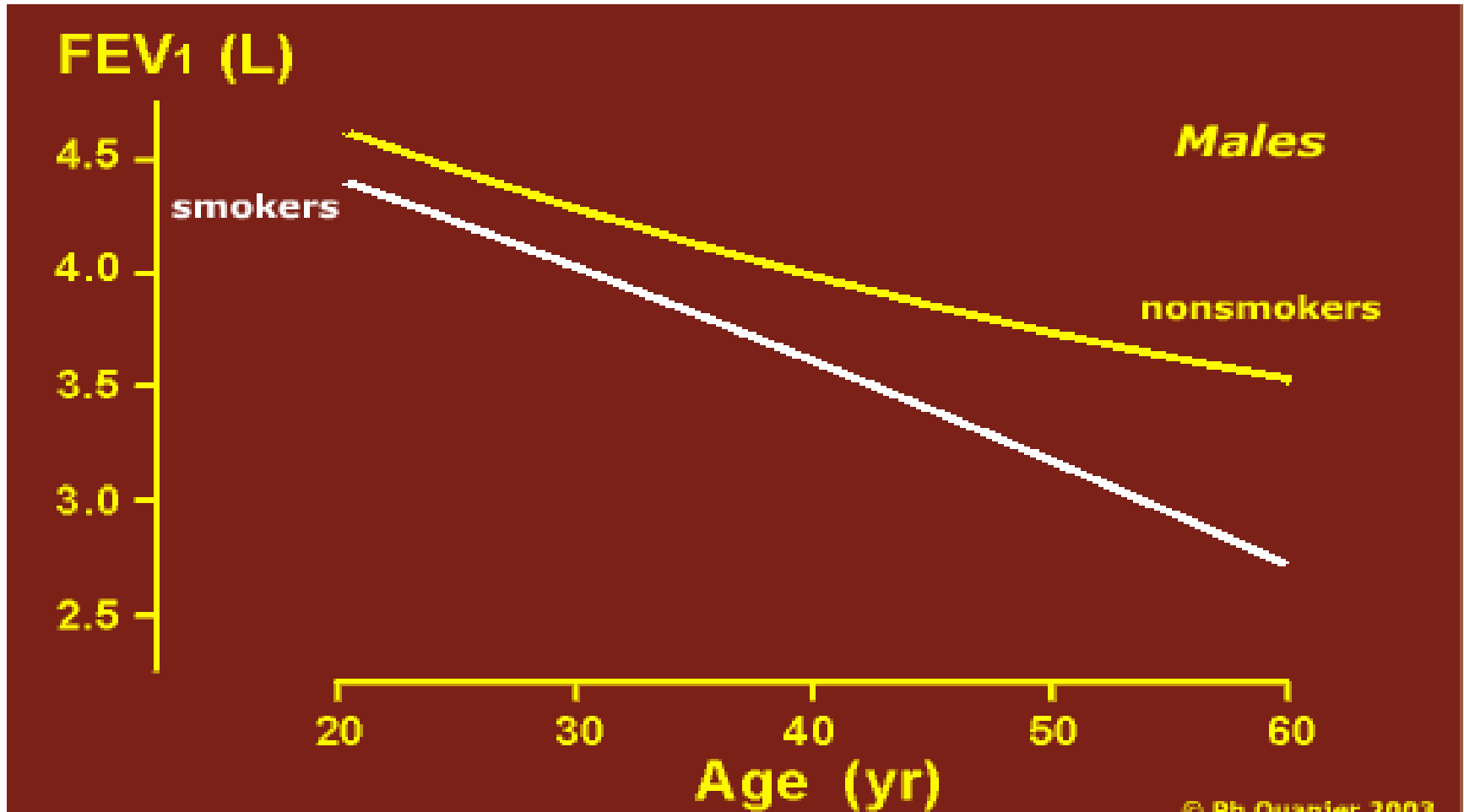
Annual change (mL/yr)

Males (177 cm)





# SMOKERS AND SPIROMETRY



# DIAGNOSIS OF COPD

## SYMPTOMS

cough  
sputum  
dyspnea

## EXPOSURE TO RISK FACTORS

tobacco  
occupation  
indoor/outdoor pollution

**SPIROMETRY**

