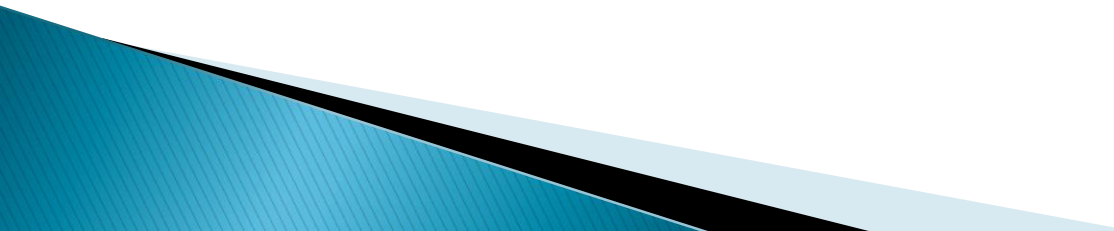


Pulmonary Function Test



دکتر زیبا لوک زاده
متخصص طب کار و بیماریهای شغلی
دانشیار دانشگاه علوم پزشکی شهید صدوقی یزد

- ▶ Diffusing Capacity
 - ▶ Body plethysmography
 - ▶ Exercise challenge test
 - ▶ Methacholine challenge test
 - ▶ 6 minute walk test
 - ▶ Spirometry
- 



Introduction

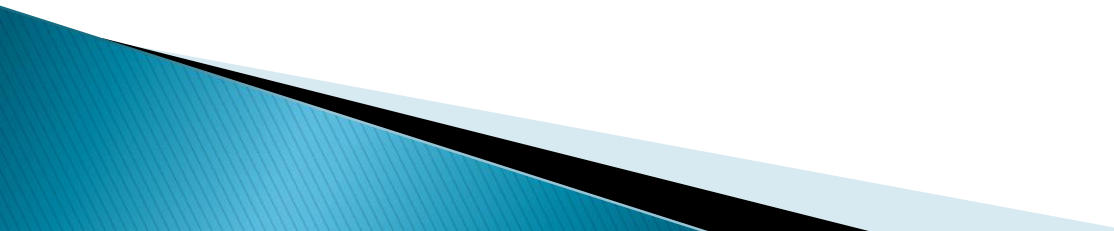
- ▶ Spirometry is the most common pulmonary function test.
 - ▶ It is widely used in the assessment of lung function to provide objective information used in the diagnosis of lung diseases and monitoring lung health.
- 

Table 1. Indications for Spirometry

Diagnosis

- To evaluate symptoms, signs, or abnormal laboratory test results
- To measure the physiologic effect of disease or disorder
- To screen individuals at risk of having pulmonary disease
- To assess preoperative risk
- To assess prognosis

Monitoring

- To assess response to therapeutic intervention
- To monitor disease progression
- To monitor patients for exacerbations of disease and recovery from exacerbations
- To monitor people for adverse effects of exposure to injurious agents
- To watch for adverse reactions to drugs with known pulmonary toxicity

Disability/impairment evaluations

- To assess patients as part of a rehabilitation program
- To assess risks as part of an insurance evaluation
- To assess individuals for legal reasons

Other

- Research and clinical trials
 - Epidemiological surveys
 - Derivation of reference equations
 - Preemployment and lung health monitoring for at-risk occupations
 - To assess health status before beginning at-risk physical activities
-

Table 2. Relative Contraindications for Spirometry

Due to increases in myocardial demand or changes in blood pressure

- Acute myocardial infarction within 1 wk

- Systemic hypotension or severe hypertension

- Significant atrial/ventricular arrhythmia

- Noncompensated heart failure

- Uncontrolled pulmonary hypertension

- Acute cor pulmonale

- Clinically unstable pulmonary embolism

- History of syncope related to forced expiration/cough

Due to increases in intracranial/intraocular pressure

- Cerebral aneurysm

- Brain surgery within 4 wk

- Recent concussion with continuing symptoms

- Eye surgery within 1 wk

Due to increases in sinus and middle ear pressures

- Sinus surgery or middle ear surgery or infection within 1 wk

Due to increases in intrathoracic and intraabdominal pressure

- Presence of pneumothorax

- Thoracic surgery within 4 wk

- Abdominal surgery within 4 wk


- Late-term pregnancy

Infection control issues

- Active or suspected transmissible respiratory or systemic infection, including tuberculosis

- Physical conditions predisposing to transmission of infections, such as hemoptysis, significant secretions, or oral lesions or oral bleeding

contraindication

- ▶ Spirometry should be discontinued if the patient experiences pain during the maneuver
 - ▶ spirometry requires the active participation of the patient, inability to understand directions or unwillingness to follow the directions of the operator will usually lead to submaximal test results.
 - ▶ No adverse effects were reported in spirometry conducted in studies of 56 and 230 patients with abdominal aortic aneurysms from 5 to 13 cm in size and in 519 patients with thoracic aortic aneurysms from 5 to 8 cm in size.
- 

Spirometry Parameters


- ▶ **FVC**: Forced Vital Capacity
 - ▶ **FEV1**: Forced Expiratory Volume in One Second
 - ▶ **FEV1 /FVC or FEV1%**: Forced Expiratory Volume in One Second Expressed as a Percentage of the Forced Vital Capacity
 - ▶ **FEF 25–75%**: Mean Forced Expiratory Flow during the Middle Half of the Forced Vital Capacity
 - ▶ **PEF**: Peak Expiratory Flow rate
- 

FIGURE 2-3. FVC AND FEV₁ ON A NORMAL VOLUME TIME CURVE

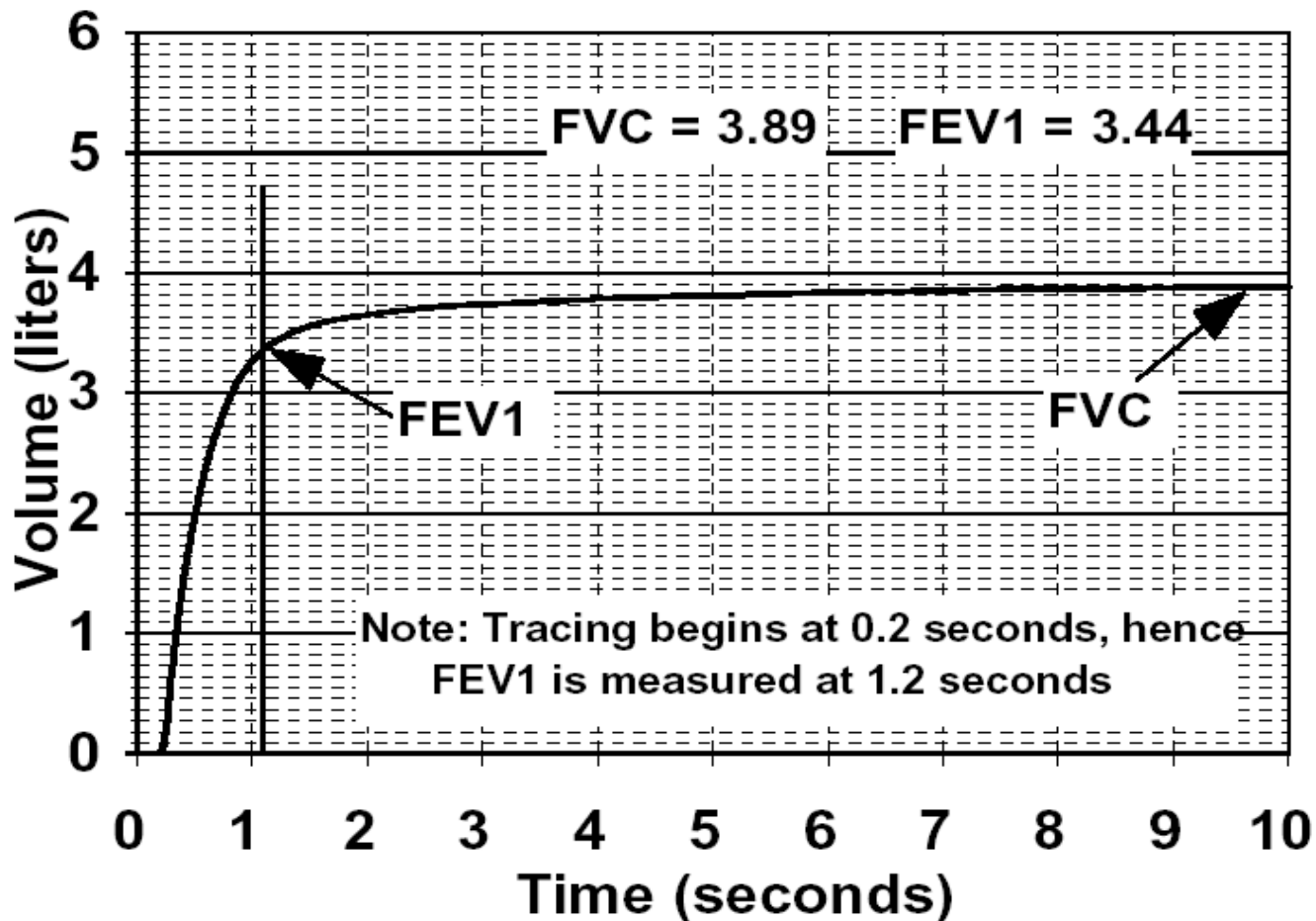
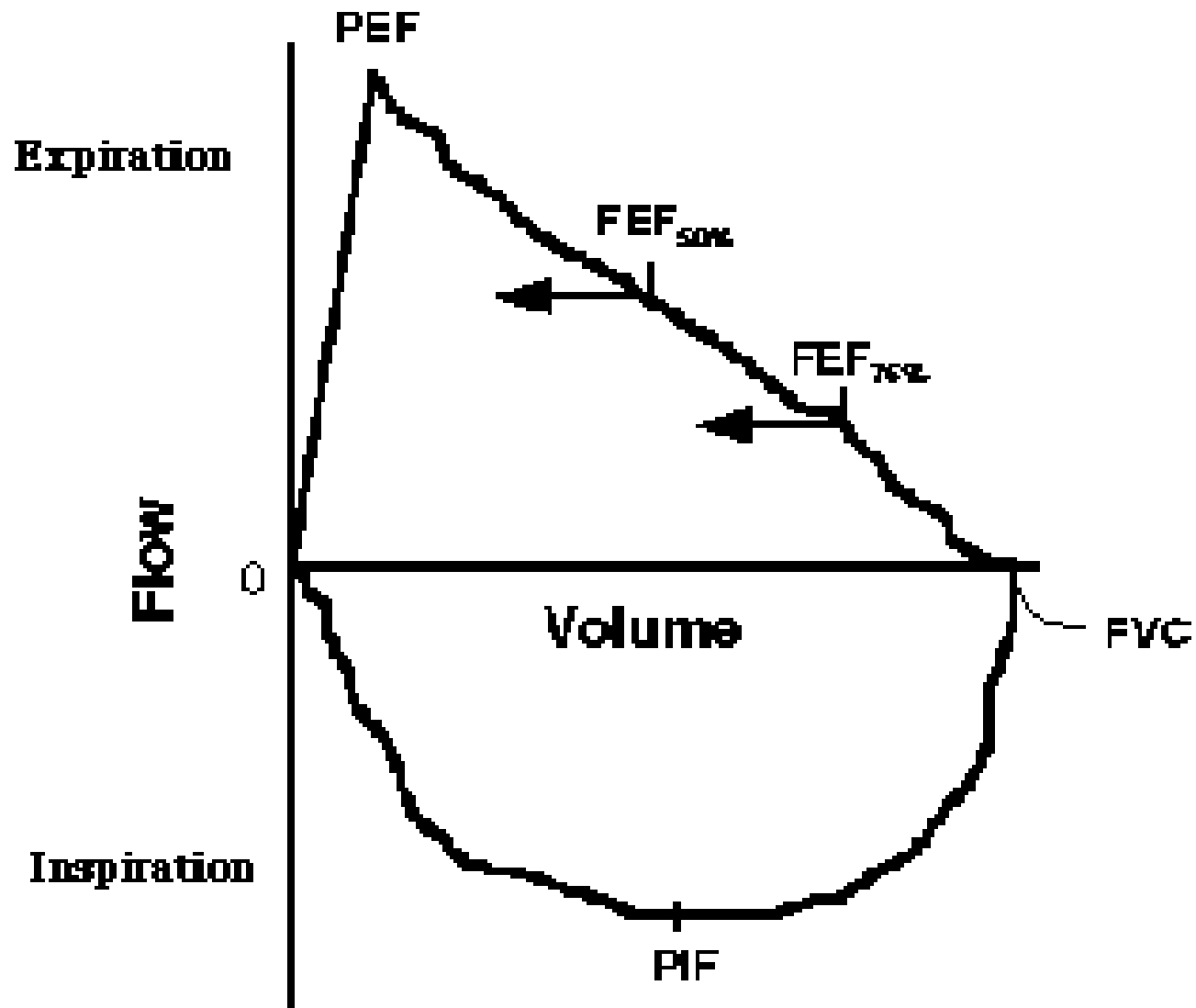


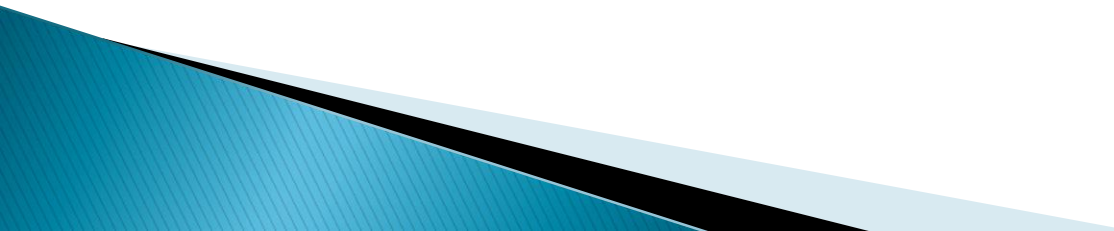
FIGURE 2-4. FVC AND FEV₁ ON A NORMAL FLOW VOLUME CURVE



Laboratory details

- ▶ These Laboratory details must be recorded:
 - Ambient temperature ($> 17^{\circ}\text{C}$)
 - Time of day

Laboratory details

- ▶ Testing should preferably occur in a quiet and comfortable environment that is separated from the waiting room and other patients being tested.
 - ▶ Drinking water should be available.
 - ▶ Tissues or paper towels should be offered to help patients deal with secretions.
- 

Laboratory details

- ▶ The patient should be seated erect, with shoulders slightly back and chin slightly elevated.

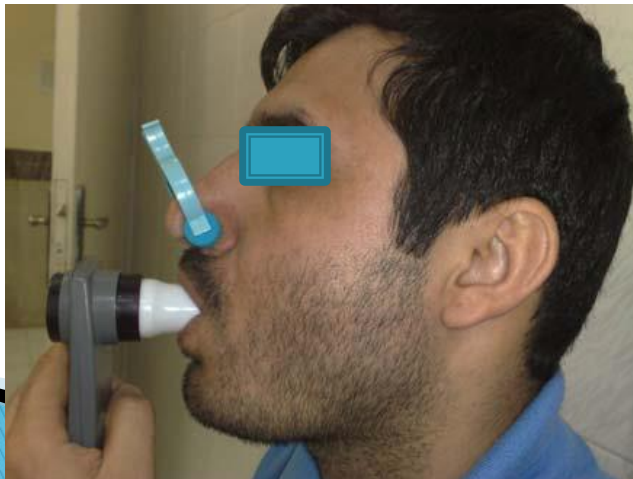


Laboratory details

- ▶ If testing is undertaken with the patient in another position, this must be documented in the report.

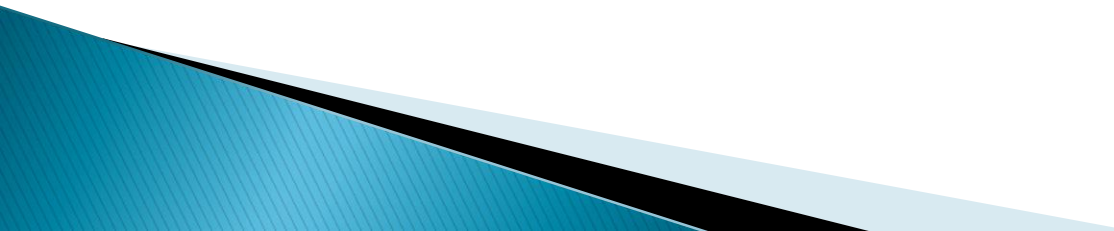
Laboratory details

- ▶ A chair with arms (to prevent falling sideways), without wheels, and with a height adjustment so that the feet are flat on the floor should be used.
- ▶ A noseclip or manual occlusion of the nostrils should be used.

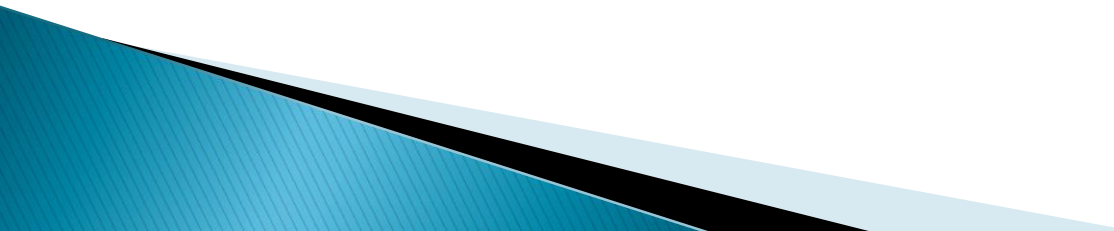




Patient details

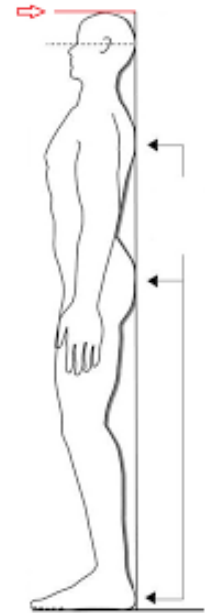
- ▶ The patient's must be recorded:
 - Age
 - Height
 - weight
 - Birth sex
 - Ethnicity
- 

Patient details

- ▶ It is preferable to calculate age using the date of birth and the date of the test
 - ▶ Age must be reported in years to one decimal place.
 - ▶ Height in centimeters to one decimal place
 - ▶ weight to the nearest 0.5 kg must be recorded
- 

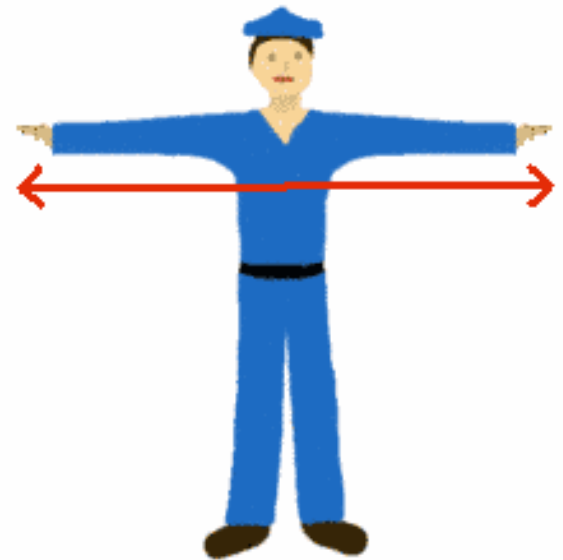
Patient details

- ▶ In persons aged 25 years or older, for whom a reliable height measurement has been made previously in the same facility, remeasuring height at subsequent visits within 1 year may not be necessary.
- ▶ The height must be measured without shoes, with the feet together, standing as tall as possible with the eyes level and looking straight ahead and the back flush against a wall.



Patient details

- ▶ For patients unable to stand erect or have severe spine deformity, height may be estimated using:
 - Male = arm span / 1.03
 - Female = arm span / 1.01

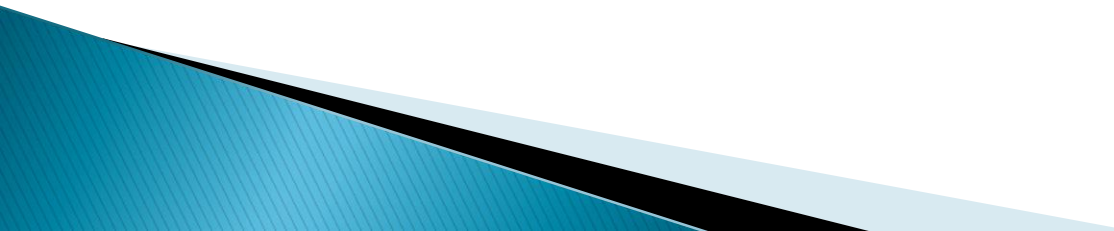


Patient Preparation

Table 5. Activities That Should Be Avoided before Lung Function Testing

- Smoking and/or vaping and/or water pipe use within 1 h before testing (to avoid acute bronchoconstriction due to smoke inhalation)
 - Consuming intoxicants within 8 h before testing (to avoid problems in coordination, comprehension, and physical ability)
 - Performing vigorous exercise within 1 h before testing (to avoid potential exercise-induced bronchoconstriction)
 - Wearing clothing that substantially restricts full chest and abdominal expansion (to avoid external restrictions on lung function)
-

Patient Preparation

- ▶ The decision to withhold long- and short-acting bronchodilators before testing:
 - If the study is performed to diagnose an underlying lung condition, then withholding bronchodilators is useful
 - For studies to determine a response to an existing therapeutic regimen, bronchodilator medications are generally not withheld.
- 

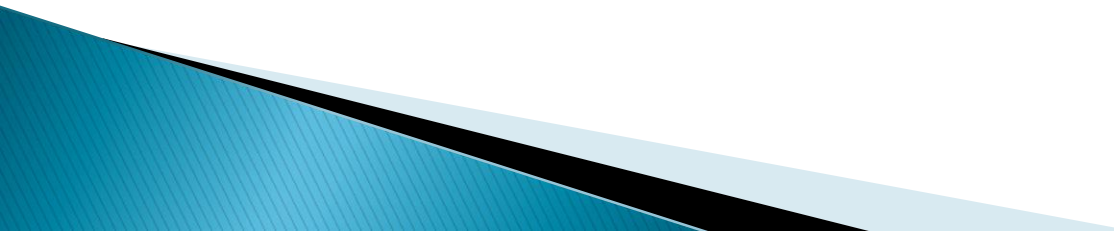
Patient Preparation

Table 8. Bronchodilator Withholding Times

Bronchodilator Medication	Withholding Time
SABA (e.g., albuterol or salbutamol)	4–6 h
SAMA (e.g., ipratropium bromide)	12 h
LABA (e.g., formoterol or salmeterol)	24 h
Ultra-LABA (e.g., indacaterol, vilanterol, or olodaterol)	36 h
LAMA (e.g., tiotropium, umeclidinium, aclidinium, or glycopyrronium)	36–48 h

Definition of abbreviations: LABA = long-acting β_2 -agonist; LAMA = long-acting muscarinic antagonist; SABA = short-acting β_2 -agonist; SAMA = short-acting muscarinic antagonist.

FVC Maneuver

1. maximal inspiration
 2. a “blast” of expiration (maximal expiration)
 3. continued complete expiration for a maximum of 15 seconds
 4. inspiration at maximal flow back to maximum lung volume
- 

A scenic view of a path leading through a lush green forest. The path is covered in fallen leaves and leads towards a large, moss-covered tree trunk. The foreground is filled with vibrant pink flowers. The text "از توجه شما سپاسگزارم" is overlaid on the image.

از توجه شما سپاسگزارم