Official PFT Guides

Official Guides
ATS Rapid Interpretation Guide
2010 GOLD Spirometry Guide
2022 ERS/ATS Interpretive Strategies for PFTs

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 $\sigma = \frac{LLN - ref}{-1.65}$ (this assumed LLN on our reports corresponds to 5th percentile).

Once σ is known for the each value (e.g., $\sigma_{FVC} \neq \sigma_{FEV1} \neq \sigma_{RV}$), you could then use $z = \frac{PT_{value} - ref}{\sigma}$ 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

1. Required:
    1. BDR >10%

1. Calculation
    1. $ BDR = \frac{FEV1_{postBD} - FEV1_{preBD}}{FEV1_{predicted}}$

Important NOTE:

1. Calculation is not
    1. $ BDR = \frac{FEV1_{postBD} - FEV1_{preBD}}{FEV1_{preBD}}$
2. Does NOT require
    1. $\Delta FEV1_{volume} >200 mL$

GOLD Definition

1. Required:
    1. $BDR >12%$
    2. $\Delta FEV1_{volume} \geq 200 mL$

1. Calculation
    1. $ BDR = \frac{FEV1_{postBD} - FEV1_{preBD}}{FEV1_{preBD}}$
    2. **NOTE: this differs from ERS/ATS calculation**

Methacholine Challenge

Source, ERS 2017

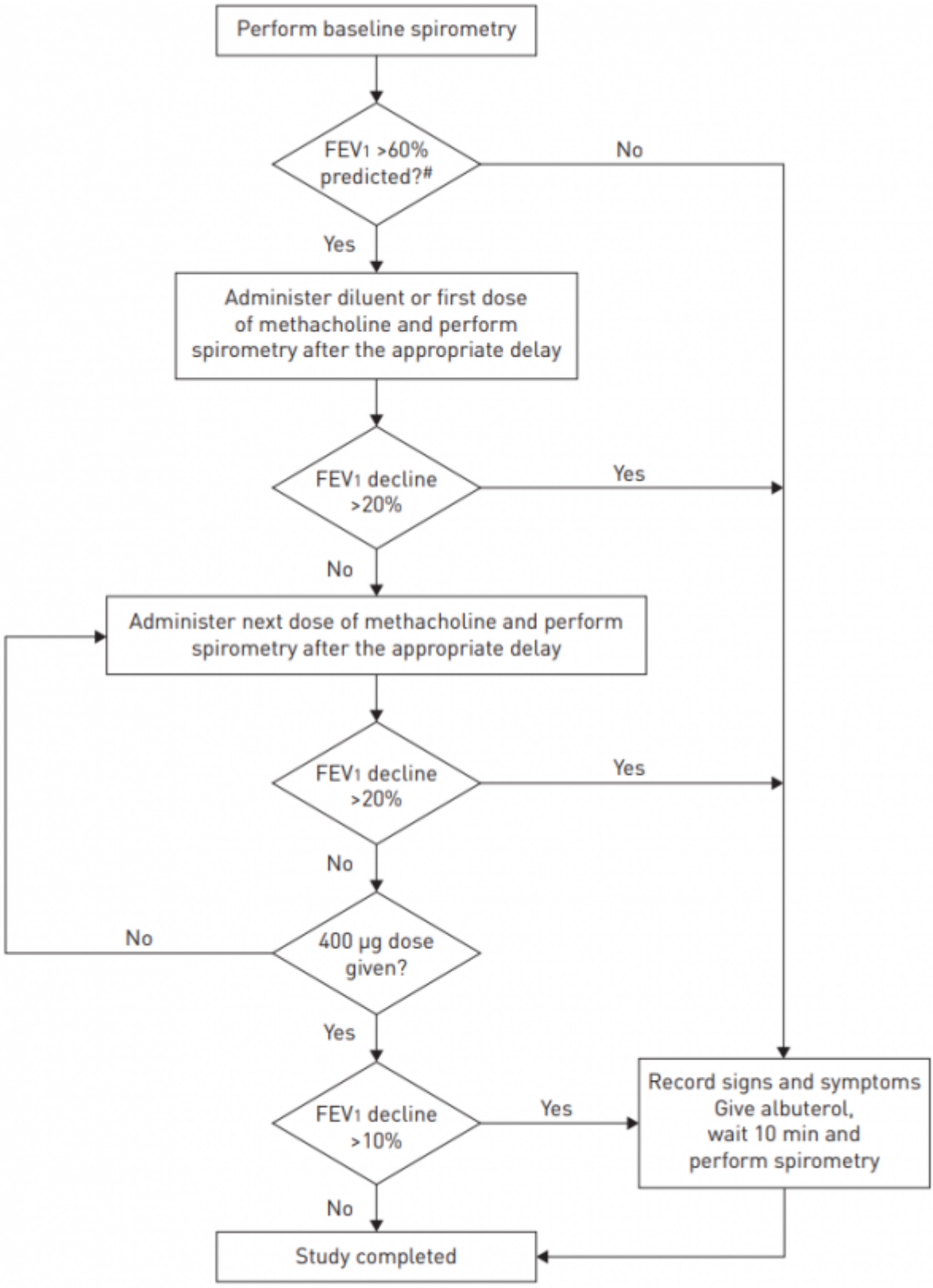
Response Categorization

TABLE 6 Categorisation of airway response to methacholine

PD_{20} µmol (µg)	PC_{20} mg·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

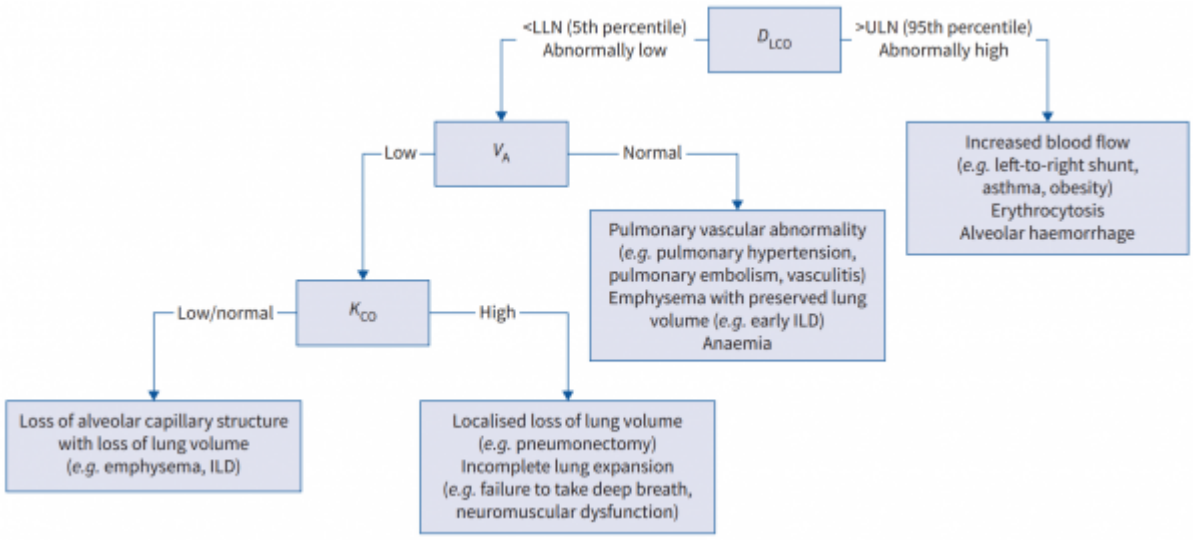
PD_{20}: provocative dose causing a 20% fall in forced expiratory volume in 1 s (FEV_1); PC_{20}: provocative concentration causing a 20% fall in FEV_1; AHR: airway hyperresponsiveness. Information from [3].

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

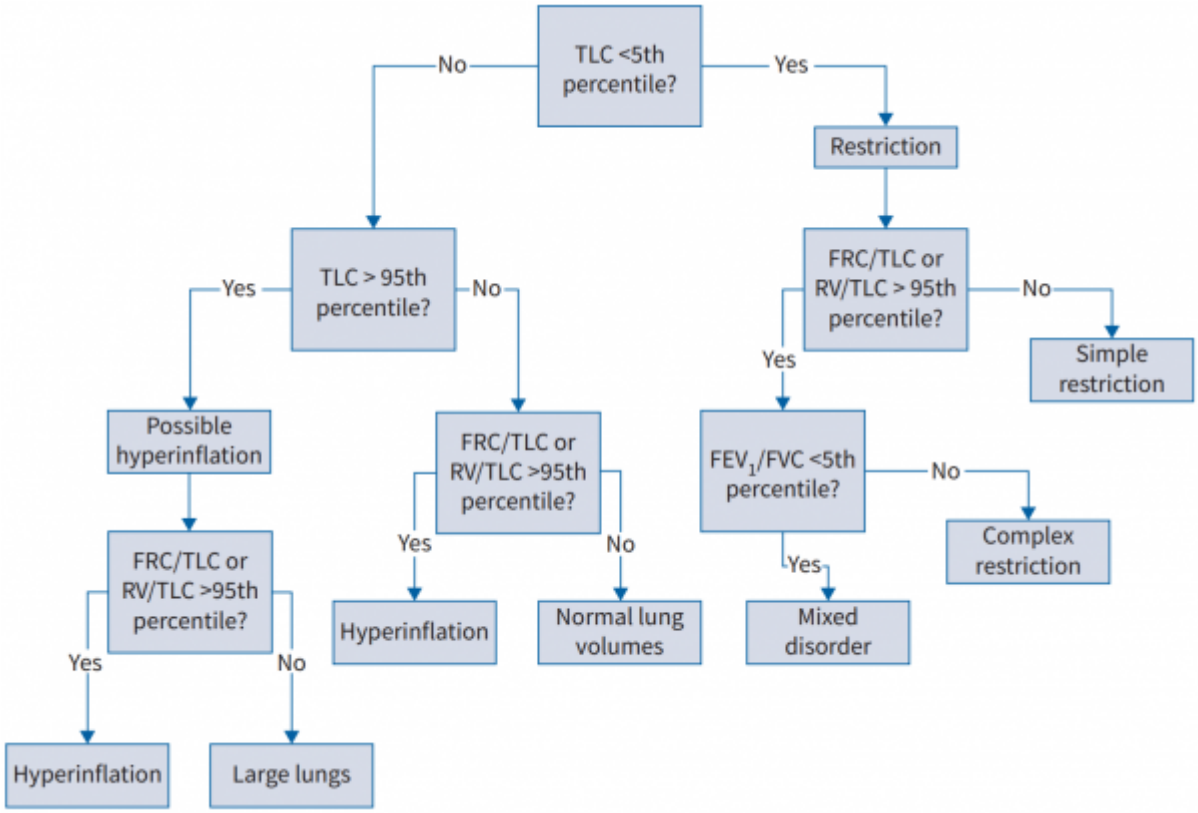
DLCO Percent Predicted	Severity
>140%	Abnormally High
76%-140%	Normal
61-75%	Mild
41-60%	Moderate
<40%	Severe

Assessing Restriction

ATS Criteria

Source, pg 17

1. Check spiro
    1. Is $FVC \cdot z_{score} \leq -1.65$ (*e.g.* < 5th percentile)?
        1. Yes: get lung volumes
        2. No: no restriction
2. Check lung volumes
    1. Is $TLC \cdot z_{score} \leq -1.65$ (*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)$
  - $\implies V_2 = V1(\frac{C_1}{C_2}-1)$
  - **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.