

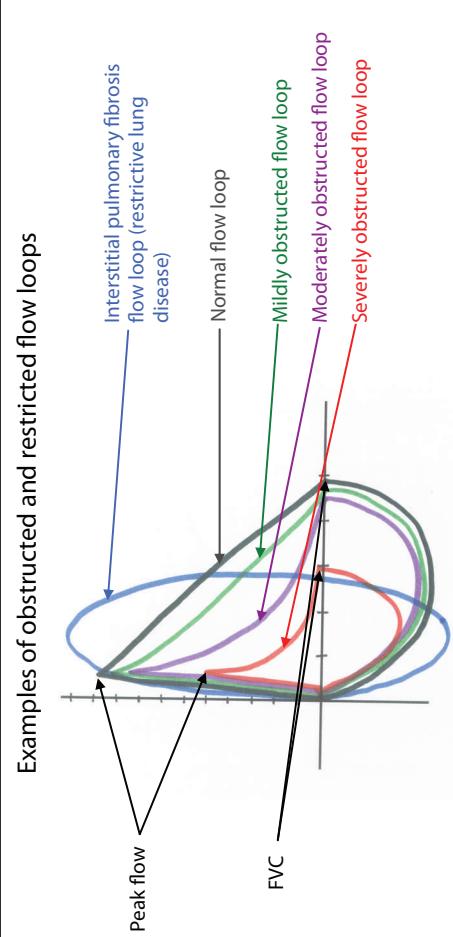
Definitions:

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 an FVC maneuver

Obstruction: flow limitation is observed during spirometry. If the observed FEV₁/FVC ratio is down 10 or more from the predicted, obstruction is present.

Restriction: Spirometry with low FVC (< 80%) can only suggest restriction. Further testing is needed to confirm.



Spirometry must establish a solid baseline meeting all criteria for acceptability and repeatability. Use GLI-2012 multi-ethnic reference ranges when available. NHANES III reference values remain appropriate for patients 8-80, where maintaining continuity is important. For children ages 5-8, Wang reference values are recommended when GLI-2012 is not available. GLI-2012 has a grading system range of A-F, spirometry tests with grades of A-C are clinically useful. Follow all OSHA and JCAHO standards for infection control. Note: Testing children < age 5 is likely to be unsuccessful.

Contraindications:

- Recent surgery
- Recent pneumothorax
- Unable to understand directions or inability to seal mouthpiece

CPT codes for spirometry:

94010 spirometry 94060 spirometry with bronchodilator (pre- and post-test)
When using these CPT codes, better reimbursement happens when current symptoms are associated with the appropriate ICD9 code for asthma or COPD.

Refer to a specialist:

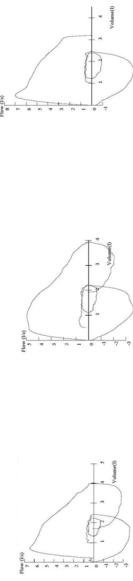
- If patient has **severe obstruction**
- If patient has a **restrictive pattern**
- If patient **does not respond to medications**

Acceptability criteria from the American Thoracic Society: Global Lung Function Initiative (GLI)-2012 multi-ethnic reference ranges are recommended. NHANES III reference values remain appropriate where maintaining continuity is important. Following a grading system range of A-F, spirometry tests with grades of A-C are clinically useful.

Examples of unacceptable tests

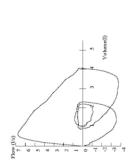
Slow start of test

Rounded peak



Early termination

Cough in first second



Examples of unacceptable tests

Actual Predicted % Predicted

FVC (l) 3.62 3.41 99

FEV₁ (l) 4.03 3.99 99

% Predicted 99

Actual Predicted % Predicted

FVC (l) 3.70 3.44 99

FEV₁ (l) 4.07 3.43 99

% Predicted 99

Repeatability criteria for the American Thoracic Society: Recommended

repeatability criteria of 150 ml.



Coaching patients through spirometry:

Instruct patient to breathe normally. When patient is ready, have him/her take his/her deepest breath and blow as hard as he/she can as long as he/she can. There is a learning curve for spirometry. Use positive reinforcement to build on the patient's successes. (For example, "That was really good; this time take an even deeper breath.") Always demonstrate rate the spirometry maneuver, especially if language is a barrier or communication issues arise.

Appropriate bronchodilator use:

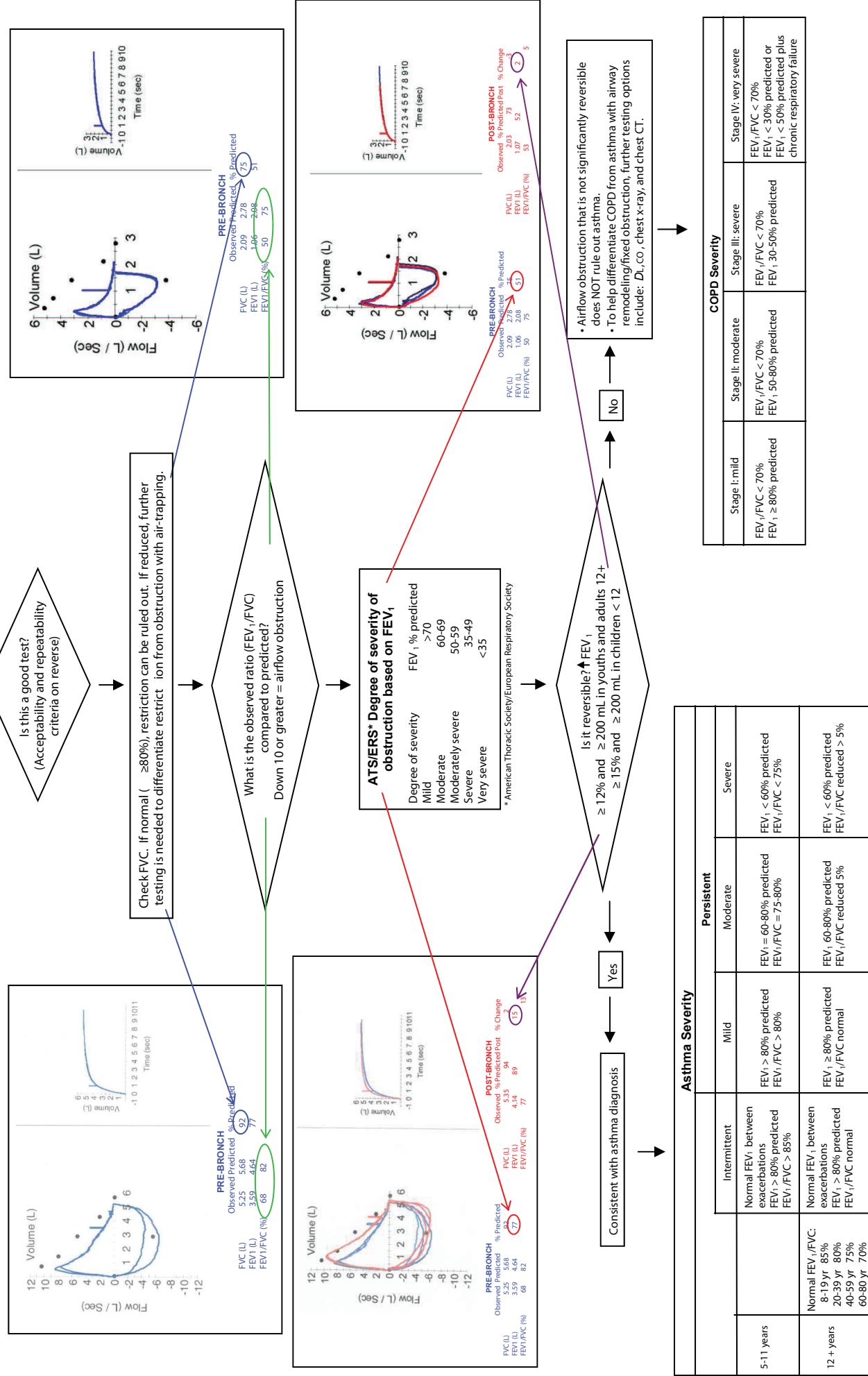
If testing for reversibility, give patient 4 puffs of bronchodilator with a spacer or a standard nebulized dose. Wait 15 minutes after last dose to perform post-bronchodilator maneuver. If a patient cannot perform acceptable baseline maneuvers according to American Thoracic Society criteria or there is no evidence of airflow obstruction, do NOT give a bronchodilator.

References:

1. Repeatability criteria for the American Thoracic Society: Three (3) acceptable tests must be performed with two (2) tests having FEV₁ and FVC within 15% of 150 ml. of each other.
2. Miller M, Hankinson J, Brusasco V, et al. Standardisation of spirometry. *European Respiratory Journal*. 2005;26:319-338.
3. Pellegrino R, Viegi G, Brusasco V, et al. Interpretative strategies for lung function tests. *European Respiratory Journal*. 2005;26:949-968.
4. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. Updated 2007. Available at <http://www.goldcopd.com>.
5. National Heart, Lung and Blood Institute National Asthma Education and Prevention Program. *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma*. 2007. Available at <http://www.nhlbi.nih.gov>.

SPIROMETRY INTERPRETATION

COPD



Sample written asthma interpretation:

Sample written asthma interpretation:
The FEV₁/RVC ratio being down more than 10 from predicted 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 response to albuterol with the FEV₁ increasing 15% or 550cc. This finding is consistent with diagnosis of asthma although a clinical correlation is needed to confirm. (Based on the 2007 NAEPP guidelines for asthma severity) this 28 year old male with a baseline FEV₁ of 77% has moderate persistent asthma.

Sample written COPD interpretation:

Sample written COPD interpretation:
The FEV₁/FVC ratio being down more than 10% from predicted is consistent with airflow obstruction. The FEV₁ being 51% of predicted suggests a moderately-severe airflow obstruction (based on the 2005 ATS/ERS guidelines for severity of obstruction). No significant response to albuterol was revealed as the FEV₁ only increased 2%. Further testing revealed a diffusion capacity of 50% of predicted. The lateral chest film showed signs of hyperinflation and flattened diaphragm and the chest CT had classic changes seen in emphysema. (Based on the 2007 GOLD guidelines for COPD severity), this 74 year old female with a baseline FEV₁ of 51% (based on the 2007 GOLD guidelines for COPD severity), this 74 year old female with a baseline FEV₁ of 51%

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