SPIROMETRY IMPLEMENTATION QUICK GLANCE GUIDE

Spirometry: A measure of airflow (how fast) and volume (how much)

**Examples of Unacceptable Spirometry Tests:**

- Slow start of test
- Rounded peak
- Early termination
- Cough in first second

**Repeatability Criteria from ATS:** ATS requires three acceptable maneuvers where the FEV₁ is within 100 ml of each other.

**Contraindications of spirometry:**
- Recent surgery
- Within one month of myocardial infarction
- Recent pneumothorax
- Unable to understand directions
- Inability to seal mouthpiece

**Refer to a specialist, if patient:**
1. Has severe obstruction
2. Shows a restrictive pattern
3. Does not respond to medications

**Coaching Patients through Spirometry:**
Instruct patient to breathe normally. When the patient is ready, have them take their deepest breath and blow as hard as they can, for as long as they can. There is a learning curve for spirometry. Use positive reinforcement to build on the patient’s successes. For example, “that was good. This time, take an even deeper breath.” Demonstrating the maneuver can assist.

**Testing for Bronchodilator Responsiveness (Formerly Reversibility):** Give patient 4 puffs of bronchodilator with a valved-holding chamber or a standard nebulized dose. Wait 10–15 minutes after last dose to perform post-bronchodilator maneuver. If the patient cannot perform acceptable baseline maneuvers or there is no evidence of airflow obstruction, do NOT give a bronchodilator.

**References:***


May 2024

**Forced Vital Capacity (FVC):** The volume delivered during an expiration made as forcefully and completely as possible starting from full inspiration.

**Forced Expiratory Volume in the first second (FEV₁):** The volume delivered in the first second of a FVC maneuver.

**Obstruction** is defined as FEV₁/FVC ratio below the lower limits of normal. The rule of thumb is if FEV₁/FVC is down 10 or more from the predicted value.

**Restriction:** Spirometry with a low FVC (less than the LLN) suggests restriction. Further testing is needed to confirm.

Spirometry must establish a solid baseline meeting the American Thoracic Society (ATS) criteria for acceptability and repeatability. Use Global Lung Initiative (GLI-2012) predictive ranges when available. GLI-2012 has a grading system range of A–F, spectrometry tests with grades of A–C are clinically useful.

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**SPIROMETRY INTERPRETATION**

Is this a good test?
Are acceptability and repeatability criteria met?

Check FVC. If greater than the lower limits of normal (LLN), restriction can be ruled out. If less than LLN, further testing is needed to differentiate restriction from obstruction with air-trapping.

What is the observed ratio (FEV1/FVC) compared to predicted?
If below LLN = airflow obstruction
Rule of thumb, down 10 or greater = airflow obstruction

ATS/ERS* Degree of severity of obstruction based on FEV1 % predicted

<table>
<thead>
<tr>
<th>Degree of severity</th>
<th>FEV1 % predicted</th>
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<tbody>
<tr>
<td>Mild</td>
<td>&gt;70</td>
</tr>
<tr>
<td>Moderate</td>
<td>60-69</td>
</tr>
<tr>
<td>Moderately severe</td>
<td>50-59</td>
</tr>
<tr>
<td>Severe</td>
<td>35-49</td>
</tr>
<tr>
<td>Very severe</td>
<td>&lt;35</td>
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</tbody>
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Is there a bronchodilator response (BDR)?
As of 2022, BDR is defined as Actual Post FEV1 = Actual Pre FEV1 x 100
Predicted FEV1
A change of >10% is considered a significant BDR response

Consistent with asthma diagnosis?
Yes

**Sample asthma interpretation:** The FEV1/FVC ratio below the lower limits of normal is consistent with airflow obstruction. The FEV1 being 77% of predicted suggests a mild airflow obstruction (based on the 2005 ATS/ERS guide for severity of obstruction). The post bronchodilator study reveals a significant BDR with the FEV1 increasing 15% and 550cc. This finding is consistent with diagnosis of asthma although clinical correlation is needed to confirm. (Based on the 2020 Focused Guidelines Update for asthma severity), this 28 year old male with a baseline FEV1 of 77% has moderate persistent asthma. Treatment should begin with Step 3 or 4 therapy.

**Sample COPD Interpretation:** The FEV1/FVC ratio being below the lower limits of normal is consistent with airflow obstruction. A post bronchodilator FEV1/FVC ratio below 70% is consistent with COPD. The FEV1 of 51% of predicted suggests a moderately-severe airflow obstruction (based on the 2024 GOLD guidelines for severity of obstruction). There was no significant BDR to albuterol. Further testing revealed a diffusion capacity of 50% of predicted. The lateral chest x-ray showed signs of hyperinflation and flattened diaphragm and the chest CT had classic changes seen in emphysema. Based on GOLD, this 74 year old female has Stage II moderate COPD. Treatment should be based on the CAT score, mMRC score and exacerbation history.