Pulmonary Fibrosis Foundation™



Understanding pulmonary function tests

A GUIDE FOR PEOPLE LIVING WITH PULMONARY FIBROSIS

Doctors use a variety of strategies for monitoring patients' pulmonary fibrosis (PF). Along with symptoms, walking tests, and high-resolution computed tomography (HRCT) scans, pulmonary function tests (PFTs) are commonly used to determine if your disease is stable or changing. The following information is designed to help people living with PF understand what PFTs do and how to read a PFT report.

TYPES OF PFTs

Doctors routinely order one or more of the following PFTs to monitor your PF progression:

Spirometry (spy-ROM-it-tree) is the primary test that tells doctors how healthy your lungs are. It's performed by taking a deep breath in, then blowing out as hard and fast as you can through a mouthpiece connected to a machine. Spirometry measures how much air you can blow out (called forced vital capacity, or FVC) and how fast the air comes out. FVC is a measure of volume, usually measured in liters. For most people with PF, monitoring it can tell your doctor whether your disease is stable or progressing and whether it's mild, moderate, or severe.

It's easiest to track your FVC expressed as a percentage of normal. Normal is between 80 and 100% of the predicted value (based on your age, gender, and height). A drop in the FVC measurement is one indicator that more fibrosis has developed in your lungs. FVC is also frequently chosen as the endpoint (target outcome) in clinical trials for interstitial lung disease.

Lung volume measurements tell how much air your lungs can hold. Just like FVC, the results are expressed as a percentage of normal. The result usually tracked is called total lung capacity (TLC). Normal is between 80 and 100% of the predicted value, and the result decreases as more scar tissue develops in the lungs. This test may be performed less frequently than spirometry, because it provides similar information.

Diffusing capacity (DLCO) measures how easily gases (like oxygen) move from your lungs into your bloodstream. Fibrosis makes the transfer of oxygen less efficient. Just like FVC and TLC, DLCO is expressed as a percentage of the normal value and goes down as more scar tissue develops in the lungs. Don't be surprised by a DLCO that's much lower than the FVC or TLC—this is common in people living with PF. It may be the first abnormal PFT in early interstitial lung disease. If it's decreased out of proportion to FVC, it may indicate the presence of pulmonary hypertension.

1 Spirometry		5 Ref	6 Pre Meas	7 Pre %Ref
2 FVC	Liters	3.45	1.64	48 8
3 FEV1	Liters	2.74	1.40	51
4 FEV1/FVC	%	79	86	
FEF25-75%	L/sec	2.69	2.23	83
FEF25%	L/sec	5.64	4.08	72
FEF50%	L/sec	3.61	5.25	145
FEF75%	L/sec	1.32	0.64	48
PEF	L/sec	6.09	5.25	86
MVV	L/min	95		
PIF	L/sec	4.17	2.45	59
FIF50%	L/sec	3.73	2.23	60
FET100%	Sec		7.21	

READING YOUR PFT REPORT

1. Each row in the chart above is a different measurement obtained during a **spirometry test.** We'll focus on the first three rows, the most important ones.

2. **FVC** stands for "forced vital capacity." It's the amount of air that comes out when you take a deep breath, then blow out as hard as you can.

3. **FEV1** is the amount of air that comes out immediately (in the first second) when you blow out as hard and fast as you can. This number is often reduced in PF; it's more relevant in obstructive diseases such as asthma or chronic obstructive pulmonary disease (COPD).

4. This result is often called the **"FEV1/FEC ratio."** It's simply the FEV1 divided by the FVC and expressed as a percentage. A normal FEV1/FVC is greater than 70%—and most people with PF have a normal FEV1/FVC. A reduced FEV1/FVC suggests other kinds of lung diseases, such as asthma or COPD.

5. **Ref stands for "reference."** Sometimes this column is also labeled "Pred", short for "predicted." These are the test results we expect if your lungs are healthy. These expected values are based on your age, gender, and height.

6. **This is the actual result of each test.** For example, for FVC, we expected this person to be able to blow out 3.45 liters of air (reference or predicted value), but they were only able to blow out 1.64 liters of air.

7. **This column is often called "percent predicted."** It's calculated as the measured value (the actual result of your test) divided by the reference (predicted) value. A normal value in someone with healthy lungs might range from 80% to over 100%.

8. **In this case, FVC is 48% of the predicted value.** Since 48% is lower than the normal range of 80% or more, FVC in this case is abnormal. Below-normal FVC is common in people living with PF. This is one of the most important test results doctors consider. As PF worsens, FVC tends to decline.

9 Lung Volumes

		Ref	Pre Meas	Pre %Ref
VC	Liters	3.45	1.64	48
10 TLC	Liters	5.37	2.55	47 12
RV	Liters	2.01	0.91	45
RV/TLC	%	38	36	
FRC PL	Liters	3.04		
FRC N2	Liters	3.04	1.11	37
FRC He	Liters	3.04		
Vtg	Liters			

11 Diffusion

DLCO	mL/mmHg/min	26.6	5.9	22 13
DL Adj	mL/mmHg/min	26.6	5.9	22
VA	Liters		2.32	
DLCO/VA	mL/LmHg/min/L	5.18	2.55	49
IVC	Liters		1.63	

9 **This test measures lung volumes during different points in the breath cycle**—for instance, the total amount of air in your lungs during the biggest breath you can take and the amount of air that is left when you breathe out. Lung volume measurements can help confirm that the cause of a decreased FVC is a "restrictive" process, such as PF, and not some other type of lung problem.

10 **TLC** stands for total lung capacity, the amount of air your lungs can hold when you take the deepest breath possible. In healthy lungs, we expect the predicted value to be greater than about 80%. When this value is less than 80%, this indicates a restrictive process such as ILD.

11 **A diffusion capacity test** measures how easily gases (like oxygen) can move from the inside of the air sacs into the bloodstream. The most important result in this section is the DLCO (sometimes listed as "DLCO uncorrected"), the primary diffusion test result.

12 **Here, TLC is 47% of the normal value.** Most people with PF have low TLC.

13 **DLCO is 22% of the predicted value here.** DLCO is almost always reduced in people with PF, and it's commonly reduced to a much greater degree than FVC or TLC.

Normal values for PFTs vary from person to person. The amounts of air inhaled and exhaled in your test results are compared to the average for someone of the same age, gender, and height. Results are also compared to any of your previous test results. If you have abnormal PFT measurements or your results have changed, you may need other tests. Contact your doctor for an explanation of your test results.

STILL HAVE QUESTIONS?

Contact the PFF Help Center at 844.TalkPFF (844.825.5733) or help@pulmonaryfibrosis.org.