Guidelines for Interpretation of Spirometry, Bronchodilator Response, Lung Volumes, Diffusion, and 6MWT

**SPIROMETRY** Spirometry defines and grades obstruction and suggests restriction. The ATS abrogated obstructive lung disease interpretation to the GOLD guidelines which should be used by all interpreters.

**Obstruction** is defined by FEV1/FVC < 0.7
- (Post BD values are used if available)

**Obstruction is graded by:**
- Mild (FEV1 % predicted ≥80%) GOLD I
- Moderate (FEV1 % predicted 50-79%) GOLD II
- Severe (FEV1 % predicted 30-49%) GOLD III
- Very severe (FEV1 % predicted <30%) GOLD IV

**Special situations:**
1) Isolated FEV1 % predicted <80% but FEV1/FVC ≥ 0.7
   This condition has been called GOLD U (Unclassified) but most of these people are young with COPD symptoms. Recommendation: "Suggests obstruction" and describe why but we can be variable on this one.

2) Flow volume loop has concavity but spirometry is numerically normal.
   Recommendation: "Normal spirometry" This does not mean that you can't try BD in clinic for patient care. Although "There is flow limitation at low lung volumes" is technically true, this interpretation is subjective.

3) Numerically normal spirometry with FEF 25-75% < 65% predicted
   Recommendation: "Normal spirometry" The GOLD guidelines have removed this from the definition of obstruction due to lack of specificity.

4) Abnormal flow volume loop, inadequate expiratory time, or other technical difficulty: These are likely the most important clinical cases in which you can make a difference. These require freehand description and in some cases a call to the ordering physician.

**Restriction**
- Restriction is suggested by the combination of FEV1/FVC > 0.7 and FVC < 80% predicted.
- Restriction is present if FEV1/FVC is ≥ 0.7 and TLC is <80% predicted.

**Special situations:**
Obstruction is present by FEV1/FVC but FVC is lower than 80% predicted.
Recommendation: Call the obstruction. Should you wish to suggest that lung volumes could be performed to define the extent of "possible" restriction you may do so. If previous lung volumes have defined restriction, you may refer to the previous lung volumes that defined restriction but you should not call it on the test at hand.

**Normal**
- FEV1/FVC is ≥ 0.7 and FEV1% predicted and FVC % predicted are ≥80%

**LUNG VOLUMES** Lung volumes have been subjected to fewer guideline recommendations because of the difference between plethysmographic and gas dilution methodology, higher noise around measurement, and fewer validation cohorts to define normative values. Therefore, values should be a minimum of 20% away from normal before any comment is made.

- Restriction is defined by TLC < 80% predicted. You may further define as mild (70-79%), (moderate 50-69%), and severe (<50% predicted) if you desire.
- Hyperinflation is defined by TLC > 120% predicted
- Gas trapping is defined by RV > 120%
Special situations:
1) Isolated low RV % predicted.
Recommendation: An isolated reduction in RV has been seen in early interstitial lung disease. This should not be called restriction.

2) Isolated reduction in ERV
Recommendation: Since weight and height is recorded on the spirometry, this patient should not be called obese unless they have a BMI >30 kg/m². There is no threshold of ERV that defines a mandatory comment. An optional statement may be made if obesity present, "Low ERV may be due to patient's weight".

3) Low TLC with normal FRC
Recommendation: The suggestion of neuromuscular disease is a subtle enough and important enough determination that in general the ordering physician should be called unless a known neuromuscular disease is already present.

DIFFUSION
There are few guidelines on interpretation of diffusion because Europeans and Americans cannot agree on the value of DLCO and DLCO/VA for clinical care. The topic has generated controversy for 40 years so we should let the residents and fellows understand the difference. However, this should not influence our group written interpretation. Furthermore, the majority of DLCO are not HgB adjusted in the laboratory; therefore, some of us have proposed a lower cut-point to define abnormality.

DLCO % predicted < 75% is interpreted as "Low Diffusion".
You may further quantify DLCO if you desire:  
- Mild >60% and <75% predicted
- Moderate 40-60% predicted
- Severe <40% predicted

Special Situations:
DLCO % predicted is <75% predicted and DL/VA is >75% predicted.
Recommendation: This situation still has a lower than normal DLCO. It is wrong to suggest that DLCO "corrects" for alveolar volume. The correct interpretation is that "DLCO is low and DL/VA is normal". This may suggest that the reason for a low DLCO is a low alveolar volume (most likely from ILD) rather than intrinsic vascular disease or widening of the alveolar capillary membrane. However, DLCO as an independent variable has been associated with mortality in a number of lung diseases independent of DL/VA and should never be "corrected" for DL/VA.

6 MINUTE WALK TEST
The 6MWT is billed as a low level cardiopulmonary exercise test, therefore, it is mandatory that both pulmonary and cardiac interpretations are made. There are some small studies that define a predicted 6MWT distance, but these are not validated. O2 desaturation >3% is not physiologic and is abnormal. Both heart rate and systolic blood pressure should increase with exercise.

Therefore, the usual (and shortest) interpretation is:
The 6MWT distance is <normal (>1500 feet), limited (500-1500 feet), or very limited (<500 feet) <with or without> O2 desaturation. The cardiovascular response to exercise is <normal or abnormal>.

Other features can obviously be important such as the walk not being limited by dyspnea, chest pain, or extreme desaturation. These are already recorded by the technicians and need not be repeated unless you desire.

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