#### **Pulmonary Function Testing**

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# What do pulmonary function tests tell you?

- Spirometry:
  - Identifies airflow obstruction
- Lung volumes
  - Identifies restriction and hyperinflation
- Diffusing capacity:
  - Measures how well gas exchanges from the air into the blood
- 6 Minute walk test:
  - Measures oxygenation during exercise

# Pulmonary Function Test Lab



#### **Indications For Spirometry**

- Evaluation of unexplained dyspnea, cough, or wheezing
- Suspected COPD or asthma with no previous spirometry
- Known asthma or COPD with uncertain control
- Known asthma or COPD when assessing response to treatment
- Periodic assessment (every 1-2 years) of asthma to assess for changes in therapy
- Assessment of vital capacity in patients with known neuromuscular disease
- Pre-operative assessment in patients with known
   or suspected lung disease

#### Pulmonary Function Tests: Spirometry

- · Measure of airflow
- Forced vital capacity (FVC) amount of air that can be exhaled in one breath with maximum force
- Forced expiratory volume in 1 sec. (FEV<sub>1.0</sub>)
- FEV<sub>10</sub>/FVC ratio
- FEF25-75% forced expiratory flow between the 25<sup>th</sup> and 75<sup>th</sup> percent of an exhaled breath
- Peak flow rate (PEF, PEFR) highest flow rate achieved during expiration
- Reversible obstruction
  - 12% increase and 200 mL increase in FVC or FEV<sub>1.0</sub> with bronchodilator

#### A Spirometry Test Requires 3 Steps To Be Done Correctly

- 1. Correct demographic information (age, height, gender, race)
- 2. Correct technique used by the nurse or other provider administering the test
- 3. Correct interpretation by the physician/NP reading the test

## Computer interpretation of spirometry

- Reasonably good at identifying normal spirometry
- The computer cannot interpret flow volume loop patterns
- For patients with abnormal spirometry, the computer interpretation is frequently inaccurate and can give an incorrect interpretation in more than half of cases, depending on the population of patients being tested

#### **Entering Demographics**

- If demographic values are not entered, the computer cannot calculate the percent predicted values and only the raw numeric results will appear
- If the demographics are entered incorrectly, then the percent predicted values will be incorrect. Always check at the top of a spirometry result to be sure that the age, gender, and height look correct. Decimal point errors or incorrectly entering cm rather than inches are common sources of error

#### **Incorrect Demographics**

Results			
Result	Pred	Best	%Prd
FVC (L)		0.74	
FEV1 (L)	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1995 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	0.28	
FEV1/FVC	0.80	¤0.38	47%
FEF25-75%	(L/s) 0.23	0.10	43%
PEFR (L/s)	1.29	1.36	106%

In this case, the height was incorrectly entered as 23 inches rather than the correct value of 60 inches for this 57-year old patient. Because there are no normal data sets for 23 inch women who are 57 years old, the predicted values for FVC and FEV1 are left blank. The predicted value for FEV1/FVC ratio is based off of age only and not height, so it is not affected.

#### **Spirometry Administration**

- Each spirometer will have slightly different instructions for preparing the equipment and performing the test. Be sure that your office staff are following the manufacturer's instructions for test performance
- In common to all spirometers, the patient will be required to inhale as deeply as possible and then exhale as hard and fast as they can until they have forced all air out of their lungs
- If the patient does not inhale as deeply as possible or exhale as forcefully or completely as possible, the results will not be valid

#### **Spirometry Administration**

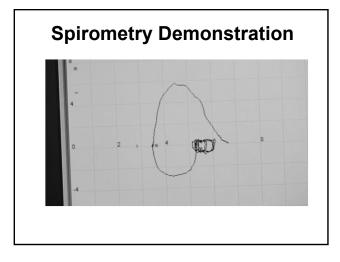
- 1. Place a nose clip on the patient
- 2. Have the patient take as deep of a breath as possible
- 3. When instructed by the spirometer, tell patients to "blast" their air out as hard and fast as they can
- 4. The patient should continue exhaling until they have exhaled at least 6 seconds and there is no further flow for at least 1 second. Nearly all patients will complete the exhalation maneuver in less than 15 seconds.

#### **Spirometry Administration**

- Be sure there is no air leak around the mouthpiece
- If the patient coughs (especially in the first second), the trial is not valid
- At least 3 trials should be performed
  Trials are considered reliable if the FEV1 and FVC vary by less than 0.15 L between trials
- The computer will generally pick the trial with the largest FVC and FEV1 as the "best" trial and report it first

#### **Spirometry Demonstration**





#### **Defining Normal Values**

- The FEV1 and FVC vary depending on:
  - 1. Age
    - 2. Gender
    - 3. Race
    - 4. Height
- Therefore (for example), the normal FEV1 for a 64 inch tall, 50-year old Caucasian woman will be very different than a 72 inch, 40-year old African American man
- Normal values are determined by doing spirometry on large numbers of people and grouping them by age, gender, race, and height and then creating large databases of normals

#### **Defining obstruction**

- Obstruction is present if the FEV1/FVC ratio is reduced
- There are several different ways of defining a low FEV1/FVC ratio. The two most common are:
- American Thoracic Society: defines a low FEV1/FVC by comparison to large databases of normal subjects. A low FEV1/FVC is then defined as less than the 5<sup>th</sup> percentile of normal subjects stratified by age
- 2. <u>Global Initiative for Obstructive Lung Disease</u> (<u>GOLD</u>): uses a fixed number for all people regardless of age and defines a low FEV1/FVC as less than 70% for everyone

#### The FEV1/FVC Ratio Changes With Age

- The FEV1/FVC ratio declines in normal people as they get older
  - An <u>average</u> FEV1/FVC in a 20 year old is 87%
  - An <u>average</u> FEV1/FVC in an 84 year old is 71%
     The lower limit of normal in an 84 year old is 59%!
- The ATS definition of obstruction takes this age variation into account
- The GOLD definition of obstruction does not - Some normal older patients may be misclassified as being obstructed when using the GOLD criteria

FVC (L)         3.37         2.97         88%         2.93         87%         2.78         8           FEV1 (L)         2.60         2.19         84%         2.13         82%         2.08         8           FEV1 (L)         2.60         2.19         84%         2.13         82%         2.08         8           FEV1 (FVC         0.78         0.74         95%         0.73         94%         0.75         9           FEF25-75% (L/s)         2.32         1.64         70%         1.43         62%         1.59         6           PEFR (L/s)         6.34         5.00         79%         5.39         85%         4.67         7           Vext %          2.55         +         3.32         +         4.92         Trial 1           Predicted Normal         Percent Of Normal         Percent Of Normal         Trial 2         Percent Of Normal         Percent Of Normal	Interpretation	<b>/ I</b> I	netry	om	Spir
FEV1 (L)         2.60         2.19         84%         2.13         82%         2.08         8           FEV1/FVC         0.78         0.74         95%         0.73         94%         0.75         95           FEF25-75% (L/s)         2.32         1.64         70%         1.43         62%         1.59         6           PEFR (L/s)         6.34         5.00         79%         5.39         85%         4.67         7           Vext %         -         2.55         ↑         3.32         ↑         4.92           Predicted Normal         Trial 1         Percent Of Normal         Trial 2         Percent Of Normal         Trial 7	Prd %Prd %Prd	%Prd	Best	Pred	
FEV/FVC         0.78         0.74         95%         0.73         94%         0.75         5           FEF25-75%         (L/s)         2.32         1.64         70%         1.43         62%         1.59         6           PERR         (L/s)         6.34         5.00         79%         5.39         85%         4.67         7           Vext %         -         2.55         ↑         3.32         ↑         4.92           Predicted Normal         Percent Of Normal         Trial 1         Percent Of Normal         Trial 2         Percent Of Normal	8% 2.93 87% 2.78 82%	88%	2.97	3.37	FVC (L)
FEF25-75% (L/s)         2.32         1.64         70%         1.43         62%         1.59         6           PEFR (L/s)         6.34         5.00         79%         5.39         85%         4.87         7           Vext %         -         2.55         ↑         3.32         ↑         4.92           ↑         Trial 1         ↑         Trial 2         ↑         ↑         ↑           Predicted         Normal         Of Normal         Of Normal         ↑         ↑         ↑	4% 2.13 82% 2.08 80%	84%	2.19	2.60	FEV1 (L)
PEFR (Us) 6.34 5.00 79% 5.39 85% 4.67 7 Vext % - 2.55 ↑ 3.32 ↑ 4.92 ↑ Trial 1 ↑ Trial 2 ↑ Tri Predicted Percent Normal Of Normal Of Normal	5% 0.73 94% 0.75 96%	95%	0.74	0.78	FEV1/FVC
Vext % - 2.55 A 3.32 A 4.92 Trial 1 Trial 2 Tri Predicted Percent Percent Normal Of Normal Of Normal	0% 1.43 62% 1.59 69%	70%	1.64	2.32	FEF25-75% (L/s)
↑ Trial 1 Trial 2 Tri Predicted Percent Percent Normal Of Normal Of Normal	9% 5.39 85% 4.67 74%	79%	5.00	6.34	PEFR (L/s)
Predicted Percent Percent Per Normal Of Normal Of Normal Of N	<b>▲</b> - 3.32 <b>▲</b> - 4.92 <b>▲</b> -		2.55		Vext %
	cent Percent Percent ormal Of Normal Of Norma	Perce Of Nori	al (		
Trial 1 Trial 2 Trial 3 (best)	Trial 2 Trial 3	-			

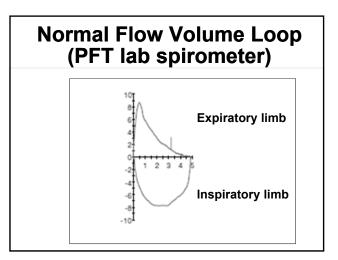
#### **Spirometry Interpretation**

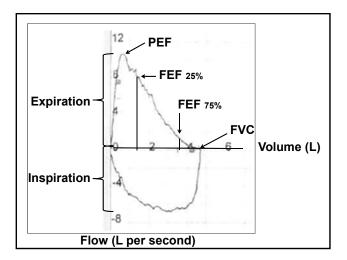
Results Result	Pred	Best %Prd
FVC (L)	3.37	2.97 88%
FEV1 (L)	2.60	2.19 84%
FEV1/FVC	0.78	0.74 95%
FEF25-75% (L/s)	2.32	1.64 70%
PEFR (L/s)	6.34	5.00 79%
Vext %	-	2.55 —

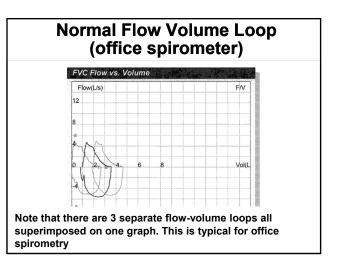
In this case, the FEV1/FVC is within a normal range (0.74 or 74%). Most office spirometers will not display the range of normal (in this case 68%-90%). The computer will flag an abnormally low value by putting an asterisk or square mark to the left of the values

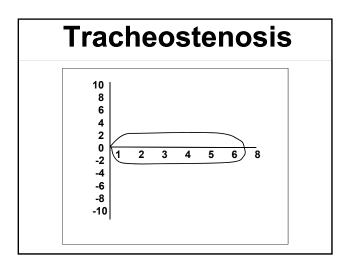


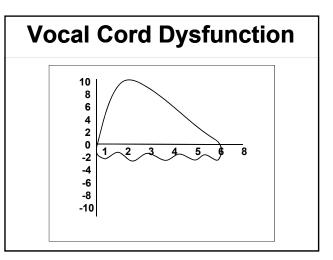
If the FEV1/FVC ratio is normal, then the patient is NOT obstructed. In this case, the FEV1 can be normal, elevated, <u>or</u> <u>reduced</u> but the patient is still not obstructed

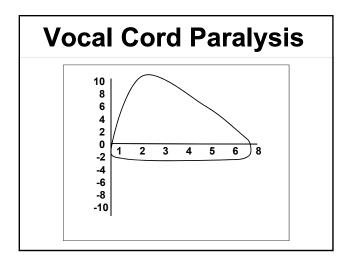


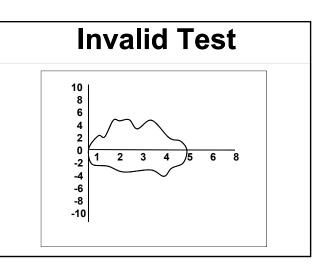


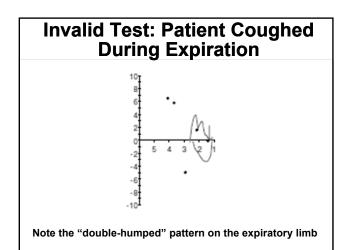


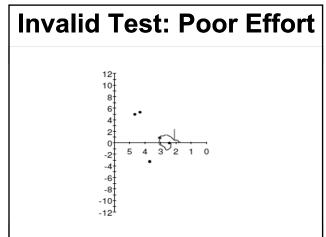












#### **Reversible obstruction**

- Although more commonly performed in the PFT lab than with office spirometry, a "bronchodilator study" can be performed to determine if there is an improvement in obstruction 15 minutes after a bronchodilator, such as albuterol (or Combivent), is given.
- Reversible obstruction can also be established by repeating spirometry after a 2-3 week treatment trial

### Reversible obstruction (continued)

- The most accurate definition of reversible obstruction is an increase in the FEV1 by > 12% and at least 200 ml.
- An increase in the FVC by > 12% and at least 200 ml is also frequently used as a definition of reversibility but it is not as accurate as the FEV1

## A note about spirometry and children

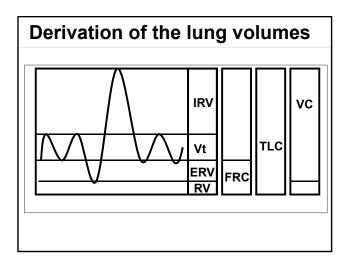


#### Children

- Office spirometry generally is not possible in children under age 6 years
- A shorter minimal FVC exhalation time of 3 seconds (rather than 6 seconds) is appropriate for children under age 10 years
- Children require more detailed coaching to perform the test
- There must be extra attention to quality measures and reproducibility of trials

#### Pulmonary Function Tests: Lung Volumes

- Total lung capacity (TLC)
  - Restriction defined as TLC < 80% predicted
  - Hyperinflation defined as TLC > 120% predicted
- Residual volume (RV)
- Functional residual capacity (FRC)
  - Air-trapping defined as FRC or RV > 120% predicted



#### **Causes of Restriction**

- · Interstitial lung disease
- · Alveolar filling processes
- Chest wall impairment
- Respiratory muscle weakness

#### Diagnosing Restriction Based On Spirometry

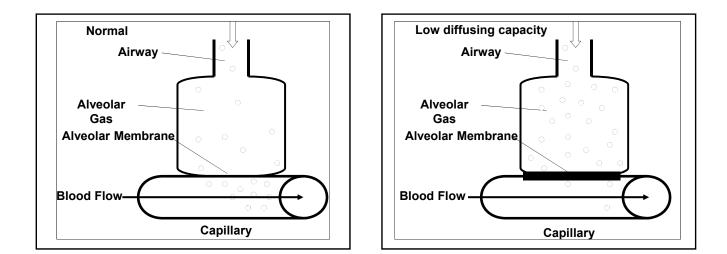
- The only confident way to diagnose restriction is by full lung volume measurements with measurement of the total lung capacity (TLC).
- You can <u>suspect</u> restriction if the FVC is low on spirometry but this can be fraught with error.
   Many patients with COPD will have a low FVC
  - The FVC is often low even when the TLC is normal
  - If the FVC is low and you suspect restriction, you
- should order lung volumes in the PFT lab to confirm restriction

#### Diagnosing Restriction Based On Spirometry (continued)

- However, in some diseases, following the FVC serially can be a good marker of lung capacity and respiratory muscle strength
  - Patients with interstitial lung disease
  - Patients with neuromuscular weakness
- When using the FVC to follow these patients for disease progression, it is important that the test be done with consistent technique, preferably by the same individual(s). Often, this is best accomplished in the PFT lab or in clinics that regularly care for neuromuscular patients.

#### Pulmonary Function Tests: Diffusing Capacity

- Measure of gas exchange across the alveolar/capillary membrane
- Dependent on surface area, gas solubility, membrane thickness, and transit time
- Affected by age, body size, gender, hemoglobin, and lung volume
- · Measured by carbon monoxide uptake



#### **Decreased Diffusing Capacity**

- Anemia
- Right-left intracardiac shunt
- Poor inspiration
- Interstitial lung disease
- Emphysema
- Pulmonary vascular disease

#### Correcting The Diffusing Capacity

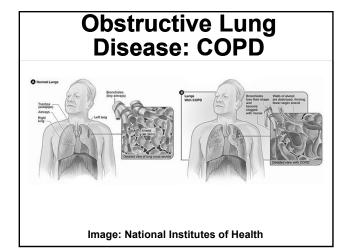
- DLCO
- Hematocrit-adjusted DLCO
- · DLCO/VA
- Hematocrit-adjusted DLCO/VA

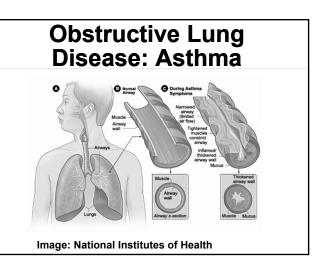
#### 4 Questions Of PFT Interpretation

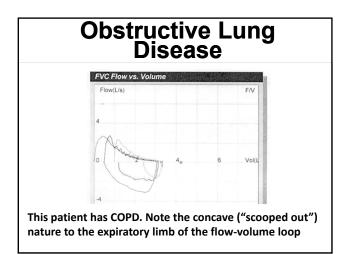
- 1. Is the patient obstructed?
  - Is FEV1/FVC reduced?
- 2. If obstructed, is obstruction reversible?
  - Use 12% improvement in FEV1 OR FVC
- 3. Is the patient restricted?
  - Is the TLC reduced?
- 4. Is the diffusing capacity reduced?
  - DLco vs. DLco/VA

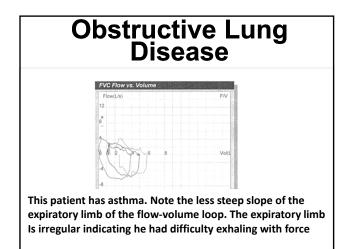
#### PFT Patterns in Lung Disease

	Asthma	Emphysema	Interstitial Lung Disease
FVC	NI or ↓	↓	$\downarrow\downarrow$
FEV <sub>1.0</sub>	$\downarrow\downarrow$	$\downarrow\downarrow$	Ļ
FEV <sub>1.0</sub> /FVC	$\downarrow$	Ļ	NI
TLC	NI or <b>↑</b>	1	Ļ
DLCO	NI	↓	↓









#### **Causes Of Obstruction**

- Chronic obstructive pulmonary disease
  - Emphysema
  - Chronic bronchitis
- Asthma
- Bronchiectasis
- Bronchiolitis & bronchiolitis obliterans

#### **Obstructive Pattern**

Result	Pred	Best	%Prd
FVC (L)	4.25	¤3.07	72%
FEV1 (L)	3.28	¤1.60	49%
FEV1/FVC	0.78	¤0.52	67%
FEF25-75% (L/s)	2.93	¤0.70	24%
PEFR (L/s)	8.75	¤2.68	31%
Vext %		2.13	

Result	Pred	Best	%Prd
FVC (L)	4.25	¤3.07	72%
FEV1 (L)	3.28	¤1.60	49%
FEV1/FVC	0.78	¤0.52	67%
FEF25-75% (L/s)	2.93	¤0.70	24%
PEFR (L/s)	8.75	¤2.68	31%
Vext %		2.13	

In this case, the FEV1/FVC is low (0.52 or 52%) and the computer has identified it as low by the square mark to the left of the value. Therefore, this patient is obstructed. To determine how obstructed, we next look at the FEV1.

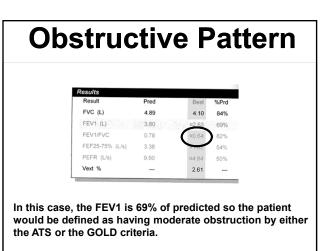
#### There are two commonly used scales of obstruction severity:

American	Thoracic Society (ATS)	Obstructive	nitiative on Lung Diseas OLD)
FEV1 (% predicted)	Obstruction	FEV1 (% predicted)	Obstruction
> 70%	Mild	> 80%	Mild
		50-79%	Moderate
60-69%	Moderate	30-49%	Severe
50-59%	Moderately Severe		
35-49%	Severe	< 30%	Very Severe
< 35%	Very Severe		

Remember, the ATS defines obstruction as an FEV1/FVC ratio of less than the predicted for that patient's age and this number will vary from patient to patient. The GOLD defines obstruction as anyone with an FEV1/FVC ratio of less than 70% regardless of age

Results			
Result	Pred	Best	%Prd
FVC (L)	4.25	¤3.07	72%
FEV1 (L)	3.28	¤1.60	49%
FEV1/FVC	0.78	¤0.52	67%
FEF25-75% (L/s)	2.93	¤0.70	24%
PEFR (L/s)	8.75	¤2.68	31%
Vext %		2.13	

the ATS or the GOLD criteria.



#### **Obstructive Pattern**

Results Result	Pred	Best	%Prd
EVIC (L)	4 78	¤2.24	47%
FEV1 (L)	3.74	¤1.09	29%
FEV1/FVC	0.78	¤0.49	63%
FEF25-75% (L/s)	3.39	¤0.54	16%
PEFR (L/s)	9.47	¤1.99	21%
Vext %		1.11	

In this case, the FEV1/FVC ratio is low at 0.49 (49% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 29% of predicted which makes this very severe obstruction by either the ATS or GOLD criteria. The computer interpreted this as mild obstruction, however.

#### **Obstructive Pattern**

Result	Pred	Best	%Prd
FVC (L)	2.45	1.90	78%
FEV1 (L)	1.90	¤1.13	59%
FEV1/FVC	0.77	¤0.59	77%
FEF25-75% (L/s)	1.73	0.51	30%
PEFR (L/s)	4.93	¤2.10	43%
Vext %		2.61	

In this case, the FEV1/FVC ratio is low at 0.59 (59% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 1.13 L (59% of predicted) which makes this moderate obstruction by GOLD criteria but moderately severe obstruction by ATS criteria. The computer interpreted this as mild obstruction.

#### **Obstructive Pattern**

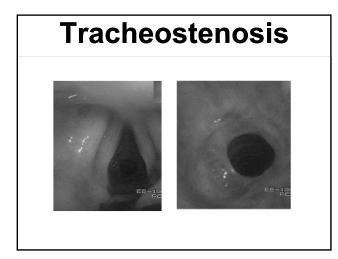
Result	Pred	Best	%Prd
FVC (L)	2.02	¤1.27	63%
FEV1 (L)	1.55	¤0.78	50%
FEV1/FVC	0.77	¤0.61	80%
FEF25-75% (L/s)	1.40	0.46	33%
PEFR (L/s)	4.18	=1.71	41%
Vext %		2.47	

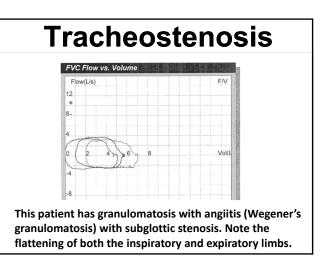
In this case, the FEV1/FVC ratio is low at 0.61 (61% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 0.78 L (50% of predicted) which makes this moderate obstruction by GOLD criteria but moderately severe obstruction by ATS criteria.

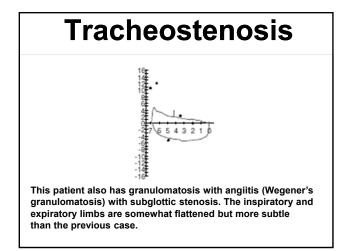
#### **Obstructive Pattern**

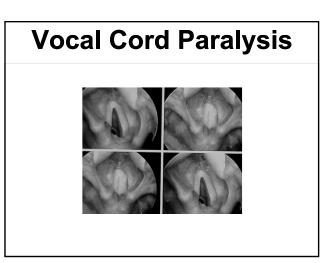
Result	Pred	Best	%Prd
FVC (L)	3.63	¤1.62	45%
FEV1 (L)	2.64	¤0.87	33%_
FEV1/FVC	0.74	¤0.54	72%
FEF25-75% (L/s)	2.02	0.44	22%
PEFR (L/s)	7.56	¤1.61	21%

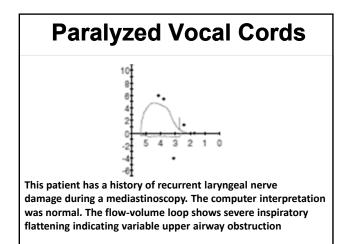
In this case, the FEV1/FVC ratio is low at 0.54 (54% of predicted). It is marked as abnormal by the computer with the square mark to the left of the value. The FEV1 is 0.87 L (33% of predicted) which makes this severe obstruction by GOLD criteria but very severe obstruction by ATS criteria. The computer interpretation was mild obstruction.









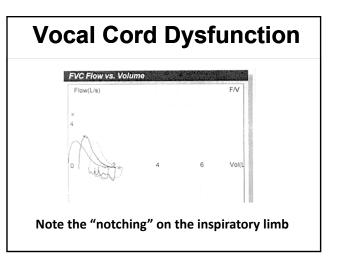


# Vocal Cord Dysfunction

**Fully Abducted** 

**Constricted Respiration** 

# Vocal Cord Dysfunction



#### **Reversible obstruction**

	Pred	<u>LLN ULN</u>	<u>Actual</u>	% Pred	Actual 9	% Pred %	Chn;
SPIROMETRY							
FVC (L)	3.55	2.96 4.14	*2.12	*59	*2.20	*62	+3
FEV1 (L)	2.78	2.32 3.24	*1.01	*36	*1.26	*45	+24
FEV1/FVC (%)	79	66 92	*48	*60	*57	*72	+19
FEV1/SVC (%)	79	66 92					
FEF 25-75% (L/sec)	2.69	2.25 3.13	*0.33	*12	*0.60	*22	+8
FEF 25% (L/sec)	11.23	9.3813.08	*1.06	*9	*1.72	*15	+6
FEF 50% (L/sec)			0.43		0.73		+7
FEF 75% (L/sec)	1.43	1.19 1.67	*0.14	*9	*0.25	*17	+7
FEF Max (L/sec)	7.67	6.40 8.94	*2.53	*33	*2.82	*36	+1
FIF 50% (L/sec)	4.78	3.99 5.57	*1.61	*33	*2.40	*50	+49
FEF50%/FIF50% (%)	90-100	79 119	26		30		+14

#### **Reversible obstruction**

	Pred	LIN	III N	Actual	% Prod	Actual	Drod @	Chng
SPIROMETRY	rieu	LLI	ULIV	Actual	<i>e</i> ricu	Actual	70 FICU 70	Cing
FVC (L)	3.55		4.14	*2.12	*59	*2.20	*62	+3
FEV1 (L)	2.78	2.32	3.24	*1.01	*36	*1.26	*45	+24
FEV1/FVC (%)	79	66	92	*48	*60	*57	*72	+19
FEV1/SVC (%)	79	66	92					
FEF 25-75% (L/sec)	2.69	2.25	3.13	*0.33	*12	*0.60	*22	+81
FEF 25% (L/sec)	11.23	9.38	13.08	*1.06	*9	*1.72	*15	+61
FEF 50% (L/sec)				0.43		0.73		+71
FEF 75% (L/sec)	1.43	1.19	1.67	*0.14	*9	*0.25	*17	+77
FEF Max (L/sec)	7.67	6.40	8.94	*2.53	*33	*2.82	*36	+11
FIF 50% (L/sec)	4.78	3.99	5.57	*1.61	*33	*2.40	*50	+49
FEF50%/FIF50% (%)	90-100	79	119	26		30		+14

#### Irreversible obstruction

			-Bron			Post-Bronch			
	Pred	LLN	ULN	Actual	% Pred	Actual	%Pred %	6 Chng	
SPIROMETRY									
FVC (L)	2.77	2.31	3.23	2.38	85	2.45	88	+2	
FEV1 (L)	2.19	1.83	2.55	*1.12	*51	*1.24	*56	+10	
FEV1/FVC (%)	80	67	93	*47	*59	*51	*63	+7	
FEV1/SVC (%)	80	67	93						
FEF 25-75% (L/sec)	2.23	1.86	2.60	*0.41	*18	*0.56	*25	+36	
FEF 25% (L/sec)	5.45	4.55	6.35	*1.24	*22	*1.47	*27	+18	
FEF 50% (L/sec)				0.48		0.70		+46	
FEF 75% (L/sec)	1.25	1.04	1.46	*0.18	*14	*0.27	*21	+47	
FEF Max (L/sec)	5.87	4.90	6.84	*2.25	*38	*2.36	*40	+4	
FIF 50% (L/sec)	3.23	2.70	3.76	*1.61	*49	*1.45	*44	-9	
FEF50%/FIF50% (%)	90-100	79	119	30		48		+62	

#### Irreversible obstruction

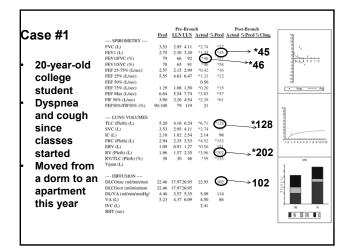
		Pre	-Bron	ch	Post-Bronch			
	Pred	LLN	ULN	Actual	%Pred	Actual	% Pred %	Chng
SPIROMETRY								
FVC (L)	2.77	2.31	3.23	2.38	85	2.45	88	+2
FEV1 (L)	2.19	1.83	2.55	*1.12	*51	*1.24	*56	+10
FEV1/FVC (%)	80	67	93	*47	*59	*51	*63	+7
FEV1/SVC (%)	80	67	93					
FEF 25-75% (L/sec)	2.23	1.86	2.60	*0.41	*18	*0.56	*25	+36
FEF 25% (L/sec)	5.45	4.55	6.35	*1.24	*22	*1.47	*27	+18
FEF 50% (L/sec)				0.48		0.70		+46
FEF 75% (L/sec)	1.25	1.04	1.46	*0.18	*14	*0.27	*21	+47
FEF Max (L/sec)	5.87	4.90	6.84	*2.25	*38	*2.36	*40	+4
FIF 50% (L/sec)	3.23	2.70	3.76	*1.61	*49	*1.45	*44	-9
FEF50%/FIF50% (%)	90-100	79	119	30		48		+62

ase #1		Pred	Pre-Bron LLN ULN		% Pred	Post-Bronch Actual <u>% Pred % Chng</u>	3
	SPIROMETRY FVC (L)	3.53	2.95 4.11	*2.74	*77		2
	FEVI (L)	2.75	2.95 4.11	*1.25	+45		1 g ·
	FEV1/FVC (%)	79	66 92	*46	*57		A 5 4 3 2 1 0
20-year-old	FEV1/SVC (%)	78	65 91	*46	*58		1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
-	FEF 25-75% (L/sec)	2.57	2.15 2.99	*0.42	*16		1
college	FEF 25% (L/sec)	5.55	4.63 6.47	*1.23	*22		-12
•	FEF 50% (L/sec) FEF 75% (L/sec)	1.29	1.08 1.50	0.50 *0.20	*15		-544
student	FEF Max (L/sec)	6.64	5.54 7.74	+3.85	*57		Pred Pre
Duramana	FIF 50% (L/sec)	3.90	3.26 4.54	*2.39	*61		
Dyspnea	FEF50%/FIF50% (%)	90-100	79 119	21			101
and cough	LUNG VOLUMES						0.00
•	TLC (Pleth) (L)	5.20	4.16 6.24	*6.71	*128		1
since	SVC (L)	3.53	2.95 4.11	*2.74	*77		14.74
	IC (L)	2.18	1.82 2.54	2.14	98		
classes	FRC (Pleth) (L)	2.94	2.35 3.53	*4.52	*153		-1 0 1 2 3 4 5 6 7 8 9 10 11 12
- 4 4 4	ERV (L)	1.09	0.91 1.27	*0.56	*51		
started	RV (Pleth) (L) RV/TLC (Pleth) (%)	1.96	1.57 2.35	*3.96	*202 *155		
Moved from	Vpant (L)	30	30 40	- 39	155		
a dorm to an	DIFFUSION		17.9726.95	22.93	102		2
	DLCOunc (ml/min/mm DLCOcor (ml/min/mm	22.46	17.9726.95	22.93	102		2010.2
apartment	DL/VA (ml/min/mmHg/	4.46	3.57 5.35	5.09	114		2
	VA (L)	5.23	4.37 6.09	4.50	86		
this year	IVC (L)			2.41			1 N N
-	BHT (sec)						N D EV D

Case #1		Pred	Pre-Bro LLN ULN		% Pred	Post-Bronch Actual <u>% Pred % Chng</u>	15
	SPIROMETRY FVC (L)	3.53	2.95 4.1	*2.74	*77		22
	FEV1 (L)	2.75	2.30 3.20		*45		4 ·
	FEV1/FVC (%)	79	66 92	*46	+57		1 1 1 2 1 0
20-year-old	FEV1/SVC (%)	78	65 9		*58	→*46	1 3
•	FEF 25-75% (L/sec)	2.57	2.15 2.99		*16		1 4
college	FEF 25% (L/sec) FEF 50% (L/sec)	5.55	4.63 6.43	*1.23	*22		12
•	FEF 75% (L/sec)	1.29	1.08 1.50		*15		· Pad - Pa
student	FEF Max (L/sec)	6.64	5.54 7.74		*57		
Duannaa	FIF 50% (L/sec)	3.90	3.26 4.54	*2.39	*61		
Dyspnea	FEF50%/FIF50% (%)	90-100	79 119	21			10
and cough	LUNG VOLUMES						0
and cough	TLC (Pleth) (L)	5.20	4.16 6.24	*6.71	*128		2
since	SVC (L)	3.53	2.95 4.11		*77		3
	IC (L)	2.18	1.82 2.54	2.14	98		
classes	FRC (Pleth) (L)	2.94	2.35 3.53		*153		-1 0 1 2 3 4 5 6 7 8 9 101
- 4 4 1	ERV (L)	1.09	0.91 1.23		*51		
started	RV (Pleth) (L) RV/TLC (Pleth) (%)	1.96	1.57 2.3		*202		
Moved from	Vpant (L)	38	30 40	39	-155		
woved from	· pan (n)						
a dorm to an	DIFFUSION						2
a donn to an	DLCOunc (ml/min/mm		17.9726.93		102		8
apartment	DLCOcor (ml/min/mm DL/VA (ml/min/mmHg/	22.46 4.46	17.9726.9		114		7 Sine 2 (5)
	VA (L)	4,46	4.37 6.09		86		
this year	IVC (L)	0.00	4.57 0.0	2.41	00		
	BHT (sec)						
							∎ N 🛛 EN 🔳 C

ase #1		Pred	Pre-I LLN U			ePred A	Post-Bronch ctual %Pred %Chng	14
	SPIROMETRY	_		_				12
	FVC (L)	3.53 2.75	2.95 4		*2.74	(*45)-	—→ <b>*45</b>	1 3 .
	FEV1 (L) FEV1/FVC (%)	2.75	2.30 1	3.20 92	*46	9	45	<u>a</u>
20-year-old	FEV1/SVC (%)	78	65	91	*46	*58	→*46	343,43210
•	FEF 25-75% (L/sec)	2.57	2.15	2.99	*0.42	*16		4
college	FEF 25% (L/sec)	5.55	4.63 6	6,47	*1.23	*22		-10
•	FEF 50% (L/sec) FEF 75% (L/sec)	1.29	1.08	1.60	0.50	*15		-544
student	FEF Max (L/sec)	6.64	5.54 1		*3.85	*57		Pred — Pre
Duannaa	FIF 50% (L/sec)	3.90	3.26		*2.39	*61		
Dyspnea	FEF50%/FIF50% (%)	90-100	79	119	21			10
and cough	LUNG VOLUMES							9
•	TLC (Pleth) (L)	5.20	4.16 6	6.24	*6.71	*128		
since	SVC (L)	3.53	2.95		*2.74	*77		
	IC (L) FRC (Pleth) (L)	2.18 2.94	1.82 2		2.14 *4.52	98 *153		1
classes	ERV (L)	2.94	0.91		*0.56	*153		-10123456789101112
started	RV (Pleth) (L)	1.96	1.57		*3.96	*202		
	RV/TLC (Pleth) (%)	38	30	46	*59	*155		1,54
Moved from	Vpant (L)							1
a dorm to an	DIFFUSION							
a uonni to an	DLCOunc (ml/min/mm		17.9720		22.93	102		3
apartment	DLCOcor (ml/min/mm	22.46 4.46	17.9720		5.09	114		
•	DL/VA (ml/min/mmHg/ VA (L)	4.46	3.57 5		4.50	86		
his year	IVC (L)	0.20			2.41	50		
	BHT (sec)							n ∎ev ∎q

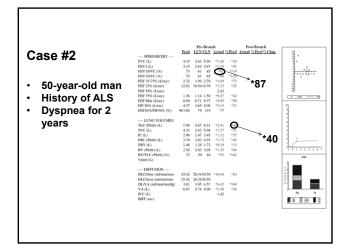
ase #1		Pred	Pre-Bron LLN ULN		% Pred Ac	Post-Bronch ctual <u>%Pred %Chng</u>	15
	SPIROMETRY FVC (L)	3.53	2.95 4.11	10.74	+77		12
	FVC (L) FEV1 (L)	2.75	2.95 4.11	*2.74	645	—→ *45	
	FEV1/FVC (%)	79	66 92	*46	- 157		a la contra cont
20-year-old	FEV1/SVC (%)	78	65 91	*46	*58	→*46	34.54.3210
-	FEF 25-75% (L/sec)	2.57	2.15 2.99	*0.42	*16		4
college	FEF 25% (L/sec)	5.55	4.63 6.47	*1.23	*22		-12
•	FEF 50% (L/sec) FEF 75% (L/sec)	1.29	1.08 1.50	0.50 +0.20	*15		-144
student	FEF Max (L/sec)	6.64	5.54 7.74	*3.85	*57		Pred — Ph
D	FIF 50% (L/sec)	3.90	3.26 4.54	*2.39	*61		
Dyspnea	FEF50%/FIF50% (%)	90-100	79 119	21			10
and couch							1000
and cough	LUNG VOLUMES		4.16 6.24		$\sim$	* 4 8 8	7
since	TLC (Pleth) (L) SVC (L)	5.20	4.16 0.24	*6.71	e128		1
31100	IC (L)	2.18	1.82 2.54	2.14	98		
classes	FRC (Pleth) (L)	2.94	2.35 3.53	*4.52	*153		10123456789101
	ERV (L)	1.09	0.91 1.27	*0.56	051		
started	RV (Pleth) (L)	1.96	1.57 2.35	*3.96	+202	— <b>→*202</b>	
	RV/TLC (Pleth) (%)	38	30 46	*59	*155		1,000
Moved from	Vpant (L)						
	DIFFUSION						
a dorm to an	DLCOunc (ml/min/mm	22.46	17.9726.95	22.93	102		2
anartmont	DLCOcor (ml/min/mm	22.46	17.9726.95				
apartment	DL/VA (ml/min/mmHg/	4.46	3.57 5.35	5.09	114		
this year	VA (L)	5.23	4.37 6.09	4.50	86		
uns year	IVC (L) BHT (sec)			2.41			nd h
	BHI (sec)						N 0.5V 0

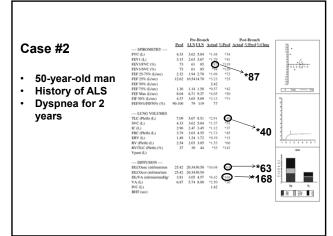


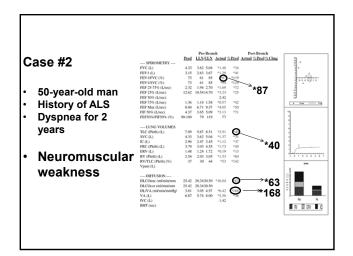
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Case #1		Pred	Pre-Brone			Post-Bronch ual %Pred %Chng	147
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		SPIROMETRY						12
$\begin{array}{c c c c c c c c c c c c c c c c c c c $						*77		1 2 .
20-year-old PEV/SVC (a) 78 65 91 76 75 75 446 college PE255 (JAc) 5.57 21.5 29 94.2 16 student PE755 (JAc) 5.57 21.5 29 94.2 16 student PE755 (JAc) 5.57 15 95 15 Dyspnea PE596 (JAc) 1.29 (61 54 7.5 19.5 15 Since State PE596 (JAc) 1.29 (61 54 7.5 19.5 15 Since State PE596 (JAc) 1.29 (61 54 7.5 19.5 15 Since State PE596 (JAc) 1.29 (61 54 7.5 19.5 15 Started RV (Pich) (J. 1.69 157 2.5 19.5 15 BV (L) 1.69 091 1.27 19.5 115 Started RV (Pich) (J. 1.69 157 2.5 19.5 115 BV (L) 1.69 091 1.27 19.5 115 Started RV (Pich) (J. 1.69 157 2.5 19.5 115 BV (L) 1.69 091 1.27 19.5 115 BV (L) 1.69 157 2.5 19.5 115 Started RV (Pich) (J. 1.69 157 2.5 19.5 115 BV (L) 1.69 157 2.5 19.5 116 DCOse (nitimizing DCOse (nitimizing DCOse (nitimizing DCOse (nitimizing) DCOse (nitimizing) 22.46 17973055 509 114 46 3.37 5.05 509 114 YA (J. 19704)						*45	—→ ^45	A
College HP 534 (Jac) 237 213 29 04 123 122 student HP 796 (Jac) 123 123 29 142 student HP 796 (Jac) 123 123 29 143 129 123 Dyspnea HP 996 (Jac) 139 139 133 15 Dyspnea HP 996 (Jac) 330 326 434 123 197 and coughLING VOLUMES since SVC (J) 238 139 433 157 Classes HC (Hel) (J) 530 416 624 671 (Jac) 124 1478 started KV (Pab) (J) 124 123 143 145 started KV (Pab) (J) 124 123 143 145 started KV (Pab) (J) 126 137 133 146 149 157 Moved from Vart (J) 126 137 133 146 149 157 adorm to an apartment UXA (minimining 2246 17973695 229) 114 UCOse (miniming 2246 17973695 229) 114	<b>00</b>				*46	#57		34.5 4 3 2 1 0
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	20-year-old				*46		~ <b>4</b> 6	
Connege         PE 5% (L/kc)         0.50								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	college		5.55	4.03 0.47		-22		3
Studient PEFMatUce) 664 554 7.74 *3.85 *57 Dyspnea PEF967(Dec) 309 3.26 434 *2.99 *61 and cough			1.29	1.08 1.50		*15		Pad - Pad
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	student		6,64	5.54 7.74	*3.85	*57		
and cough since $TLC(Pkb)(L)$ 5.20 4.16 6.24 4°.71 3°.4128 classes $Pc(L)$ 2.18 122 24 24 4°.71 3°.452 4°.14 started $Pc(L)$ 2.18 122 24 24 145 started $Pc(L)$ 1.29 23 4°.5	Duannaa	FIF 50% (L/sec)	3.90	3.26 4.54	*2.39	*61		
$\begin{array}{c cccc} since & TLC(Pibh)(L) & 5.20 & 416 & 624 & 671 & 123 & 128 \\ classes & FC(L) & 2.18 & 152 & 254 & 214 & 98 \\ classes & FC(L) & 2.18 & 152 & 254 & 214 & 98 \\ started & FV(Pibh)(L) & 1.09 & 001 & 127 & 056 & 125 & 125 \\ FV(Pibh)(L) & 1.09 & 001 & 127 & 056 & 125 & 125 \\ moved from & Vyan(L) & 1.09 & 123 & 156 & 125 & 125 & 125 \\ a dorm to an & DFIFURNMEND & 2246 & 17972605 & 229 & 120 & 102 \\ DLCOse (ultiminime 2246 & 17972605 & 229 & 114 \\ DLCOse (ultiminime 2246 & 17972605 & 529 & 114 \\ DLCOse (ultiminime 2246 & 17972605 & 529 & 114 \\ this year & VA(L) & 523 & 437 & 609 & 430 & 80 \\ \end{array}$	Dysphea	FEF50%/FIF50% (%)	90-100	79 119	21			10
$\begin{array}{c cccc} since & TLC(Pibh)(L) & 5.20 & 416 & 624 & 671 & 123 & 128 \\ classes & FC(L) & 2.18 & 152 & 254 & 214 & 98 \\ classes & FC(L) & 2.18 & 152 & 254 & 214 & 98 \\ started & FV(Pibh)(L) & 1.09 & 001 & 127 & 056 & 125 & 125 \\ FV(Pibh)(L) & 1.09 & 001 & 127 & 056 & 125 & 125 \\ moved from & Vyan(L) & 1.09 & 123 & 156 & 125 & 125 & 125 \\ a dorm to an & DFIFURNMEND & 2246 & 17972605 & 229 & 120 & 102 \\ DLCOse (ultiminime 2246 & 17972605 & 229 & 114 \\ DLCOse (ultiminime 2246 & 17972605 & 529 & 114 \\ DLCOse (ultiminime 2246 & 17972605 & 529 & 114 \\ this year & VA(L) & 523 & 437 & 609 & 430 & 80 \\ \end{array}$	and aquab							1000
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	anu cougn					$\sim$		72
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	cinco					°128		1
Classes         PRC(Preth) (L)         244         233         333         44.25         153           started         RV (Pa)         1.09         091         127         235         536         4537         456         4537         456         4507	Since					-77	· · ·	2
$\begin{array}{c cccc} & & & & & & & & & & & & & & & & & $	classos							1
started         RV (Pielu) (J)         1.06         1.57         2.35         *3.06         4.00         *202           Moved from         Vpant (J)         1.06         1.57         2.35         *3.06         +39         →155         *202           Moved from         Vpant (J)         1.06         1.57         2.35         *3.06         +39         →155         *202           a dorm to an apartment         DLCOse (nultimismin         22.6         17.973.695         22.93         ⊕102         →102           UCACe (nultimismin         22.6         17.973.695         5.09         114           this year         VA (J)         5.23         4.37         6.09         4.01	C103363					*51		-1 0 1 2 5 4 5 6 7 8 9 1011
Noved from         RV/TLC (Phd) (%)         38         30         46         +99         +155           a dorm to an apartment this year         DLOws (Infinitemently 466         3.57         5.53         5.09         114         102           this year         V/L         5.23         4.37         6.09         4.50         86	started					(*202)	.*202	
Moved from a dorm to an apartment this year         Vpust (L) DCOxe (ultimizing VA (a)         22.46         17.9736.95         22.93         (02)         102           1000000000000000000000000000000000000	Starteu					*155		
a dorm to an DLCOws (ultimismin 22.46 17.9736.95 22.93 00 100 100 100 100 100 100 100 100 100	Moved from	Vpant (L)						,
a dom'n to an DLCOme (infinitement 2246 11978:065 2239 (10) 112 (1	Woveu nom							
apartment this year V(1) UXA (minimirmal 2246 1737305 225 (1) UXA (minimirmal 2246 1737305 225 (1) UXA (minimirmal 2246 1737305 225 (1) UXA (minimirmal 2246 1737305 (1)	a dorm to an					$\sim$		2
this year V(L) 523 437 609 86 V(L) 14	a donn to an				22.93	102	<u>→102</u>	3
this year V(L) 523 437 609 86 V(L) 14	anartment							3
this year IVC (L) 2.41	•							
PHT (cos)	this year		5.23	4.37 6.09		80		
	uno you				2.41			
		bitt (84)						A B FN C

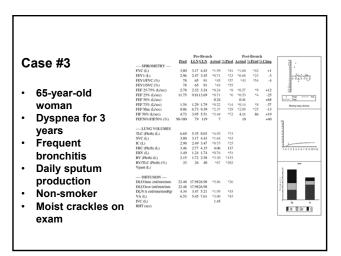
		Pred	Pre-Bron LLN ULN		Se Pred	Post-Bronch Actual <u>% Pred % Chng</u>	14g
	SPIROMETRY FVC (L)	4.33	3.62 5.04	*1.48	*34		2.
Case #2	FVC (L) FEV1 (L)	4.33	3.62 5.04	*1.48	*41		
Case #2	FEV1/EVC (%)	73	61 85	*87	*119		A.
	FEV I/SVC (%)	73	61 85	*94	*129		2 6543,310
	FEF 25-75% (L/sec)	2.32	1.94 2.70	*1.69	*72		
	FEF 25% (L/sec)	12.62	10,5414,70	*3.23	*25		-10
<ul> <li>50-year-old</li> </ul>	FEF 50% (L/sec)			2.42			-14
•	FEF 75% (L/sec)	1.36	1.14 1.58	*0.57	*42		· Pad Pad
man	FEF Max (L/sec)	8.04	6.71 9.37	*4.05	*50		
	FIF 50% (L/sec)	4.37	3.65 5.09	*3.13	*71		10
<ul> <li>History of ALS</li> </ul>	FEF50%/FIF50% (%)	90-100	79 119	77			8 8 7
<ul> <li>Dvennos for 2</li> </ul>	LUNG VOLUMES						
Dyspnea for 2	TLC (Pleth) (L)	7.09	5.67 8.51	*2.91	*40		1 1
	SVC (L) IC (L)	4.33	3.62 5.04 2.47 3.45	*1.37	*31 *37		1 3
years	FRC (Pleth) (L)	3.79	3.03 4.55	*1.73	*45		
,	ERV (L)	1.48	1.24 1.72	*0.19	*13		
	RV (Pleth) (L)	2.54	2.03 3.05	*1.53	*60		101234567
	RV/TLC (Pleth) (%) Vpant (L)	37	30 44	*53	*142		it in the second
	DIFFUSION DLCOunc (ml/min/mm	25.42	20.3430.50	*16.04	*63		
	DLCOcor (ml/min/mm	25.42	20.3430.50				
	DL/VA (ml/min/mmHg/	3.81	3.05 4.57	*6.42	*168		
	VA(L)	6.87	5.74 8.00	*2.50	*36		
	IVC (L)			1.42			hi h
	BHT (sec)						RV ERV ID

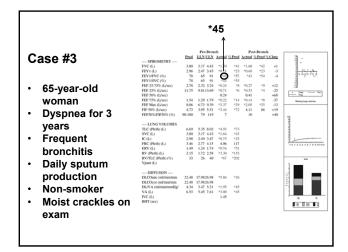
		Pred	Pre-Bron LLNULN		Fred	Post-Bronch Actual <u>&amp; Pred &amp; Chng</u>	3
	SPIROMETRY FVC (L)	4.33	3.62 5.04	*1.48	*34		1919 -
Case #2	FEV1 (L)	3.15	2.63 3.67	*1.29	*41		8 4
	FEV1/FVC (%)	73	61 85	*87	*119		4543210
	FEV1/SVC (%)	73	61 85	*94	*129	>	· · ·
	FEF 25-75% (L/sec)	2.32	1.94 2.70	*1.69	*72	*87	3
	FEF 25% (L/sec)	12.62	10.5414.70	*3.23	*25	••	10.00
<ul> <li>50-year-old man</li> </ul>	FEF 50% (L/sec)	1.36		2.42	*42		
Ju-year-olu man	FEF 75% (L/sec) FEF Max (L/sec)	8.04	1.14 1.58 6.71 9.37	*0.57	*42		• he he
History of ALS	FIF 50% (L/sec)	4.37	3.65 5.09	+3.13	*71		10
	FEF50%/FIF50% (%)	90-100	79 119	77	-71		9
Dyspnea for 2	FG 20 01 11 20 10 (10)						
<ul> <li>Dyspnea for 2</li> </ul>	LUNG VOLUMES						7
	TLC (Pleth) (L)	7.09	5.67 8.51	*2.91	*40		
vears	SVC (L)	4.33	3.62 5.04	*1.37	*31		-
	IC (L)	2.96		*1.12	*37		2
	FRC (Pleth) (L)	3.79	3.03 4.55	*1.73	*45		1
	ERV (L)	1.48	1.24 1.72	*0.19	*13		1
	RV (Pleth) (L)	2.54	2.03 3.05	*1.53	*60		101204567
	RV/TLC (Pleth) (%) Vpant (L)	37	30 44	*53	*142		-
	vpant (L)						1
	DIFFUSION						
	DLCOunc (ml/min/mm		20.3430.50	*16.04	*63		3
	DLCOcor (ml/min/mm		20.3430.50 3.05 4.57		****		
	DL/VA (ml/min/mmHg/ VA (L)	3.81		*6.42 *2.50	*168 *36		
	VA (L) IVC (L)	0.87	5.74 8.00	1.42	-30		N h
	BHT (sec)			1.42			R/ FR/ 10
	bitt (At)						R ER I

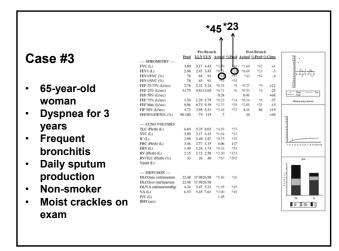


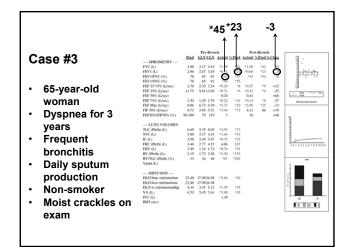


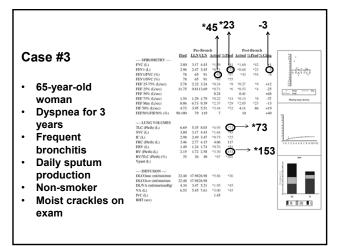


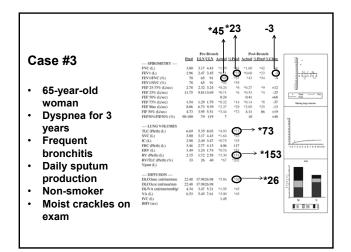


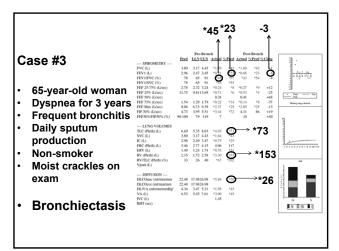




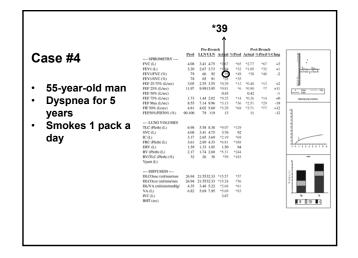


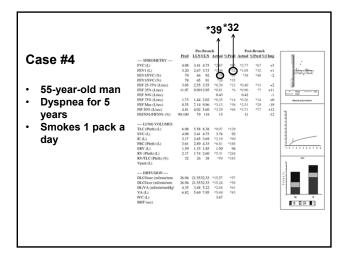


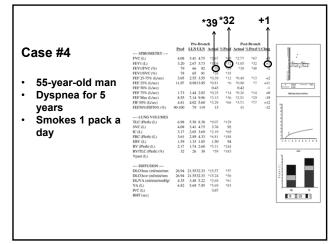


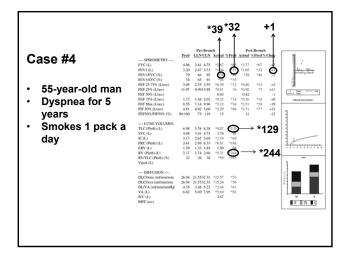


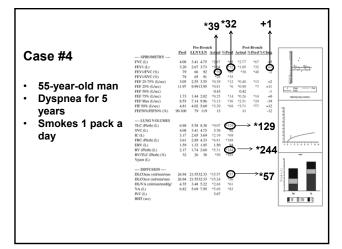
Case #4 <ul> <li>55-year-old man</li> <li>Dyspnea for 5 years</li> <li>Smokes 1 pack a</li> </ul>	SPROMITRY- INC (L) FEV (L)	Pred 4.08 3.20 79 78 3.06 11.97 1.73 8.55 4.81 90-100 6.98 4.08	Pre-Brea LLN UIN 3.41 475 2.67 3.73 66 92 2.55 3.55 9.9911305 1.44 2.02 7.14 9.06 4.02 5.63 79 119 5.58 8.388 3.41 475	Actual *2.67 *1.04 *39 *28 *0.39 *0.81 0.43	5 Pred *65 *32 *19 *12 *14 *36 *68 *129 92	*67 *67 *32 *48 *13 *7 *14 *29 *77	A A A A A A A A A A A A A A A A A A A
day	PRC (Pleds) (L) ERV (L) RV (Peth) (L) RV (Peth) (L) RV (Peth) (L) RV (PEC) (L) PLCODEC (100/mini/mm DLCODEC (100/mini/mm DLC				*188 94 *244 *183 *57 *56 *61 *83		

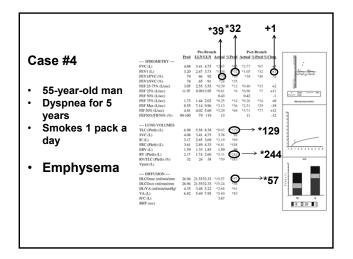


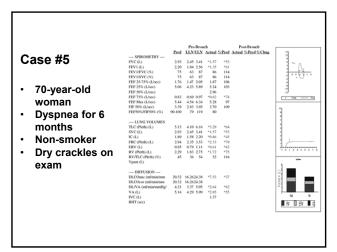












			Pre-Bronch			Post-Bronch	
		Pred	LLN ULN	Actual 4	FPred /	ctual SPred SChing	3
Case #5	SPIROMETRY FVC (L)	2.93	2.45 3.41	*1.57	*53		
ouse ne	FEV1 (L)	2.93	1.84 2.56	*1.35	*61		Λ.
	FEV1/FVC (%)	75	63 87	6	_114		
	FEV1/SVC (%)	75	63 87	30	114	N	
	FEF 25-75% (L/sec)	1.76	1.47 2.05	1.87	106	≥*86	
<ul> <li>70-year-old</li> </ul>	FEF 25% (L/sec)	5.06	4.23 5.89	5.24	103	••	
ro-year ora	FEF 50% (L/sec) FEF 75% (L/sec)	0.83	0.69 0.97	2.96	*74		
woman	FEF Max (L/sec)	5.44	4.54 6.34	5.28	97		· Pol Pol
woman	FIF 50% (L/sec)	3.39	2.83 3.95	3.70	109		10
<ul> <li>Dyspnea for 6</li> </ul>	FEF50%/FIF50% (%)	90-100	79 119	80			17 1
• Dyspilea ioi o							1 1
months	LUNG VOLUMES TLC (Pleth) (L)	5.13	4.10 6.16	*3.29	*64		
monuis	SVC (L)	2.93	2.45 3.41	*1.57	*53		
<ul> <li>Non-smoker</li> </ul>	IC (L)	1.89	1.58 2.20	*0.86	*45		
<ul> <li>NON-SITIOKER</li> </ul>	FRC (Pleth) (L)	2.94	2.35 3.53	*2.33	*79		
Data service data service	ERV (L)	0.95	0.79 1.11	*0.61	*63		4.6.12345478
<ul> <li>Dry crackles on</li> </ul>	RV (Pieth) (L)	2.29	1.83 2.75	*1.72	*75		
•	RV/TLC (Pleth) (%) Vpant (L)	45	36 54	52	116		ieten
exam	vpant (t.)						1
•	DIFFUSION						(1)
	DLCOunc (ml/min/mm		16.2624.38	*7.53	*37		
	DLCOcor (ml/min/mm		16.2624.38				3
	DL/VA (ml/min/mmHg/ VA (L)	4.21	3.37 5.05 4.29 5.99	*2.64 *2.85	*62		~}
	VA (L) IVC (L)	2.14	4.29 0.59	1.37	-00		hd h
	BHT (sec)			1.00			RV DERV DQ

