Pulmonary Function Interpretation
A systematic way to Interpret Pulmonary Function Testing (PFT)

1. Step 1. Look at the forced vital capacity (FVC) and determine if it is within predicted normal limits.
2. Step 2. Look at the forced expiratory volume in one second (FEV1) and determine if it is within predicted normal limits.
3. Step 3. If both FVC and FEV1 are normal, then you do not have to go any further – the patient has a normal test.
4. Step 4. If FVC and /or FEV1 are low, then the presence of a ventilatory defect is presumed.
5. Step 5. If step 4 indicates that there is a ventilatory defect, then you need to calculate the FEV1/FVC ratio (FEV1/FVC%). If decreased, consider the diagnosis of an obstructive ventilatory defect. If normal, consider the diagnosis of a restrictive ventilatory defect.
6. Step 6. Once an obstructive process is confirmed by an abnormally low FEV1/FVC ratio; the degree of obstruction can be determined by the FEV1 percent of predicted. (see table #2)
7. Step 7. Once a restrictive defect is suspected *, then determine the total lung capacity (TLC). If decreased, a restrictive ventilatory defect is confirmed. The degree of restriction can be determined by the TLC percent predicted (see Table #3).

* If all you have to interpret is a spirometry, you can make only the presumption of a restrictive ventilatory defect. A lung volume study is required to confirm the diagnosis.
Table #1*

**PFT Normals for FEV1/FVC%**

Age < 40 y/o normal > 75%  Age 40-60 y/o normal > 70%  Age > 60 y/o normal > 65%

Table #2*

**FPT Severity Degrees for COPD**

<table>
<thead>
<tr>
<th>At Risk</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic symptoms</td>
<td>FEV1/FVC&lt;70%</td>
<td>FEV1/FVC&lt;70%</td>
<td>FEV1/FVC&lt;70%</td>
<td>FEV1/FVC&lt;70%</td>
</tr>
<tr>
<td>Exposure to risk factors</td>
<td>FEV1 ≥ 80%</td>
<td>50% &gt;FEV1&lt; 80%</td>
<td>30%&gt;FEV1&lt;50%</td>
<td>FEV1&lt;30% or presence of chronic respiratory failure or right heart failure</td>
</tr>
<tr>
<td>Normal spirometry</td>
<td>With or without symptoms</td>
<td>With or without symptoms</td>
<td>With or without symptoms</td>
<td></td>
</tr>
</tbody>
</table>

Table #3*

**PFT Severity Degrees for Restriction (TLC)**

Normal > 80% predicted  Mild  70-80% predicted  Moderate 60-70% predicted  Severe  < 60% predicted

* There are a number of guidelines used to determine the severity of disease that vary slightly from one to another. Use these tables for your PFT interpretations. You will be given a copy of these tables during exams.
Sample cases for practice interpretation of PFT.

Case #1
A 75 year old male smoker has a chronic non-productive cough for three years.

<table>
<thead>
<tr>
<th></th>
<th>Predicted Values</th>
<th>Measured Values</th>
<th>% Predicted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>5.05 liters</td>
<td>3.94 liters</td>
<td>78%</td>
</tr>
<tr>
<td>FEV1</td>
<td>3.29 liters</td>
<td>2.21 liters</td>
<td>67%</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td></td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td>TLC</td>
<td>6.06 liters</td>
<td>6.60 liters</td>
<td>109%</td>
</tr>
</tbody>
</table>

Interpret PFT:

- normal
- mild obstructive ventilatory defect
- moderate obstructive ventilatory defect
- severe obstructive ventilatory defect
- mild restrictive ventilatory defect
- moderate restrictive ventilatory defect
- moderate restrictive ventilatory defect
- severe restrictive ventilatory defect
- combined obstructive and restrictive ventilatory defect
Case #2 A 65 year old male complaining of dyspnea since mitral value replacement surgery 2 months ago.

<table>
<thead>
<tr>
<th></th>
<th>Predicted Values</th>
<th>Measured Values</th>
<th>% Predicted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>4.60 liters</td>
<td>3.00 liters</td>
<td>65%</td>
</tr>
<tr>
<td>FEV1</td>
<td>3.05 liters</td>
<td>2.36 liters</td>
<td>77%</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td></td>
<td></td>
<td>79%</td>
</tr>
<tr>
<td>TLC</td>
<td>5.52 liters</td>
<td>3.60 liters</td>
<td>65%</td>
</tr>
</tbody>
</table>

Interpret PFT:

- normal
- mild obstructive ventilatory defect
- moderate obstructive ventilatory defect
- severe obstructive ventilatory defect
- mild restrictive ventilatory defect
- moderate restrictive ventilatory defect
- severe restrictive ventilatory defect
- severe restrictive ventilatory defect
- combined obstructive and restrictive ventilatory defect
Case #3 A 53 year old female undergoing pre-operative evaluation for open cholecystectomy.

<table>
<thead>
<tr>
<th></th>
<th>Predicted Values</th>
<th>Measured Values</th>
<th>% Predicted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>4.00 liters</td>
<td>1.85 liter</td>
<td>46%</td>
</tr>
<tr>
<td>FEV1</td>
<td>3.01 liters</td>
<td>0.92 liters</td>
<td>28%</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td></td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>TLC</td>
<td>4.80 liters</td>
<td>3.70 liters</td>
<td>77%</td>
</tr>
</tbody>
</table>

Interpret PFT:

- normal
- mild obstructive ventilatory defect
- moderate ventilatory defect
- severe ventilatory defect
- mild restrictive ventilatory defect
- moderate restrictive ventilatory defect
- severe restrictive ventilatory defect
- combined obstructive and restrictive ventilatory defect
Annotated Answers to PFT Cases

Case #1 - This 75 year old male patient has an obstructed ventilatory defect because his FEV1/FVC% is less than 65%. There is no restrictive component because his TLC is normal. This PFT is classic for Chronic Obstructive Pulmonary Disease (COPD). A chest radiograph showed hyperinflated lung fields with three small bullae. These findings are consistent with emphysema. If measured, a diffusion capacity would be low in a COPD patient with emphysema.

Case #2 - This 65 year old patient has a restrictive ventilatory defect because her FVC is decreased and her FEV1/FVC% is normal. The decreased TLC confirms this interpretation. If this patient had a normal PFT pre-operatively, this finding is probably due to post operative splinting and chest wall rigidity sometimes seen after open heart surgery.

Case #3 - This 53 year old patient has a combined obstructive and restrictive ventilatory defect. First, she has an obstructive ventilatory defect because the FEV1/FVC% is low. Second, she is restricted since the TLC is also low. This patient was morbidly obese on physical exam. The anesthesiologist decided he needed to assess if her obesity might complicate her general anesthesia or post-operative course.