

Spirometry



You Want Me To Blow Into What?
For How Long?

1

What is spirometry?

- Measures how much air an individual can blow out and how fast.
- A procedure done in a short time in both clinical & non-clinical settings
- The gold standard for the diagnosis & monitoring of COPD & other respiratory diseases, such as asthma

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Spirometry measurements & what they mean

- **FVC** = Forced vital capacity is the total volume of air exhaled following a maximum inhalation
- **FEV₁** = Forced expiratory volume in one second is the expiratory volume during the 1st second of a FVC maneuver
- **FEV₁/FVC (or FEV₁%)** = the proportion of the forced vital capacity exhaled in the first second
- FEV₁ & FVC are age, gender, height & race dependent

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Spirometry Reference Values

- “Predicted” values
 - Obtained from studies of health people
 - Dependent on:
 - Height
 - Age
 - Gender
 - Race or ethnicity
 - Weight is **not** a factor in predicted values
 - Extremes of weight can reduce lung function
- NHANES III reference equations are recommended

National Health & Nutrition Examination Survey

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Spirometry in Evaluating Lung Function & Detecting Disease

- Test can show restrictive or obstructive disease patterns, but are not specific
- It's highly dependent on patient cooperation
- Many mild asthmatics have normal spirometry between acute exacerbations, limiting it's diagnostic usefulness in asthma

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Technician Training and Review

- A well trained & competent technician is the most important factor in assuring good quality spirometry results
- Recommended training from ATS – suggest that completion of secondary education & at least 2 years of college education would be required to understand & fulfill the complete range of tasks undertaken by a pulmonary function technician

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A good Spirometry Technician has been likened to a combination of a bully with a cheerleader in obtaining maximal efforts. Attention to detail in calibrating the equipment and in measuring the test, experienced judgment in determining which maneuvers represent the subject's true lung function, sensitivity to the test subject, and enthusiastic supportive coaching are important qualities in a successful spirometry technician.

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Perform Spirometry

- Properly prepare equipment prior to testing
- Identify subjects & criteria for postponing the test
- Wash hands
- Measure weight & height without shoes
- Instruct & demonstrate the test
 - Correct posture – sitting or standing
 - Nose clips
 - Inhale rapidly & completely
 - Position the mouthpiece
 - Exhale with maximal force

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Determine the acceptability of Spirograms

Acceptable tests must meet the following criteria:

- Good start (no back extrapolation error)
- No cough during the first second
- No early termination (not less than 6 seconds)
- No Valsalva maneuver
- No leak (mostly older volume spirometers)
- No obstruction of mouthpiece (Lips, false teeth)
- No extra breaths

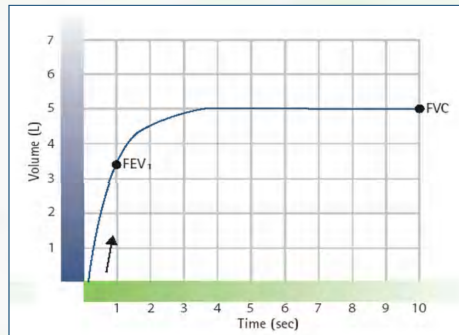
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Useable Trials

- Must meet first two criteria
- However, failure to meet these goals should not prevent reporting of the results
- Reproducible trials
 - Requires 3 acceptable trials
 - Results must be recorded, with the two largest FVC & FEV₁ values reproducing within 150 mL

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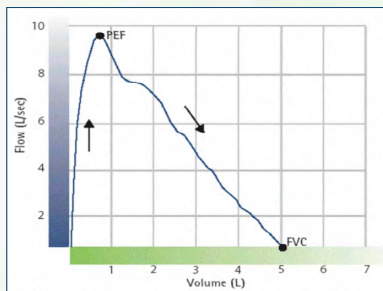
Graphic Representation of the FVC Maneuver on the Traditional Time – Volume Spirogram



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Graphic Representation of the FVC Maneuver on the Flow Versus Volume Curve

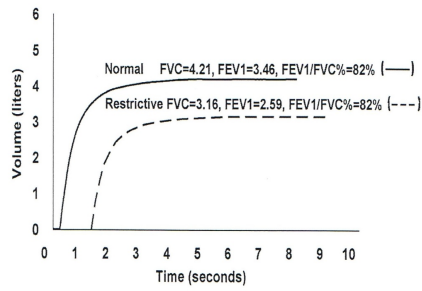


PEF is the Peak Expiratory Flow in L/sec. To translate to a standard peak flow meter reading that is measured in L/min, multiply by 60.

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FIGURE 2-5. NORMAL AND RESTRICTIVE PATTERNS
VOLUME TIME CURVES



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FIGURE 2-6. FLOW VOLUME CURVES

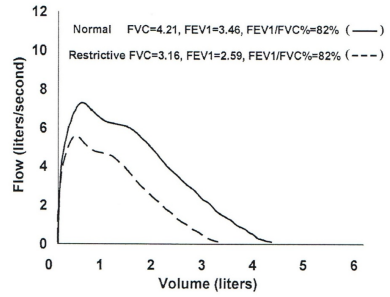
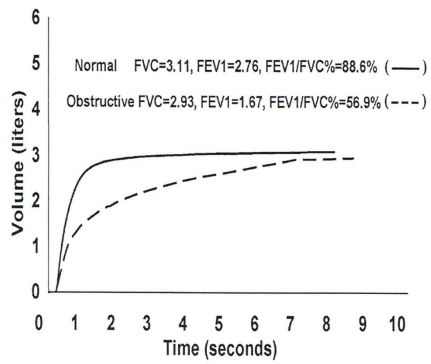


FIGURE 2-7. NORMAL AND OBSTRUCTIVE PATTERNS
VOLUME TIME CURVES



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FIGURE 2-8. FLOW VOLUME CURVES

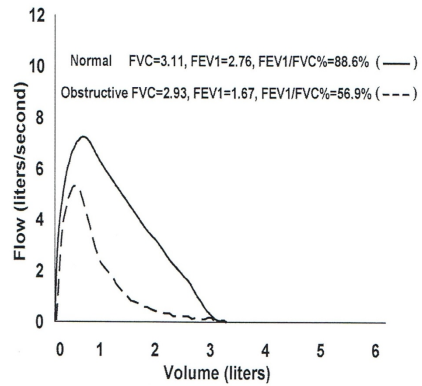


FIGURE 4-3. VOLUME TIME CURVE
- EXTRAPOLATED VOLUME (Vext)

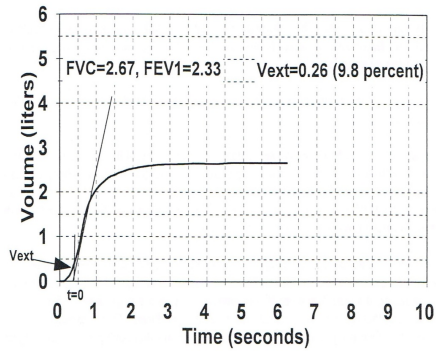
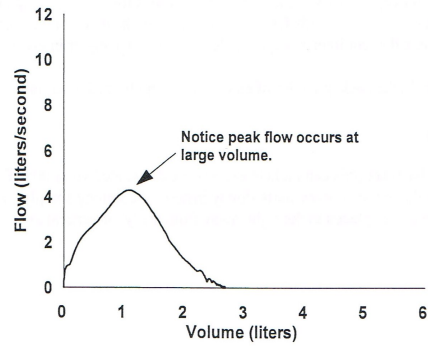


FIGURE 4-4. FLOW VOLUME CURVE - VEXT



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2. Cough: (Figures 4-5 and 4-6). Both the volume time and the flow volume curves show dips instead of a smoothly-formed line.

FIGURE 4-5. VOLUME TIME CURVE - COUGH

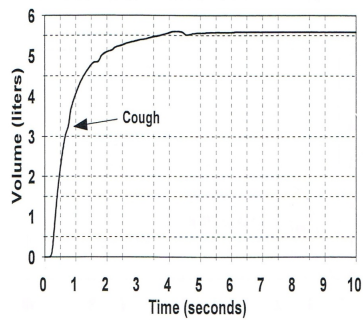
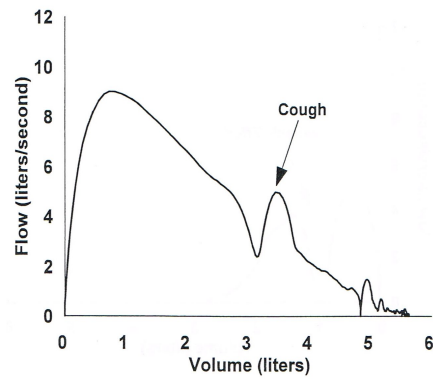


FIGURE 4-6. FLOW VOLUME CURVE - COUGH



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5. Early termination: (Figures 4-11 and 4-12). The volume time curve does not plateau and is less than six seconds in this example. The flow volume curve shows a low total volume and the line (flow) drops sharply at the end of expiration.

FIGURE 4-11. VOLUME TIME CURVE - EARLY TERMINATION

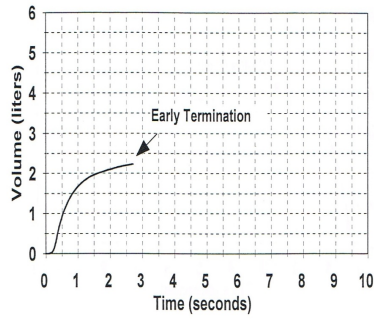
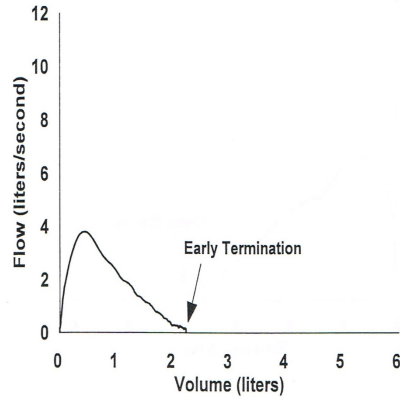


FIGURE 4-12. FLOW VOLUME CURVE



Spirometry Report
 Puritan-Bennett Renaissance II
 S/N: 6030700813
 Version: 1.1.11

Session Date: 14 JUL 2006
 Session Time: 09:23AM
 Last Cal Check: 14 JUL 2006

REST 3 PFC/FV REPORT

ID: [REDACTED]
 Name: [REDACTED]
 Gender: MALE
 Medication: [REDACTED]
 Dosage: [REDACTED]

Height: 69"
 Age: 19YRS
 Physician: [REDACTED]
 Ref: 178185
 Technician: [REDACTED]
 Sex: M
 Ethnicity/Correction: CAUCASIAN 100.0%

Sensor Code: 43816
 Temperature: 66
 Barometric Press: 751mmHg
 FIDC Correction: 1.125
 Normal: KRUSON 83

Clinical Format: PREMED - 60-250W
 Print Criteria: [REDACTED]

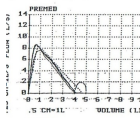
* Indicates Best Value
 N/A

MEASUREMENT	Initial	Mid	Final	Final	Final	Final	Final
	1	2	3	4	5	6	7
FVC (L)	3.01*	3.07	4.88	4.31	4.72	2.77	
FEV1 (L)	3.04	89	3.81*	3.77	4.07	3.30	
FEV2 (L)	72	84	82	81	86	73	
FEV2-75 (L/S)	2.29*	50	3.99	4.69	4.55		
PEF (L/S)	8.08*	103	7.66	8.79	8.50		
FET (S)	4.83*		13.82	3.43			

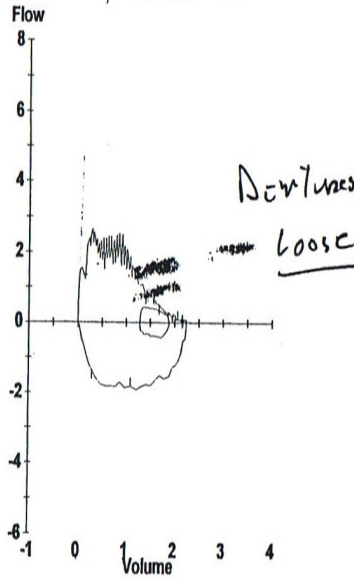
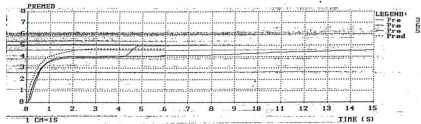
Report Summary:
 Pre Med: Tests 8 Acceptable 1 Reproducible 0 FVC WVR: 443% FEV1 WVR: 43% PEF WVR: 1220%/S

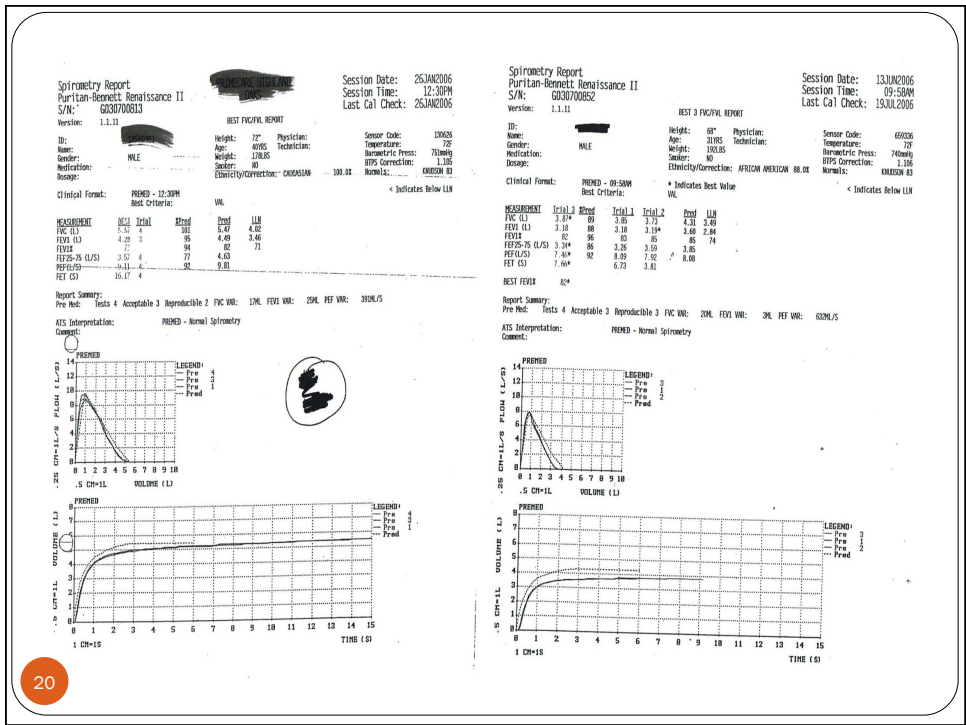
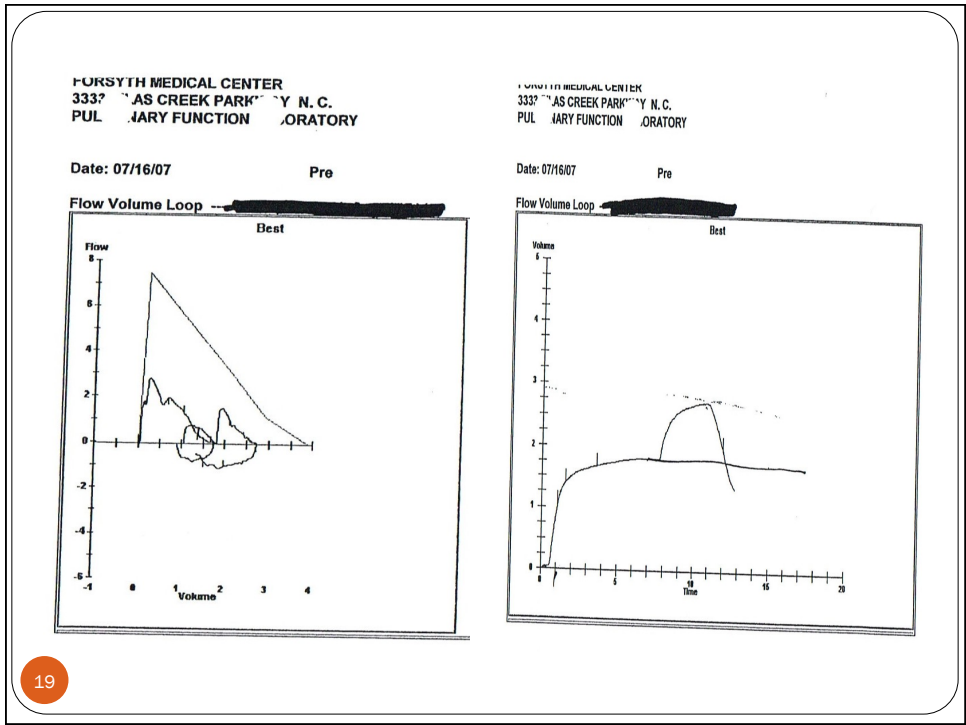
ATS Interpretation: PREMED - Mild Obstruction

Comment:



WAL
 7/14/06







We're Done
Questions?

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