

# Official PFT Guides

<b>Official Guides</b>
<a href="#">ATS Rapid Interpretation Guide</a>
<a href="#">2010 GOLD Spirometry Guide</a>
<a href="#">2022 ERS/ATS Interpretive Strategies for PFTs</a>

## Interpretation Position

### Why I use GOLD Criteria

At UMMC, PFTs do report LLN and reference value (pop mean?) but not percentiles or z scores.

One can back-calculate the SD using  $\sigma = \frac{\text{LLN} - \text{ref}}{-1.65}$  (this assumed LLN on our reports corresponds to 5th percentile).

Once  $\sigma$  is known for the each value (e.g.,  $\sigma_{\text{FVC}} \neq \sigma_{\text{FEV1}} \neq \sigma_{\text{RV}}$ ), you could then use  $z = \frac{\text{PT}_{\text{value}} - \text{ref}}{\sigma}$  and refer to the tables below to grade severity.

Given the complexity of this, using ERS/ATS for diagnosing and grading abnormalities is not possible.

Therefore, I use GOLD criteria.

## Step-by-Step to Interpreting PFTs

### Assess Flow-Volume Loops

1. Are the loops similar between attempts?
  1. YES: Skip to next
  2. NO: See first page's comment if ATS reproducibility criteria was met
2. Roughly speaking, do the loops appear obstructive or restrictive?

### Assess Spirometry

#### Spirometric Severity

#### ATS Criteria

[Source](#)

Grade	FEV1 z score	Severity
NA	-1.65 to -2.5	Mild
NA	-2.51 to -4.0	Moderate
NA	<-4.1	Severe

## GOLD Criteria

### Source

Grade	FEV1 Percent Predicted	Severity
1	≥80%	Mild
2	50% – 79%	Moderate
3	30% – 49%	Severe
4	<30% or <50% with CHRF	Very Severe

## Bronchodilator Response

### ERS/ATS Definition

- Required:
  - BDR >10%
- Calculation
  - $$\text{\$ BDR} = \frac{\text{FEV1}_{\text{postBD}} - \text{FEV1}_{\text{preBD}}}{\text{FEV1}_{\text{predicted}}}\text{\$}$$

### Important NOTE:

- Calculation is not
  - $$\text{\$ BDR} = \frac{\text{FEV1}_{\text{postBD}} - \text{FEV1}_{\text{preBD}}}{\text{FEV1}_{\text{preBD}}}\text{\$}$$
- Does NOT require
  - $$\text{\$}\Delta \text{FEV1}_{\text{volume}} > 200 \text{ mL}\text{\$}$$

### GOLD Definition

- Required:
  - $$\text{\$BDR} > 12\%\text{\$}$$
  - $$\text{\$}\Delta \text{FEV1}_{\text{volume}} \geq 200 \text{ mL}\text{\$}$$
- Calculation
  - $$\text{\$ BDR} = \frac{\text{FEV1}_{\text{postBD}} - \text{FEV1}_{\text{preBD}}}{\text{FEV1}_{\text{preBD}}}\text{\$}$$
  - NOTE: this differs from ERS/ATS calculation**

## Methacholine Challenge

### Source, ERS 2017

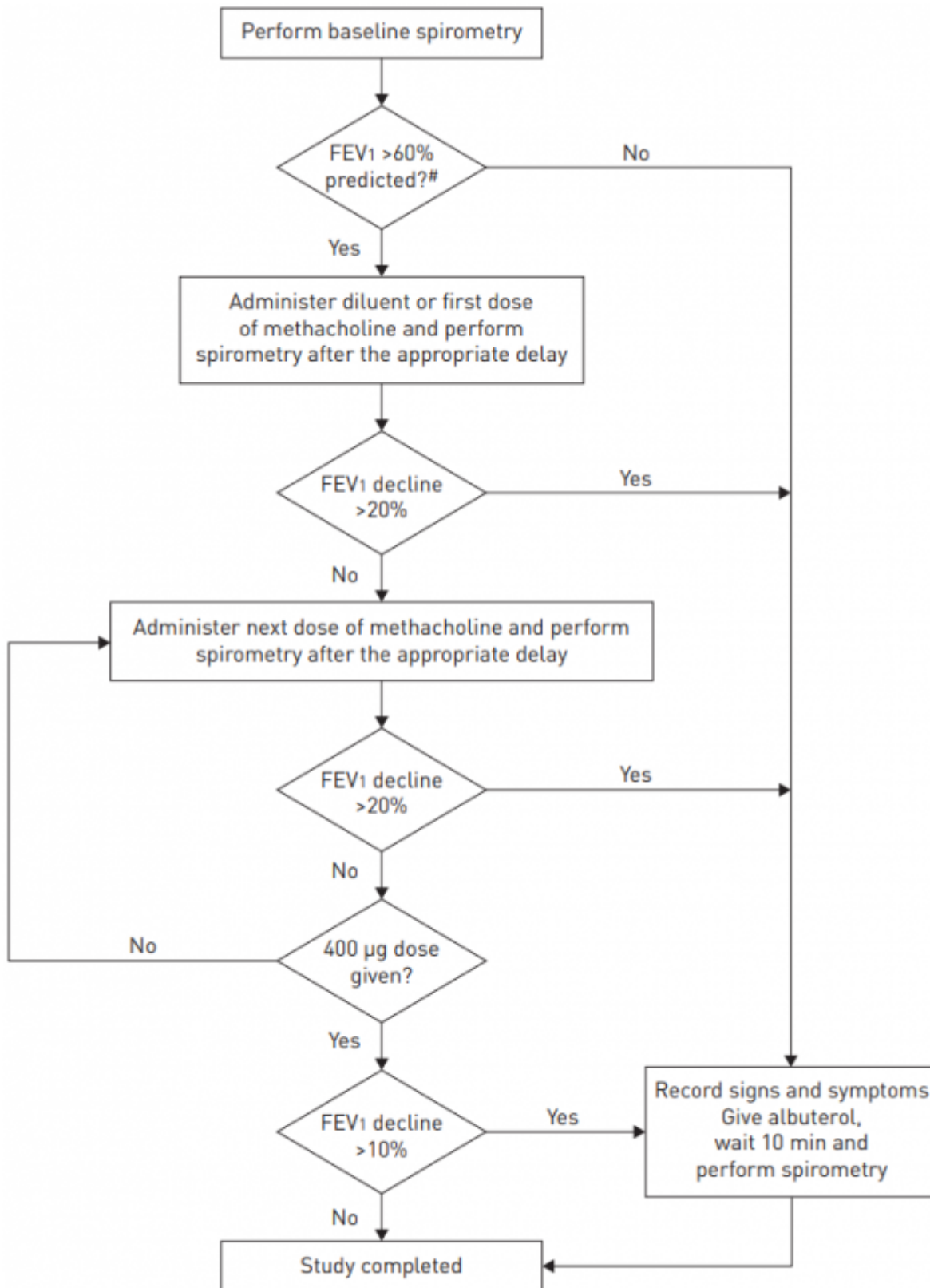
## Response Categorization

TABLE 6 Categorisation of airway response to methacholine

PD <sub>20</sub> $\mu\text{mol}$ ( $\mu\text{g}$ )	PC <sub>20</sub> $\text{mg}\cdot\text{mL}^{-1}$	Interpretation
>2 (>400)	>16	Normal
0.5–2.0 (100–400)	4–16	Borderline AHR
0.13–0.5 (25–100)	1–4	Mild AHR
0.03–0.13 (6–25)	0.25–1	Moderate AHR
<0.03 (<6)	<0.25	Marked AHR

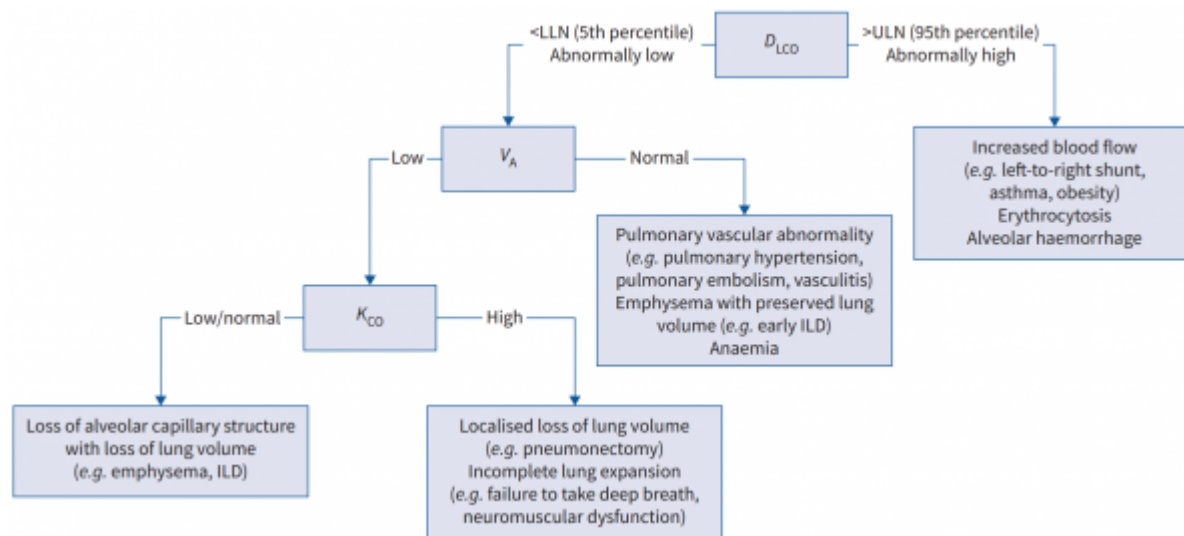
PD<sub>20</sub>: provocative dose causing a 20% fall in forced expiratory volume in 1 s (FEV<sub>1</sub>); PC<sub>20</sub>: provocative concentration causing a 20% fall in FEV<sub>1</sub>; AHR: airway hyperresponsiveness. Information from [3].

## Testing Protocol



## DLCO Severity

## ERS / ATS Definition



### Source

Grade	FEV1 z score	Severity
NA	-1.65 to -2.5	Mild
NA	-2.51 to -4.0	Moderate
NA	<-4.1	Severe

### Gold Definition

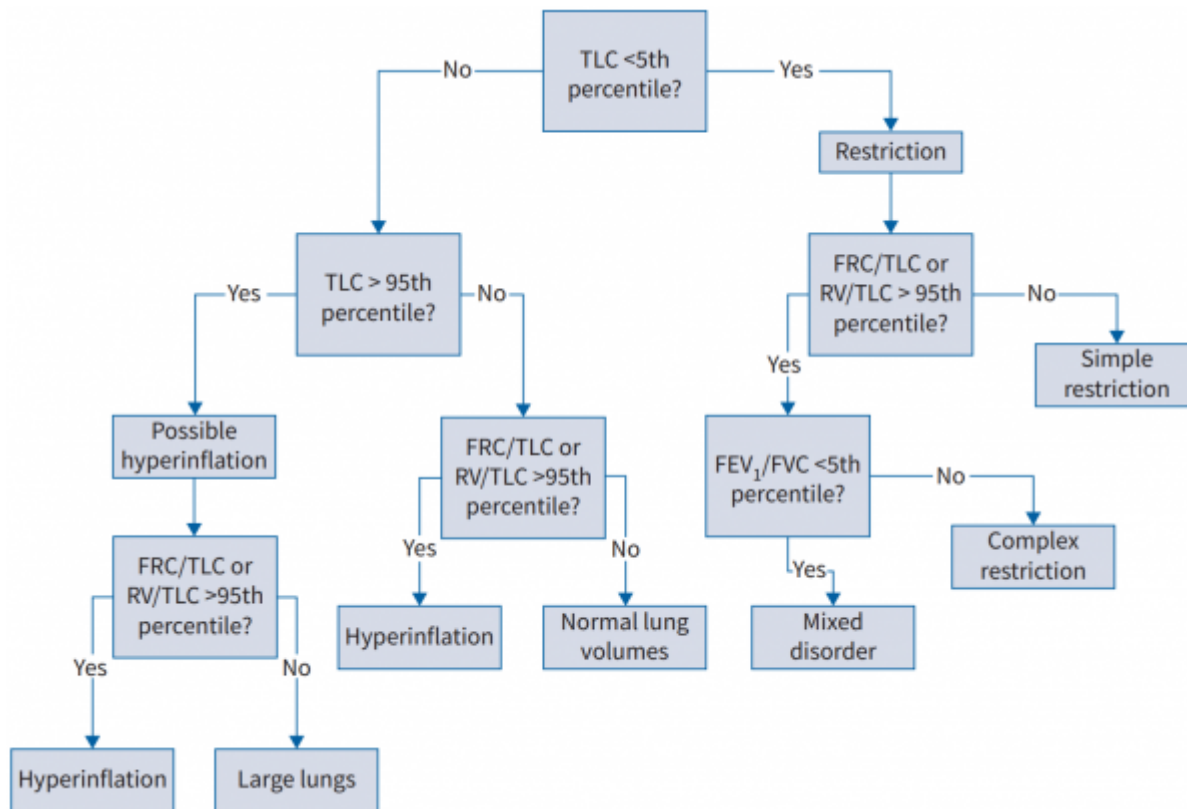
DLCO Percent Predicted	Severity
>140%	Abnormally High
76%-140%	Normal
61-75%	Mild
41-60%	Moderate
<40%	Severe

## Assessing Restriction

### ATS Criteria

#### Source, pg 17

1. Check spiro
  1. Is  $FVC \cdot z_{\text{score}} \leq -1.65$  (e.g. < 5th percentile)?
    1. Yes: get lung volumes
    2. No: no restriction
2. Check lung volumes
  1. Is  $TLC \cdot z_{\text{score}} \leq -1.65$  (e.g. < 5th percentile)?



Source

Grade	FEV1 z score	Severity
NA	-1.65 to -2.5	Mild
NA	-2.51 to -4.0	Moderate
NA	<-4.1	

### GOLD Definition

1. Required:
  1. FVC <80% predicted

^ TLC Percent Predicted ^ Severity ^

>70%	Mild
50%-69%	Moderate
<50%	Severe

### Other Lung Volumes

VC: ↓ in restriction, ↓ in air trapping  
 RV & FRC: ↑ with air trapping  
 RV & FRC: ↓ with restriction  
 ERV: ↓ in obesity

### Lung Volume

FRC is the primary thing calculated in lung volume calculations.

# Other

## Plethysmography

### Boyle's Law

- $P_1V_1 = P_2V_2$
- $\implies V_{tg} = 970 \frac{\Delta V}{\Delta P}$

$$FRC = ERV + RV$$

$$TLC = VC + RV$$

### Helium

- Helium is used because He doesn't cross the alveolar-capillary membrane
  - $C_1V_1 = C_2(V_1+V_2)$
  - $\implies V_2 = V_1 \left( \frac{C_1}{C_2} - 1 \right)$
  - **limitations** since inhalation done only for a few minutes, would get into poorly ventilated lungs, so will underestimate FRC

### Nitrogen

Method for calculation is similar to [Helium](#) method.

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