Spirometry

Brigitte Borg

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Australasian Faculty of Occupational and Environmental Medicine, RACP
Annual Training Meeting 2022

Declarations:

- Workplace conducts spirometry training courses.
- Co-author of textbook “Interpreting Lung Function Tests: a Step-by-Step Guide.”

Objectives

- Brief review of lung function tests
- Spirometry – what is it? primary parameters
- Identify standards for spirometry and interpretation
- Training requirements
- Spirometry interpretation

The Purpose of Lung Function Tests

Provide an **objective** assessment to:

- *Aid diagnosis*
- *Response to therapy*
- *Assessment of disease progression*
- Suitability for surgery
- Epidemiological surveys
- Assessment of claims for disability
- Capability for physical work and rehabilitation
- Establishment of safe conditions in industry (respiratory hazards)

Factors that affect the Lungs Function

Ventilation

- Lung size
- Airway size
- Respiratory muscle function
- Respiratory system compliance (chest wall & lungs)
- Respiratory control centres

Gas Exchange

- Provision of air to alveoli
- Alveolar membrane integrity (area, thickness)
- Pulmonary capillary blood flow and supply

Common Lung Function tests:

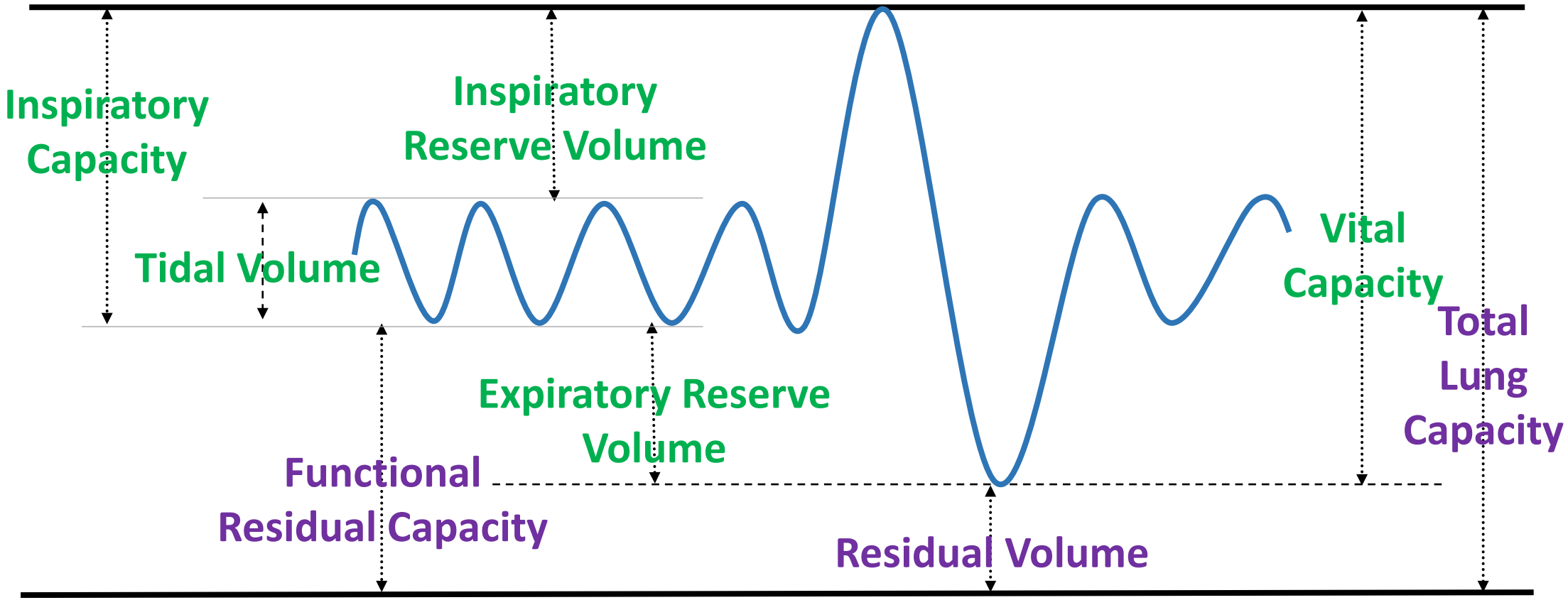
Test	Physiology measured
Spirometry	Ventilation
Static lung volumes	Lung volumes and capacities, ventilation
CO gas transfer (DLCO or TLCO)	Gas exchange
Maximal respiratory pressures	Global respiratory muscle function
Arterial blood gases	Gas exchange
Bronchial provocation test	Ventilation
Cardiopulmonary Exercise test	Gas Exchange and Ventilation

Lung Function Laboratory, The Alfred

Spirometry

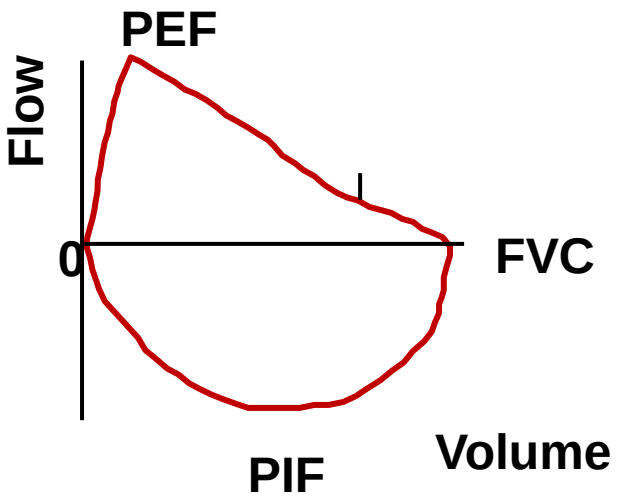
- Movement of air moving in and out of the lungs
- Performed under relaxed or forced conditions

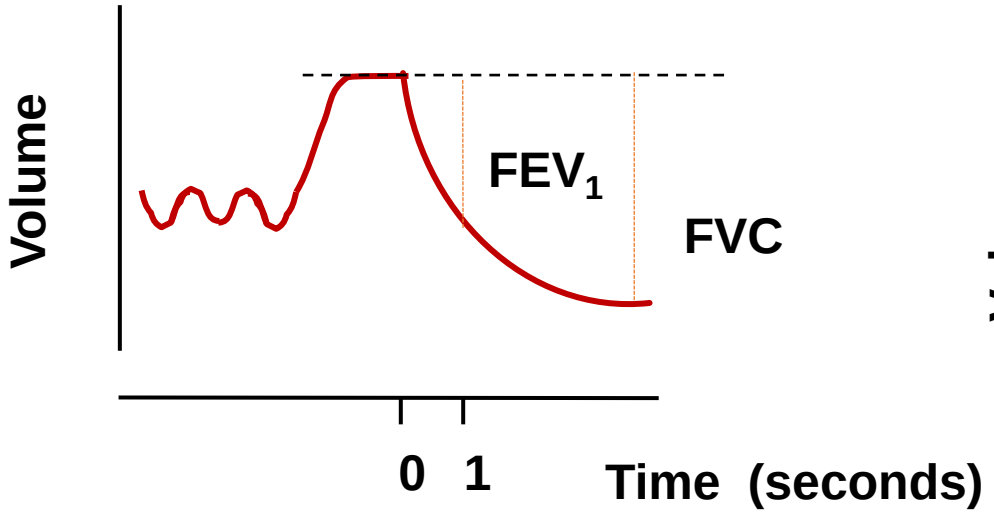
Lung Volumes and Capacities

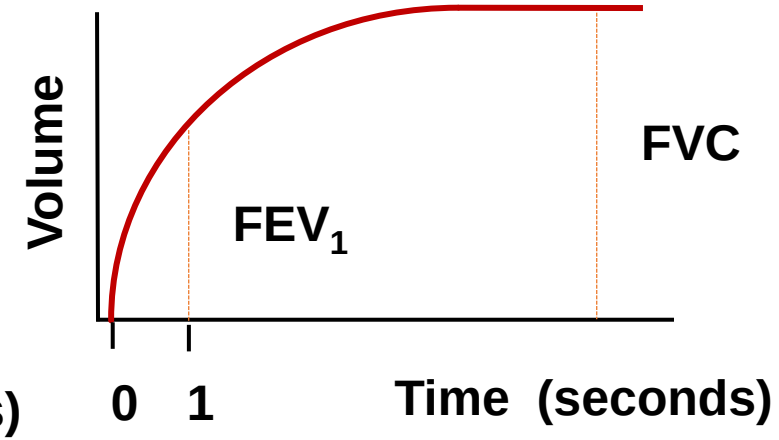


Cannot measure TLC, FRC, RV with spirometry

Volume-time & Flow-volume Curves



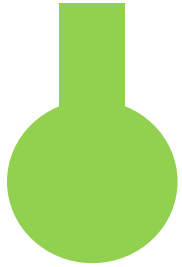


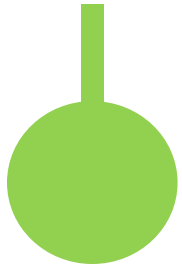


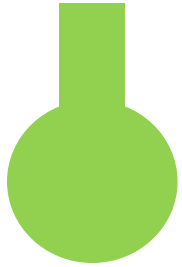
Primary Parameters of Spirometry

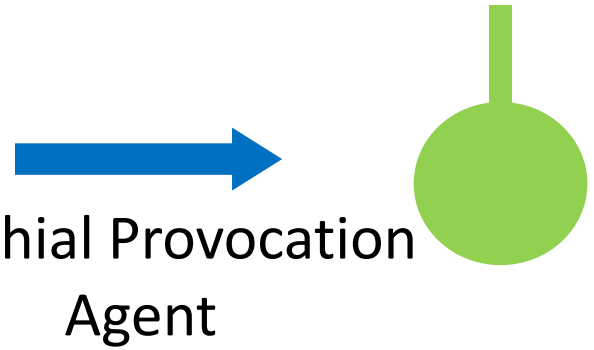
- FEV_1 (L) – Forced expiratory volume in 1 second
- (F)VC (L) – (Forced) vital capacity
- FEV_1/(F)VC

Purpose of Spirometry - to assess:

1.  Normal

2.  Airflow Obstruction
(Cannot blow out quickly)

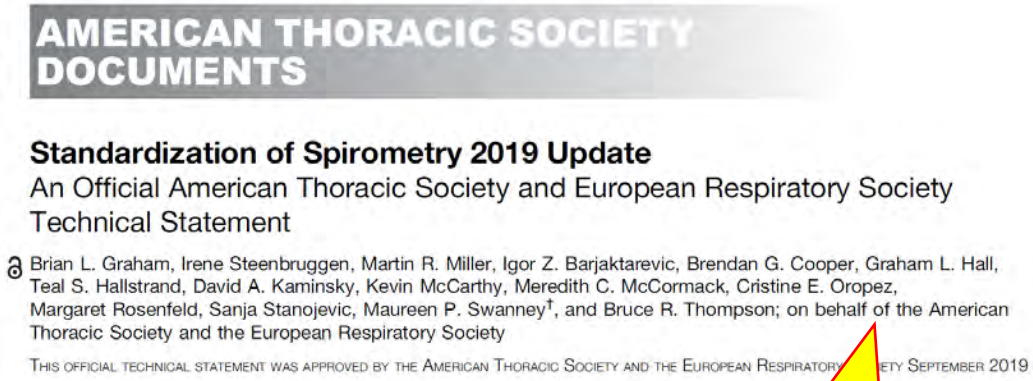
3.  Airway Reactivity



4.  Possible Lung Restriction (small lungs)

Spirometers:
Community / occupational practice

Performing spirometry

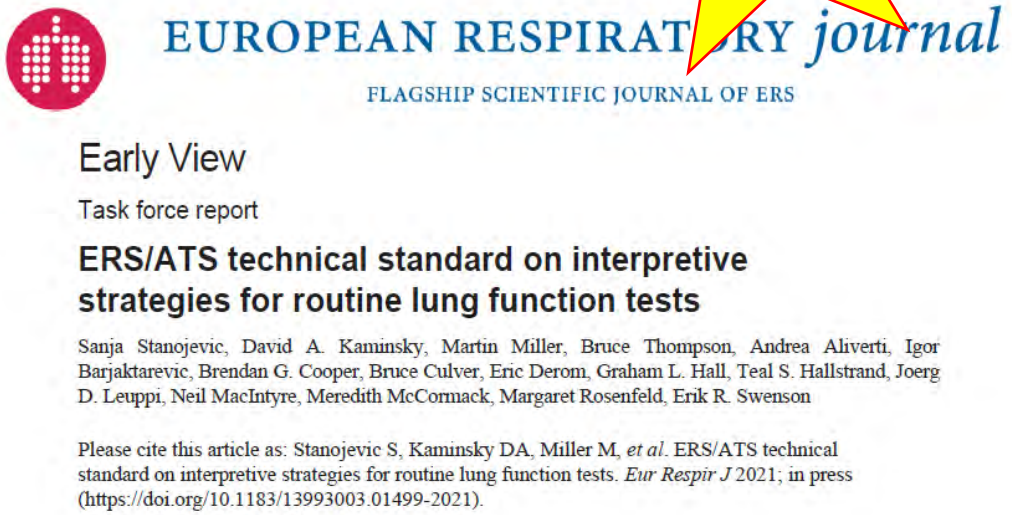

AMERICAN THORACIC SOCIETY DOCUMENTS

Standardization of Spirometry 2019 Update
An Official American Thoracic Society and European Respiratory Society Technical Statement

Brian L. Graham, Irene Steenbruggen, Martin R. Miller, Igor Z. Barjaktarevic, Brendan G. Cooper, Graham L. Hall, Teal S. Hallstrand, David A. Kaminsky, Kevin McCarthy, Meredith C. McCormack, Cristine E. Oropez, Margaret Rosenfeld, Sanja Stanojevic, Maureen P. Swanney†, and Bruce R. Thompson; on behalf of the American Thoracic Society and the European Respiratory Society

THIS OFFICIAL TECHNICAL STATEMENT WAS APPROVED BY THE AMERICAN THORACIC SOCIETY AND THE EUROPEAN RESPIRATORY ...ETY SEPTEMBER 2019

- International standards for the performance of spirometry
- Standards discuss:
  - Equipment (spirometer) specifications
  - Quality assurance activities (equipment and test performance)
  - Performance of test
    - Description of parameters
    - Acceptability and repeatability criteria
    - Grading scales
- Separate standard for interpretation


EUROPEAN RESPIRATORY *journal*

FLAGSHIP SCIENTIFIC JOURNAL OF ERS

Early View

Task force report

ERS/ATS technical standard on interpretive strategies for routine lung function tests

Sanja Stanojevic, David A. Kaminsky, Martin Miller, Bruce Thompson, Andrea Aliverti, Igor Barjaktarevic, Brendan G. Cooper, Bruce Culver, Eric Derom, Graham L. Hall, Teal S. Hallstrand, Joerg D. Leuppi, Neil MacIntyre, Meredith McCormack, Margaret Rosenfeld, Erik R. Swenson

Please cite this article as: Stanojevic S, Kaminsky DA, Miller M, *et al*. ERS/ATS technical standard on interpretive strategies for routine lung function tests. *Eur Respir J* 2021; in press (https://doi.org/10.1183/13993003.01499-2021).

Requirements for Valid Spirometry Results

- Properly functioning equipment
- Adequate instruction and motivation to elicit a maximal response from subject
- Ability to assess results for validity

ERJ 2005; 26: 319–338

Operator requires knowledge and skill

Table 7. Summary of Acceptability, Usability, and Repeatability Criteria for FEV_1 and FVC

Acceptability and Usability Criterion	Required for Acceptability		Required for Usability	
	FEV_1	FVC	FEV_1	FVC
Must have BEV ≤5% of FVC or 0.100 L, whichever is greater	Yes	Yes	Yes	Yes
Must have no evidence of a faulty zero-flow setting	Yes	Yes	Yes	Yes
Must have no cough in the first second of expiration*	Yes	No	Yes	No
Must have no glottic closure in the first second of expiration*	Yes	Yes	Yes	Yes
Must have no glottic closure after 1 s of expiration	No	Yes	No	No
Must achieve one of these three EOFE indicators:	No	Yes	No	No
1. Expiratory plateau (≤0.025 L in the last 1 s of expiration)				
2. Expiratory time ≥15 s				
3. FVC is within the repeatability tolerance of or is greater than the largest prior observed FVC†				
Must have no evidence of obstructed mouthpiece or spirometer	Yes	Yes	No	No
Must have no evidence of a leak	Yes	Yes	No	No
If the maximal inspiration after EOFE is greater than FVC, then FIVC − FVC must be ≤0.100 L or 5% of FVC, whichever is greater‡	Yes	Yes	No	No
Repeatability criteria (applied to acceptable FVC and FEV_1 values)				
Age >6 yr: The difference between the two largest FVC values must be ≤0.150 L, and the difference between the two largest FEV_1 values must be ≤0.150 L				
Age ≤6 yr: The difference between the two largest FVC values must be ≤0.100 L or 10% of the highest value, whichever is greater, and the difference between the two largest FEV_1 values must be ≤0.100 L or 10% of the highest value, whichever is greater				

Definition of abbreviations: BEV = back-extrapolated volume; EOFE = end of forced expiration; $FEV_{0.75}$ = forced expiratory volume in the first 0.75 seconds; FIVC = forced inspiratory VC.
The grading system (Table 10) will inform the interpreter if values are reported from usable maneuvers not meeting all acceptability criteria.
*For children aged 6 years or younger, must have at least 0.75 seconds of expiration without glottic closure or cough for acceptable or usable measurement of $FEV_{0.75}$.
†Occurs when the patient cannot expire long enough to achieve a plateau (e.g., children with high elastic recoil or patients with restrictive lung disease) or when the patient inspires or comes off the mouthpiece before a plateau. For within-maneuver acceptability, the FVC must be greater than or within the repeatability tolerance of the largest FVC observed before this maneuver within the current prebronchodilator or the current post-bronchodilator testing set.
‡Although the performance of a maximal forced inspiration is strongly recommended, its absence does not preclude a maneuver from being judged acceptable, unless extrathoracic obstruction is specifically being investigated.

Table 10. Grading System for FEV_1 and FVC (Graded Separately)

Grade	Number of Measurements	Repeatability: Age >6 yr	Repeatability: Age ≤6 yr*
A	≥3 acceptable	Within 0.150 L	Within 0.100 L*
B	2 acceptable	Within 0.150 L	Within 0.100 L*
C	≥2 acceptable	Within 0.200 L	Within 0.150 L*
D	≥2 acceptable	Within 0.250 L	Within 0.200 L*
E	≥2 acceptable	>0.250 L	>0.200 L*
	OR 1 acceptable	N/A	N/A
U	0 acceptable AND ≥1 usable	N/A	N/A
F	0 acceptable and 0 usable	N/A	N/A

Definition of abbreviation: N/A = not applicable.
The repeatability grade is determined for the set of prebronchodilator maneuvers and the set of post-bronchodilator maneuvers separately. The repeatability criteria are applied to the differences between the two largest FVC values and the two largest FEV_1 values. Grade U indicates that only usable but not acceptable measurements were obtained. *Although some maneuvers may be acceptable or usable at grading levels lower than A, the overriding goal of the operator must be to always achieve the best possible testing quality for each patient.* Adapted from Reference 114.
*Or 10% of the highest value, whichever is greater; applies for age 6 years or younger only.

Graham et al ,AJRCCM 2019

Official Journal of the Asian Pacific Society of Respirology
Respirology

POSITION STATEMENT

Spirometry training courses: Content, delivery and assessment - a position statement from the Australian and New Zealand Society of Respiratory Science*

MAUREEN P. SWANNEY,[1] CHRISTOPHER A. O'DEA,[2] EMILY R. INGRAM,[1] LEANNE T. RODWELL[3] AND BRIGITTE M. BORG[4] for the ANZSRS Spirometry Training Course Working Group

[1]*Respiratory Physiology Laboratory, Christchurch Hospital, Christchurch, New Zealand;* [2]*Department of Respiratory Medicine, Princess Margaret Hospital, Perth, WA;* [3]*Department of Respiratory and Sleep Medicine, Lady Cilento Children's Hospital, Brisbane, QLD;* [4]*Respiratory Medicine, The Alfred Hospital, Melbourne, VIC, Australia*

Respirology 2017. doi: 10.1111/resp.13133.

The Thoracic Society of Australia & New Zealand
LEADERS IN LUNG HEALTH

STANDARDS FOR SPIROMETRY TRAINING COURSES

COMPANION DOCUMENT TO STANDARDS FOR THE DELIVERY OF

SPIROMETRY FOR COAL MINE WORKERS

Thoracic Society of Australia and New Zealand

July 2017

The Thoracic Society of Australia & New Zealand
LEADERS IN LUNG HEALTH

ARDS FOR THE DELIVERY OF

ROMETRY FOR

L MINE WORKERS

Society of Australia and New Zealand

July 2017

Interpretation

General Features of Interpretation

1. Assess test validity*
2. Assess adequacy of reference values
3. Determine normality or abnormality with reference range
4. Classify detected abnormality
5. Determine severity of abnormality*
6. Compare to previous results
7. Attempt to address the clinical question

*Cautionary statement may be required

Technical comments from the operator are really important and useful to the reporter

Grading Scale

Spirometry GLI 2012: Age range 3-95yr

Normal limits	Centile	Z score
LLN	5th	-1.64
ULN	95th	+1.64

"Interpreting Lung Function Tests: A Step-by-Step Guide" ISBN 9781118405512

Technical vs Clinical Interpretation

Technical interpretation:

- Assesses quality markers
- Pattern recognition (normal vs abnormal)
- Can be done without knowledge of clinical history

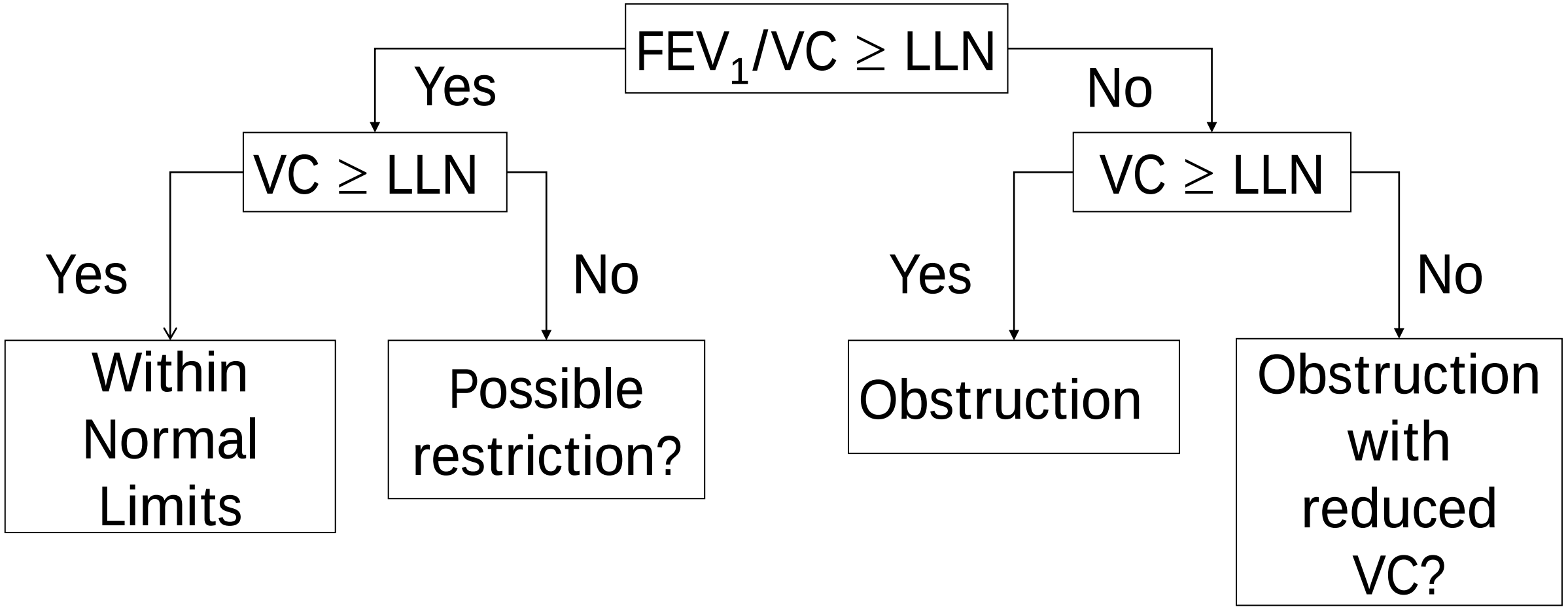
Clinical interpretation:

- Includes technical interpretation
- Requires knowledge of clinical history of patient
- Attempts to addresses clinical question
- Ideally performed by referring/treating doctor

“Interpreting Lung Function Tests: A Step-by-Step Guide” ISBN 9781118405512

Interpretation of Ventilatory Function

Spirometry Alone



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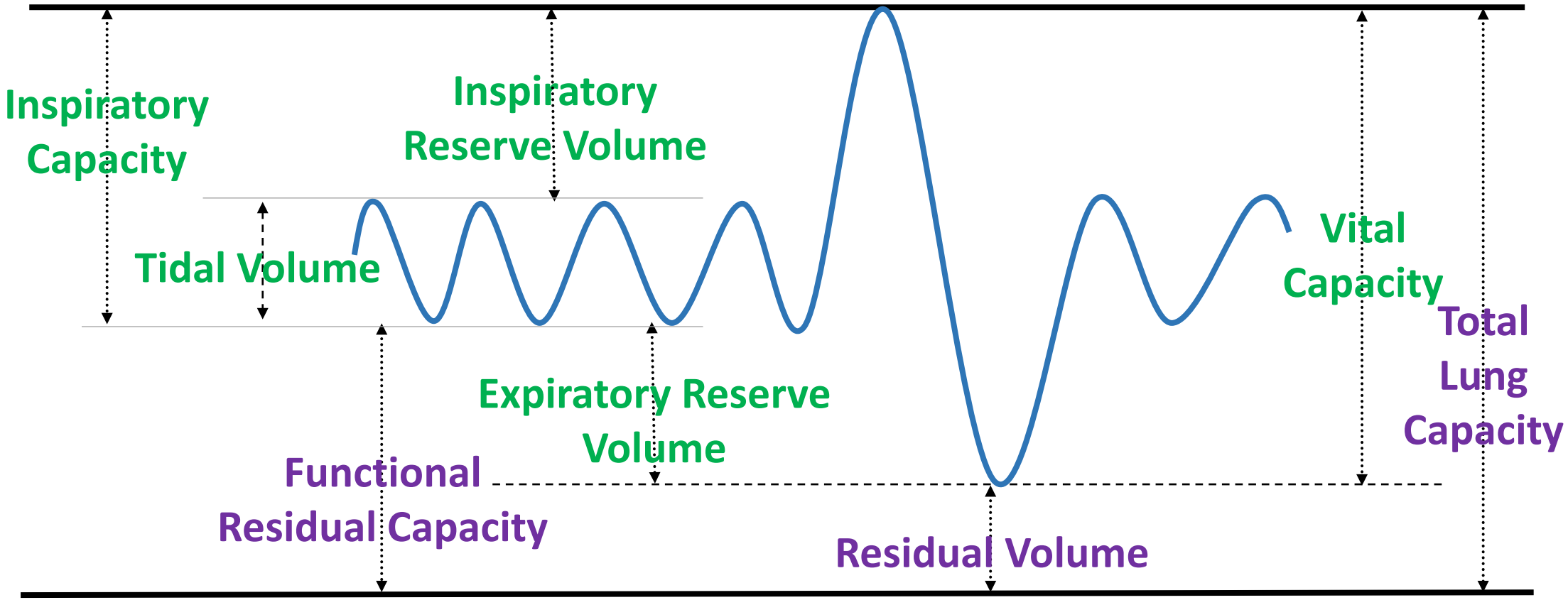
Definitions of Ventilatory Patterns

Ventilatory Pattern	Spirometry		Static Lung Volumes
Obstruction (1)	$FEV_1/(F)VC < LLN$		
Restriction (1)	$FEV_1/(F)VC > LLN$	**AND**	$TLC < LLN$
Mixed Obstruction/Restriction (1)	$FEV_1/(F)VC < LLN$	**AND**	$TLC < LLN$
Non Specific Ventilatory Pattern (2)	$FEV_1/(F)VC > LLN$, $FVC < LLN$, $FEV_1 < LLN$	**AND**	$TLC > LLN$

1. Eur Respir J. 2005 Nov;26(5):948-68
2. Chest. 2009 Feb;135(2):419-24

Lung Volumes and Capacities



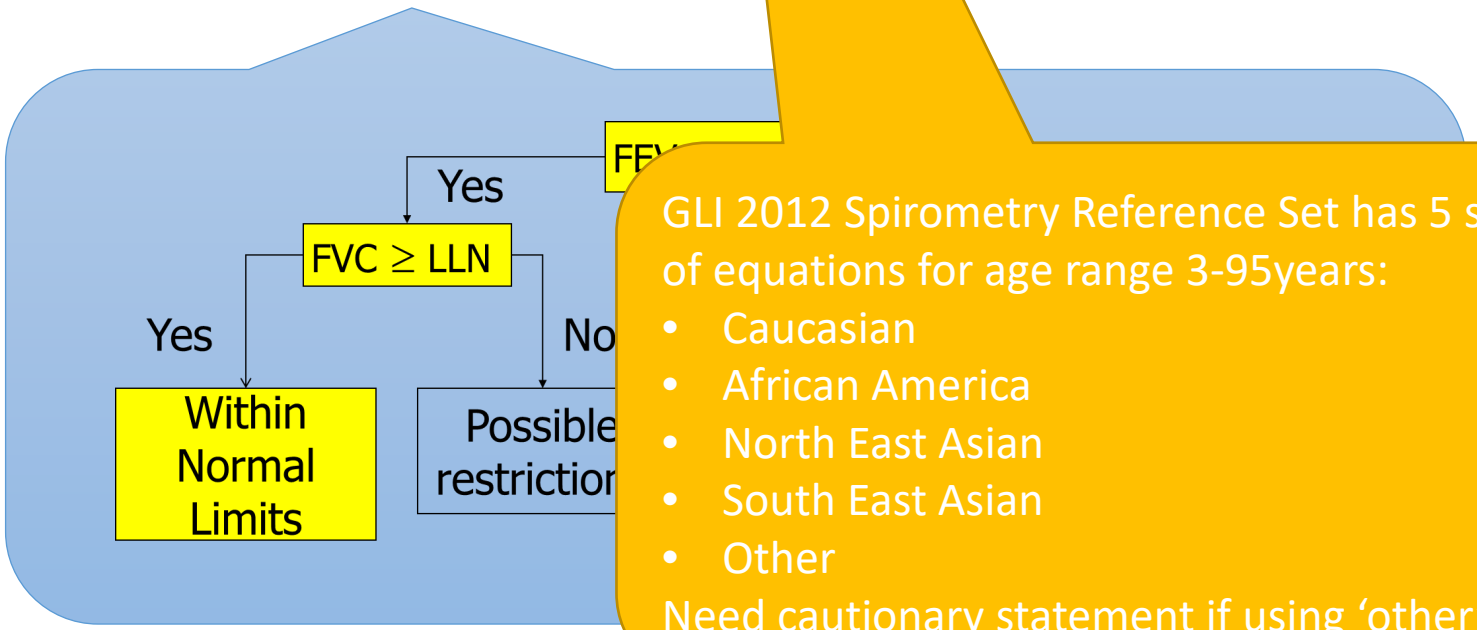
Cannot measure TLC, FRC, RV with spirometry

Case 1

Gender: Male
Age (yr): 24 **Weight (kg):** 63.9
Height (cm): 162.3 **Race:** Other
Clinical Notes: Asthma

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**3.67**	3.53	2.84	+0.33	**3.93**	+0.97	7.4
FVC (L)	**4.34**	4.09	3.35	+0.54	**4.42**	+0.72	2.0
FEV_1/FVC	**0.85**	0.87	0.76	-0.26	**0.89**	+0.42	

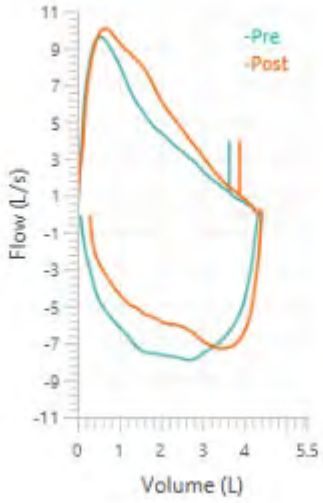
Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A

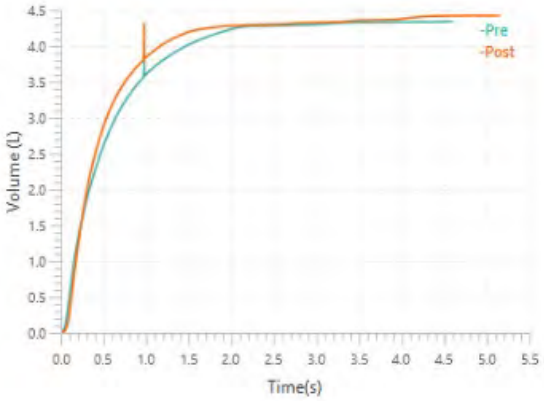


GLI 2012 Spirometry Reference Set has 5 sets of equations for age range 3-95years:

- Caucasian
- African America
- North East Asian
- South East Asian
- Other

Need cautionary statement if using 'other'





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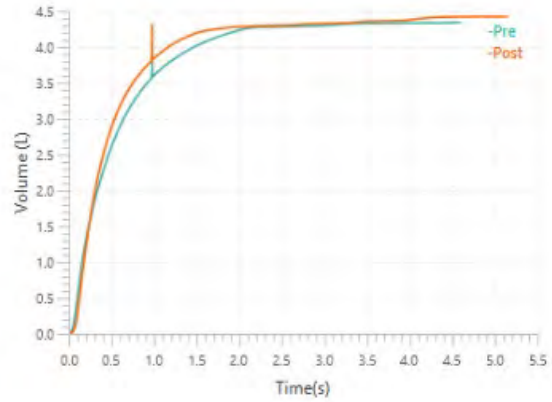
Technical Comment:	Pre BD: FEV1 A		FVC A		Post BD:	F	

"Baseline Spirometry" is also used to describe pre-bronchodilator spirometry. The terms pre-bronchodilator and baseline are used interchangeably.

Reference values may not be representative of this patient's ethnicity and should be used with caution. Pre-bronchodilator spirometry is within normal limits.



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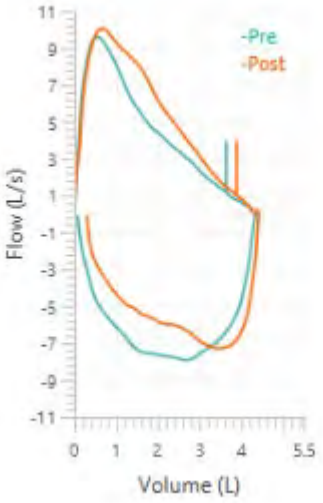
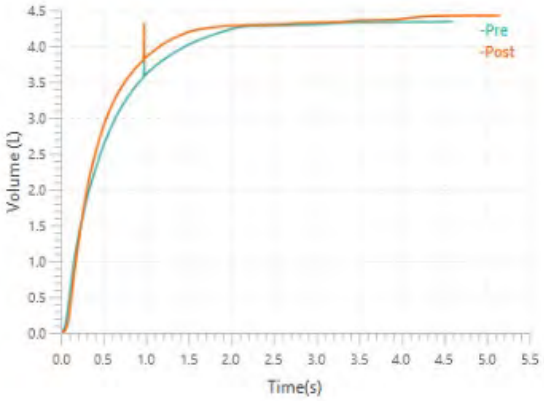


Reference values may not be representative of this patient's ethnicity and should be used with caution.
Baseline spirometry is within normal limits.
The response to inhaled bronchodilator is not significant.

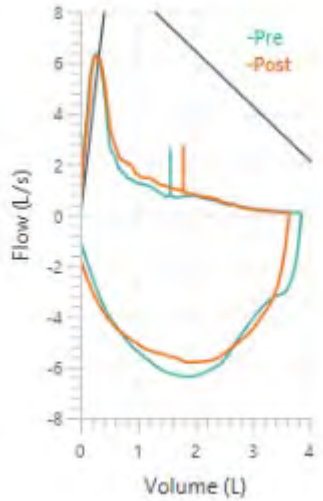


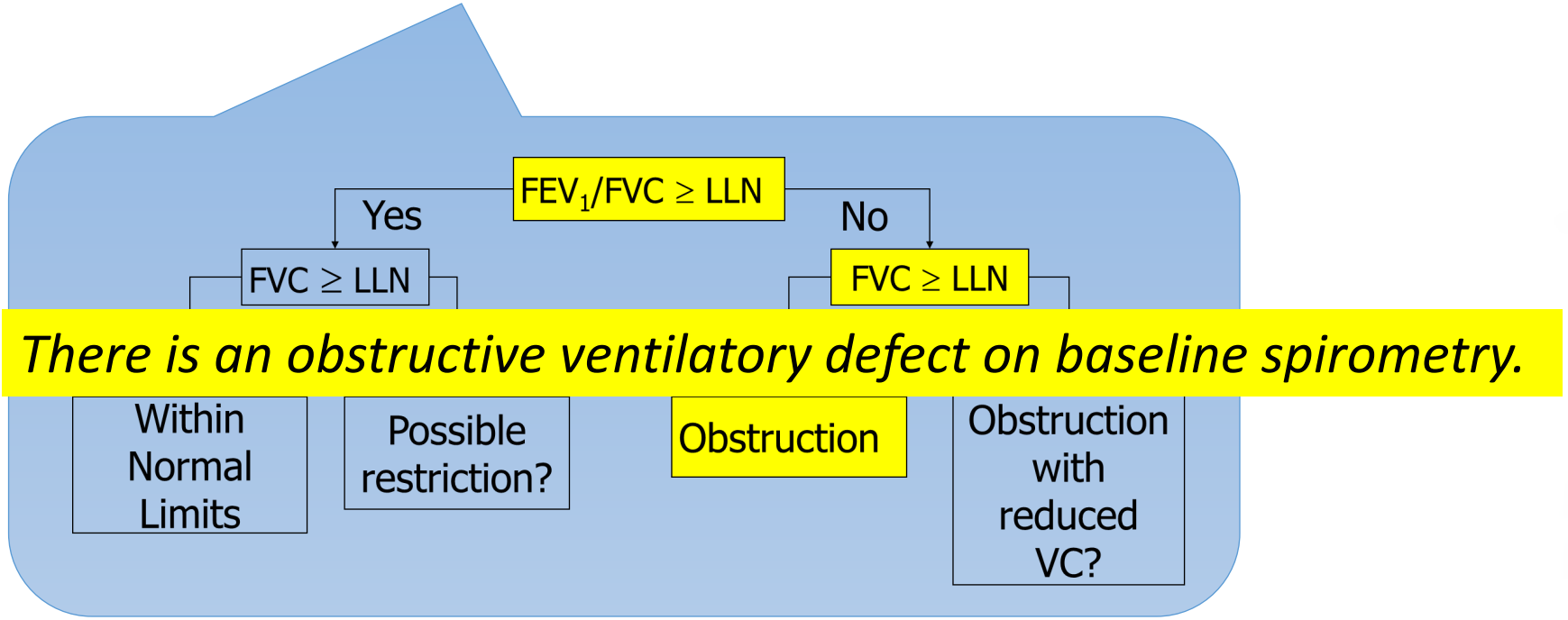
Case 2

Gender: Male
Age (yr): 59 **Weight (kg):** 97.5
Height (cm): 182.7 **Race:** Caucasian
Clinical Notes: COPD for review

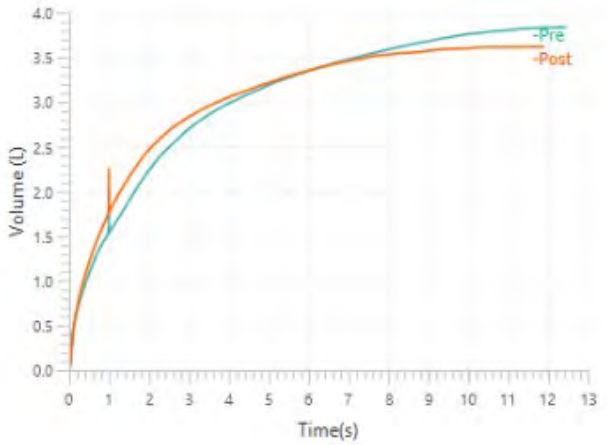
	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.57**	3.84	2.91	-3.78	**1.81**	-3.42	6.2
FVC (L)	**3.97**	4.99	3.81	-1.42	**3.84**	-1.61	-2.6
FEV_1/FVC	**0.40**	0.77	0.65	-4.27	**0.47**	-3.67	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





There is an obstructive ventilatory defect on baseline spirometry.



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	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
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FVC (L)	**3.97**	4.99	3.81	-1.42	**3.84**	-1.61	-2.6
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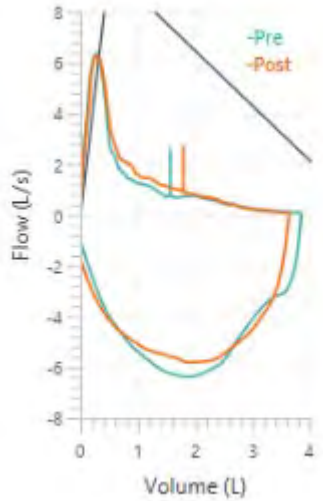
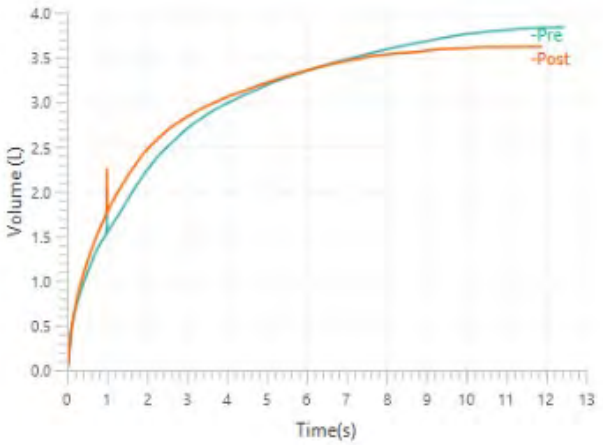


Bronchodilator response?

$$(post\ BD\ value - baseline\ value)$$

There is an obstructive ventilatory defect on baseline spirometry. The response to inhaled bronchodilator is not significant.

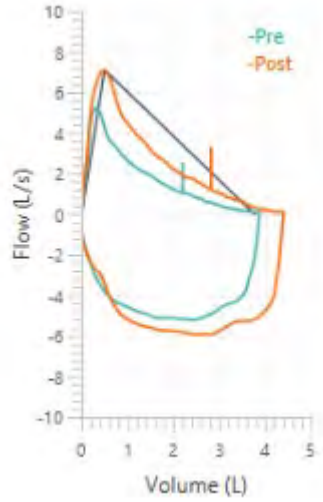


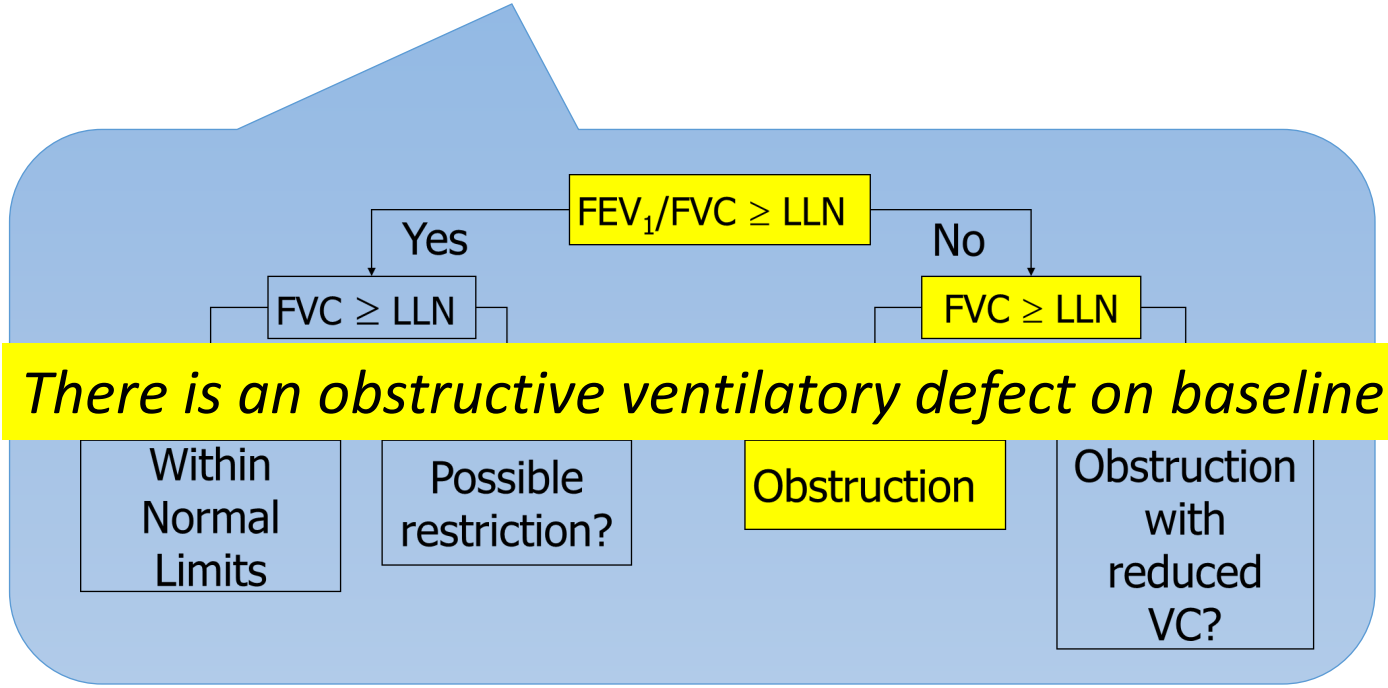
Case 3

Gender: Female
Age (yr): 42 **Weight (kg):** 59.5
Height (cm): 165.3 **Race:** Caucasian
Clinical Notes: Asthma for review. ?control

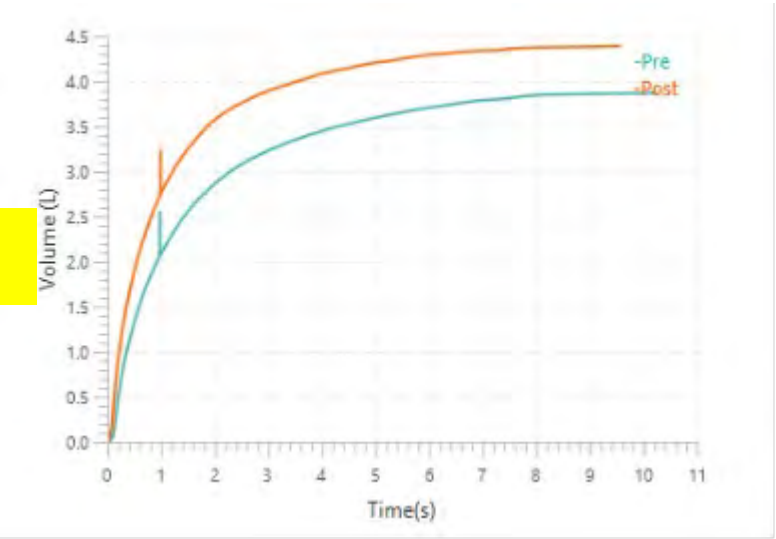
	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**2.22**	3.06	2.42	-2.16	**2.84**	-0.57	20
FVC (L)	**3.88**	3.77	2.99	+0.24	**4.41**	+1.32	14
FEV_1/FVC	**0.56**	0.82	0.71	-3.30	**0.63**	-2.58	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





There is an obstructive ventilatory defect on baseline spirometry.

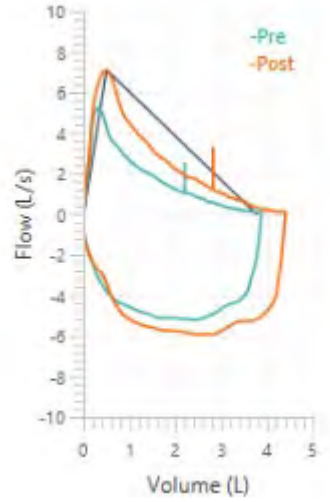


Case 3

Gender: Female
Age (yr): 42 **Weight (kg):** 59.5
Height (cm): 165.3 **Race:** Caucasian
Clinical Notes: Asthma for review. ?control

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**2.22**	3.06	2.42	-2.16	**2.84**	-0.57	20
FVC (L)	**3.88**	3.77	2.99	+0.24	**4.41**	+1.32	14
FEV_1/FVC	**0.56**	0.82	0.71	-3.30	**0.63**	-2.58	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A

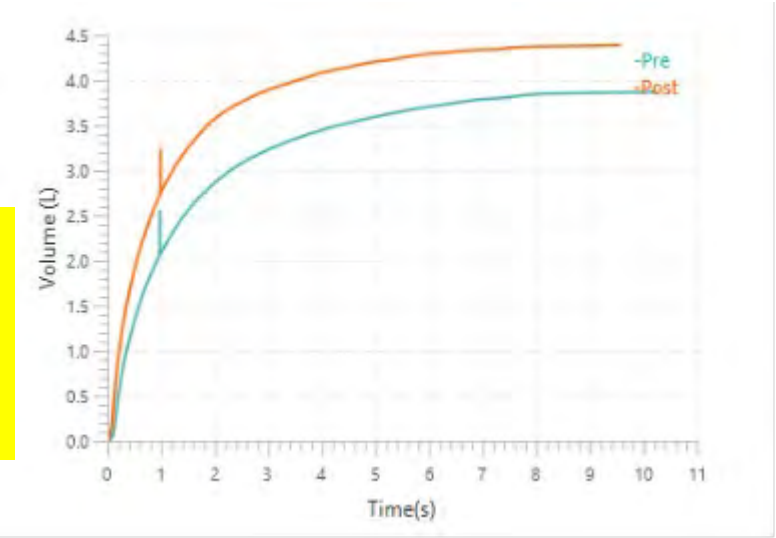


Bronchodilator response?

$$\text{BD response} = \frac{(post\ BD\ value - baseline\ value)}{} \times 100$$

VC?

There is an obstructive ventilatory defect on baseline spirometry. The response to inhaled bronchodilator is significant with incomplete reversibility of airflow obstruction.

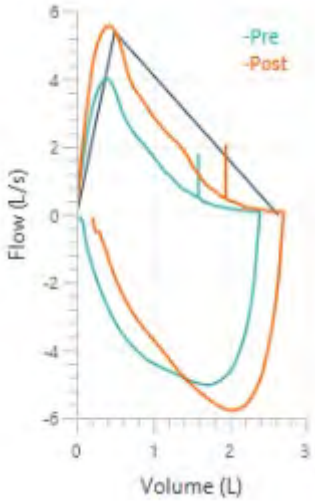


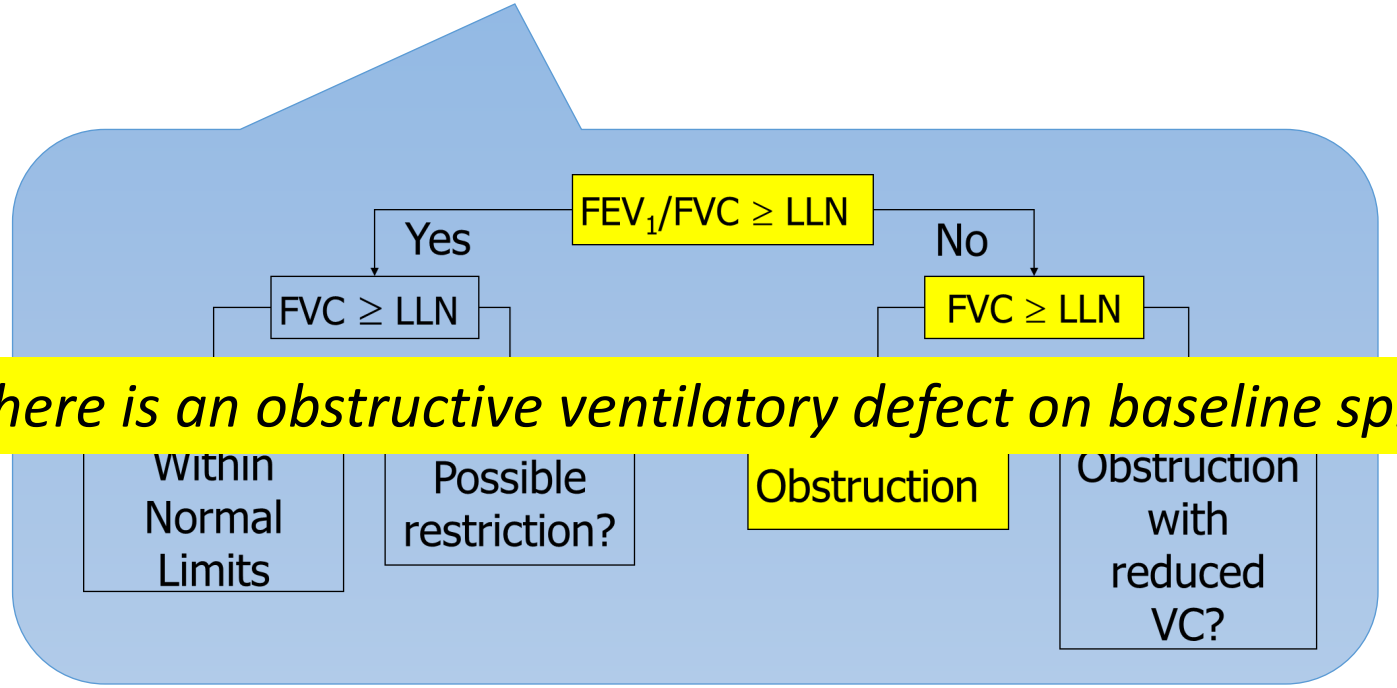
Case 4

Gender: Female
Age (yr): 67 **Weight (kg):** 75.3
Height (cm): 154.8 **Race:** Caucasian
Clinical Notes: Asthma for review.

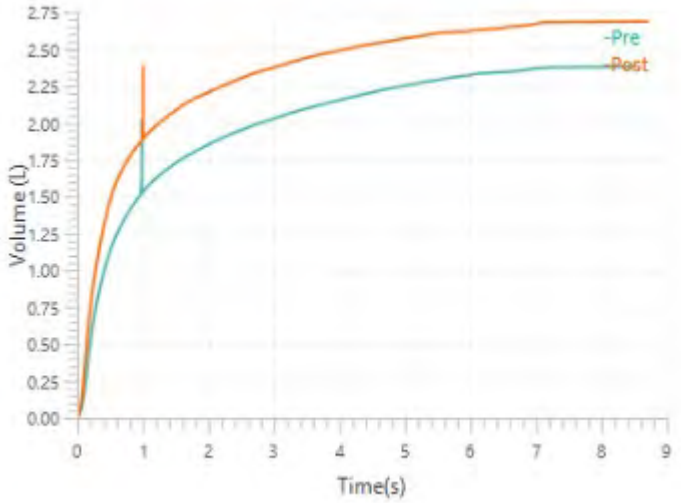
	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.60**	2.06	1.52	-1.41	**1.97**	-0.29	18
FVC (L)	**2.46**	2.63	1.94	-0.54	**2.71**	+0.19	10
FEV_1/FVC	**0.65**	0.79	0.66	-1.75	**0.73**	-0.78	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





There is an obstructive ventilatory defect on baseline spirometry.

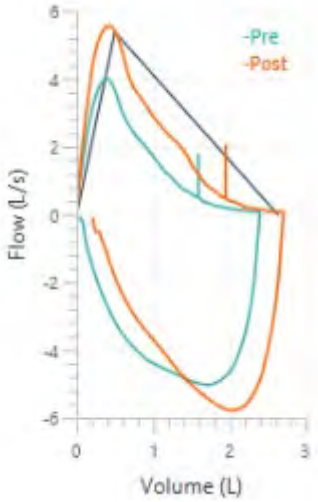


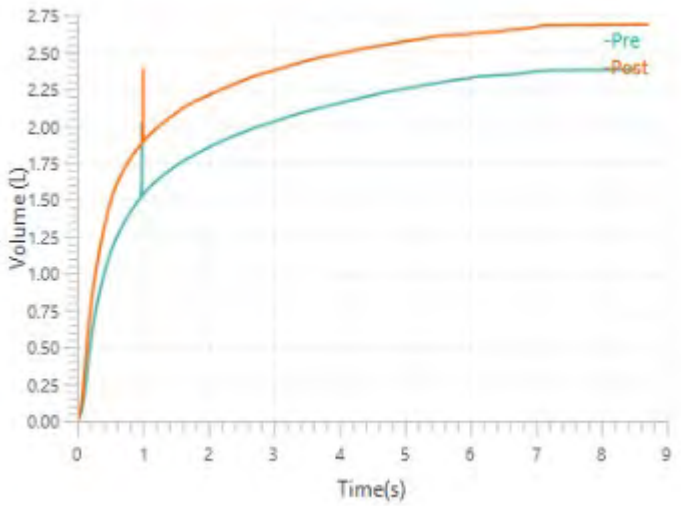
Case 4

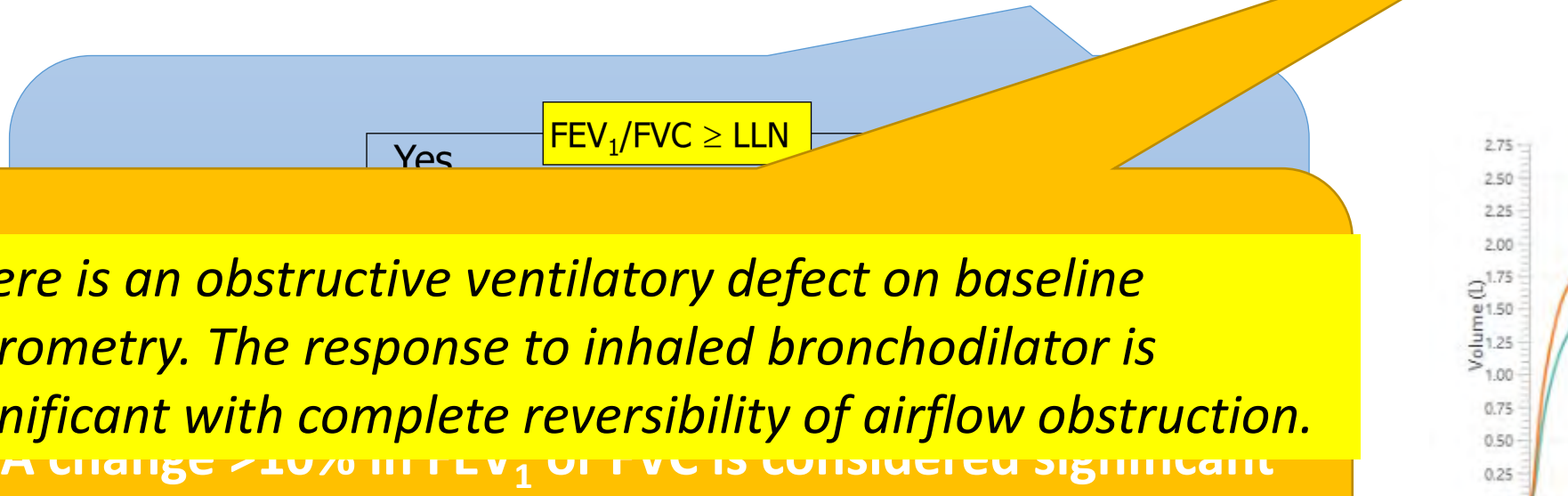
Gender: Female
Age (yr): 67 **Weight (kg):** 75.3
Height (cm): 154.8 **Race:** Caucasian
Clinical Notes: Asthma for review.

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.60**	2.06	1.52	-1.41	**1.97**	-0.29	18
FVC (L)	**2.46**	2.63	1.94	-0.54	**2.71**	+0.19	10
FEV_1/FVC	**0.65**	0.79	0.66	-1.75	**0.73**	-0.78	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A







There is an obstructive ventilatory defect on baseline spirometry. The response to inhaled bronchodilator is significant with complete reversibility of airflow obstruction.

A change >10% in FEV_1 or FVC is considered significant

Case 5

Gender: Male

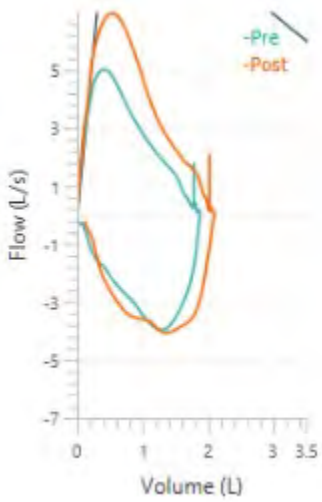
Age (yr): 22 **Weight (kg):** 73.3

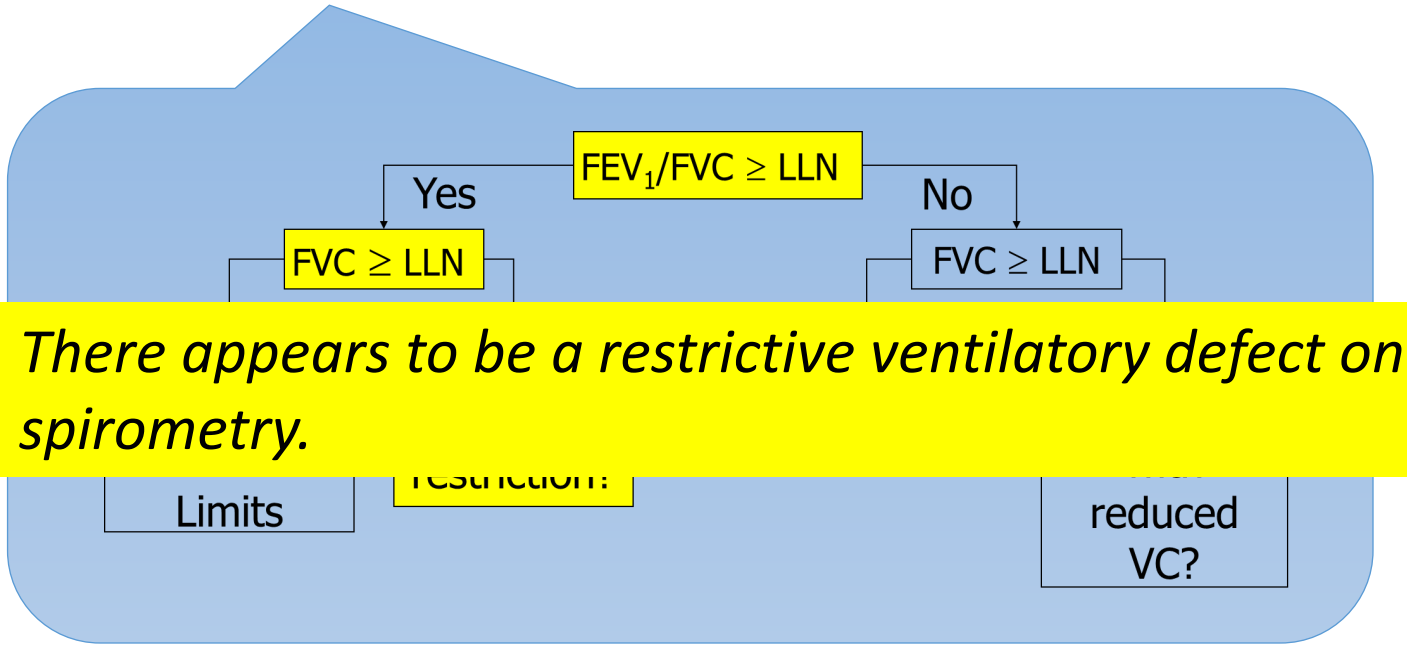
Height (cm): 193.0 **Race:** Caucasian

Clinical Notes: Pre-sibling allogenic stem cell transplant

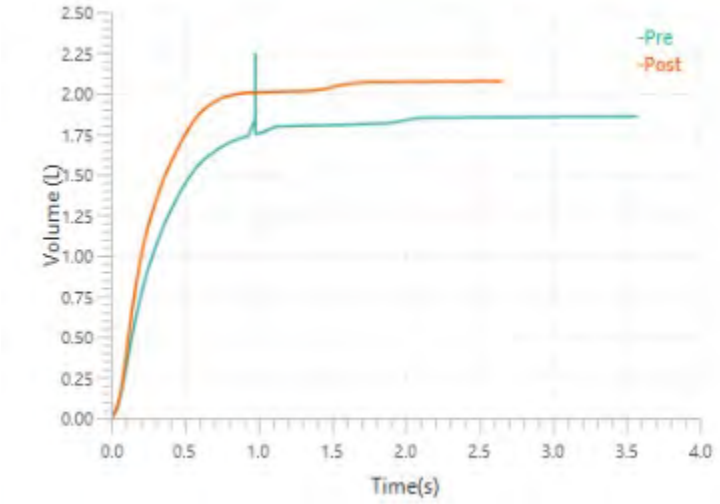
	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.79**	5.60	4.53	-5.60	**2.03**	-5.28	4.3
FVC (L)	**1.88**	6.76	5.47	-6.39	**2.09**	-6.11	3.1
FEV_1/FVC	**0.95**	0.84	0.71	+1.94	**0.97**	+2.33	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





There appears to be a restrictive ventilatory defect on baseline spirometry.

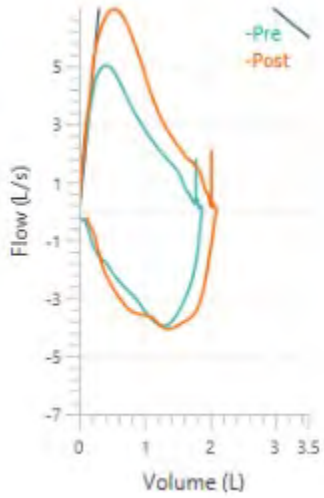


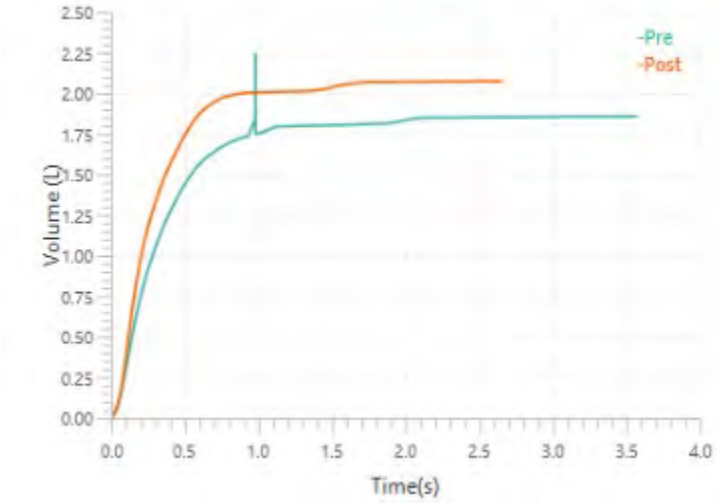
Gend
Age
Height
Clinical

Ventilatory Pattern	Spirometry		Static Lung Volumes
Obstruction (1)	$FEV_1/(F)VC < LLN$		
Restriction (1)	$FEV_1/(F)VC > LLN$	AND	TLC < LLN
Mixed Obstruction/Restriction (1)	$FEV_1/(F)VC < LLN$	AND	TLC < LLN
Non Specific Ventilatory Pattern (2)	$FEV_1/(F)VC > LLN$, $FVC < LLN$, $FEV_1 < LLN$	AND	TLC > LLN

Case 5

					%Chng
Spirom					
FEV_1 (L)					4.3
FVC (L)					3.1
FEV_1/FVC	**0.95**	0.84	0.71	+1.94	+2.33
Technical Comment:	Pre BD: FEV1 A	FVC A		EV1 A	A





There appears to be a restrictive ventil y defect on baseline spirometry. The response to inhaled b nchodilator is not significant. Measurement of static lung volumes is suggested to confirm restriction.

Case 6

Gender: Male

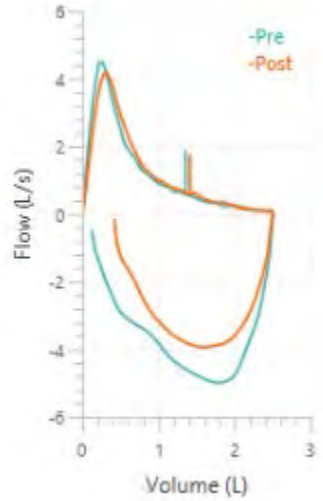
Age (yr): 50 **Weight (kg):** 110.3

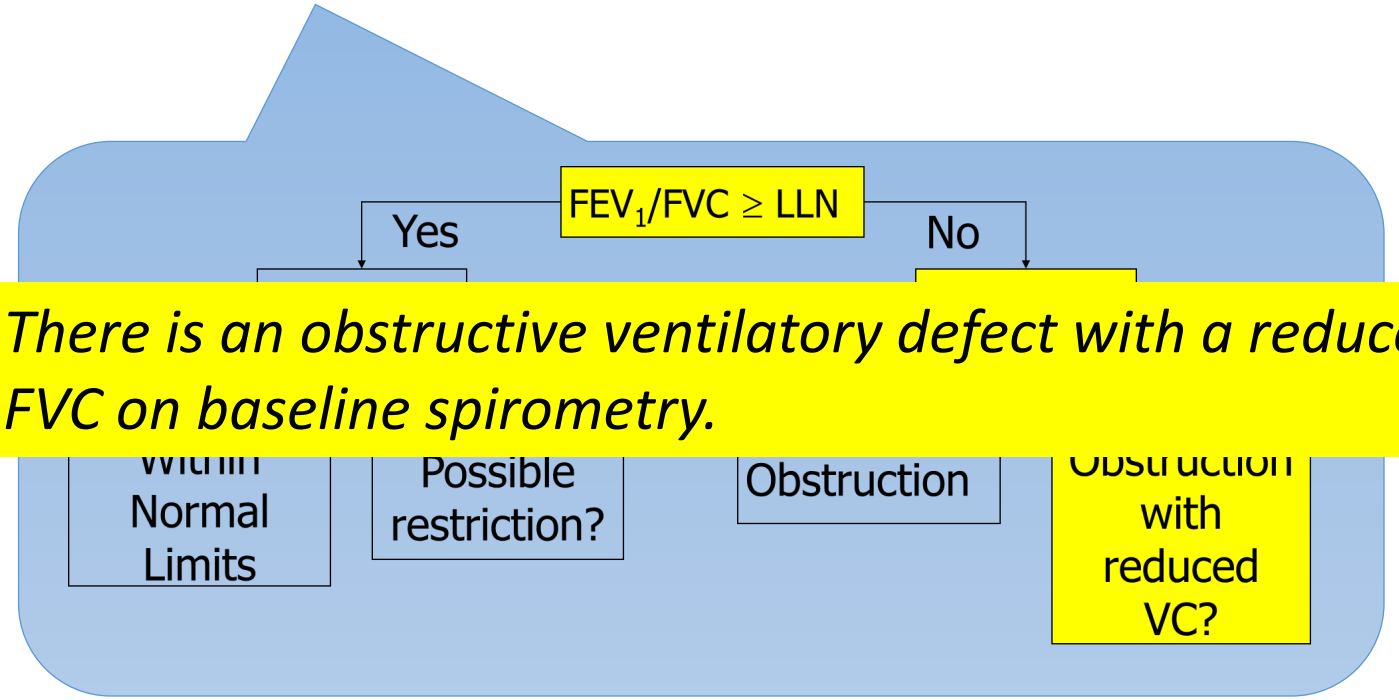
Height (cm): 165.7 **Race:** Caucasian

Clinical Notes: Pulmonary hypertension. ?worsening COPD +/- obesity

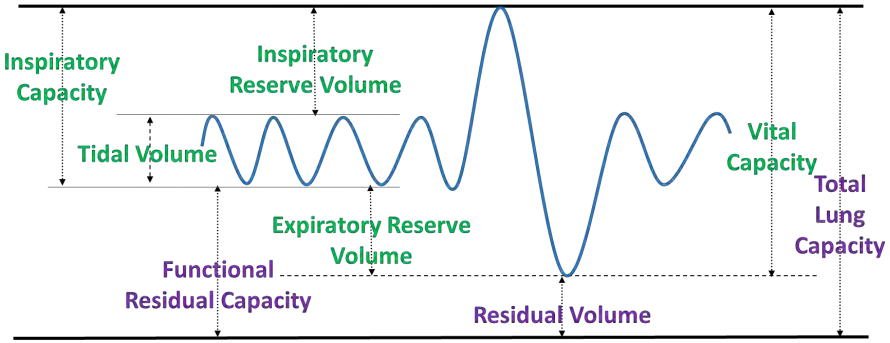
	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.36**	3.36	2.61	-4.21	**1.42**	-4.10	1.8
FVC (L)	**2.51**	4.21	3.28	-3.06	**2.50**	-3.08	-0.2
FEV_1/FVC	**0.54**	0.80	0.68	-3.42	**0.57**	-3.10	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





There is an obstructive ventilatory defect with a reduced FVC on baseline spirometry.



Case 6

Gender: Male

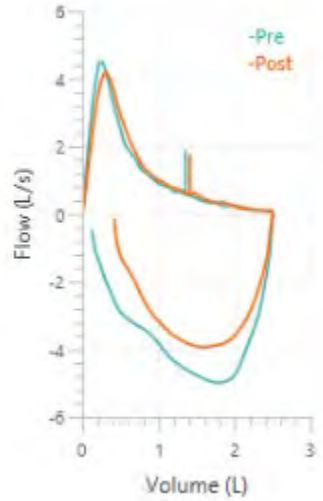
Age (yr): 50 **Weight (kg):** 110.3

Height (cm): 165.7 **Race:** Caucasian

Clinical Notes: Pulmonary hypertension. ?worsening COPD +/- obesity

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.36**	3.36	2.61	-4.21	**1.42**	-4.10	1.8
FVC (L)	**2.51**	4.21	3.28	-3.06	**2.50**	-3.08	-0.2
FEV_1/FVC	**0.54**	0.80	0.68	-3.42	**0.57**	-3.10	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A



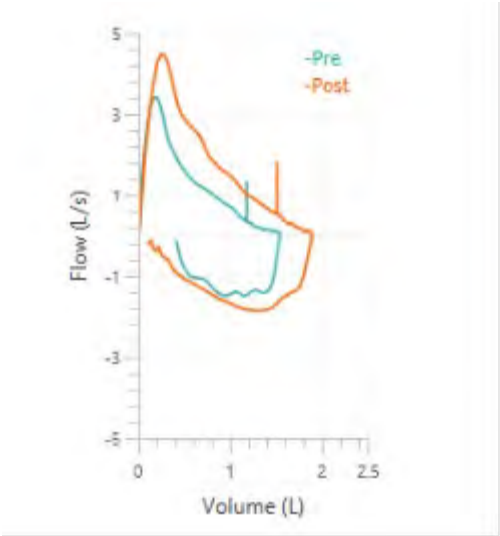
There is an obstructive ventilatory defect with a reduced FVC on baseline spirometry. The response to inhaled bronchodilator is not significant. The reduction in FVC may be due to airflow obstruction or concomitant restriction and measurement of static lung volumes are suggested to further elucidate results.

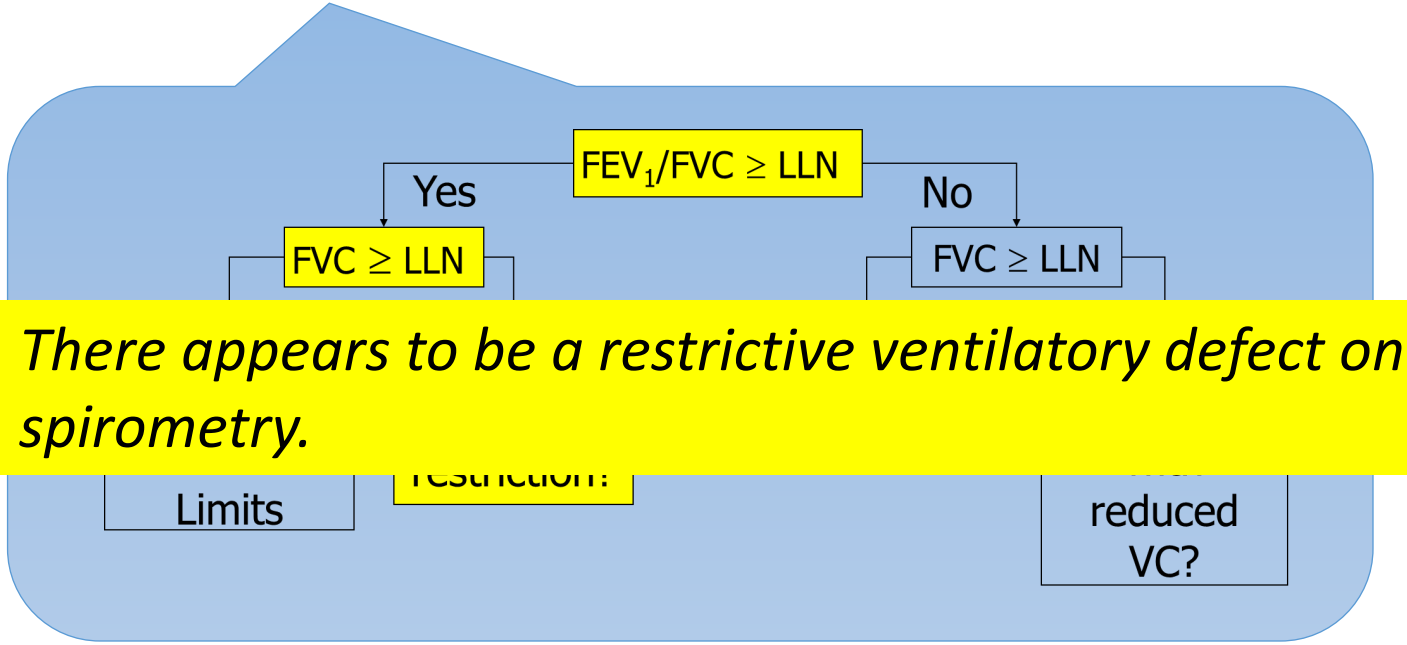
Case 7

Gender: Female
Age (yr): 68 **Weight (kg):** 78.1
Height (cm): 159.1 **Race:** Caucasian
Clinical Notes: Asthma

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.19**	2.15	1.57	-2.7	**1.52**	-1.8	15
FVC (L)	**1.54**	2.76	2.02	-2.8	**1.90**	-1.94	13
FEV_1/FVC	**0.77**	0.79	0.64	-0.2	**0.80**	+0.21	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





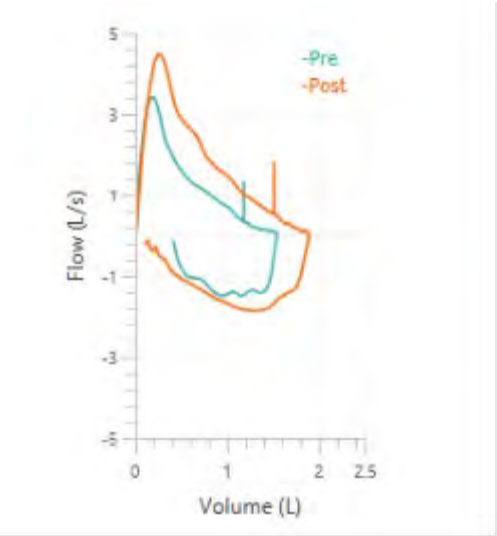
There appears to be a restrictive ventilatory defect on baseline spirometry.

Case 7

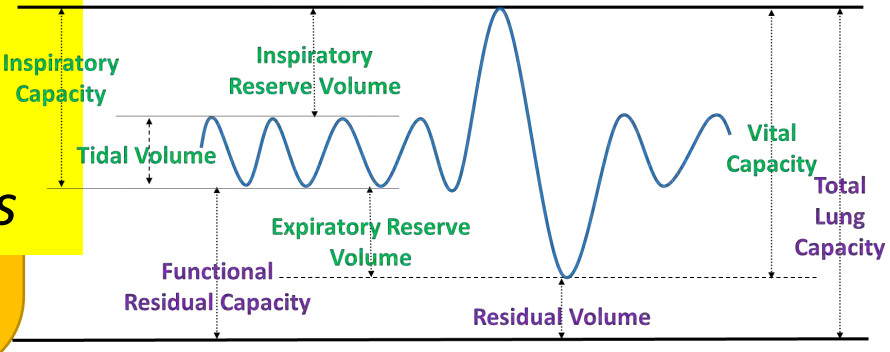
Gender: Female
Age (yr): 68 **Weight (kg):** 78.1
Height (cm): 159.1 **Race:** Caucasian
Clinical Notes: Asthma

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**1.19**	2.15	1.57	-2.7	**1.52**	-1.8	15
FVC (L)	**1.54**	2.76	2.02	-2.8	**1.90**	-1.94	13
FEV_1/FVC	**0.77**	0.79	0.64	-0.2	**0.80**	+0.21	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC



There appears to be a restrictive ventilatory defect on baseline spirometry. The response to inhaled bronchodilator is significant, suggestive of some reversible airflow limitation. Static lung volumes are suggested to further elucidate results

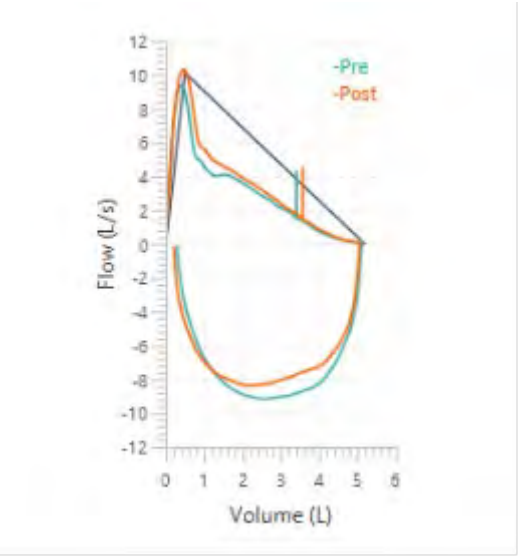


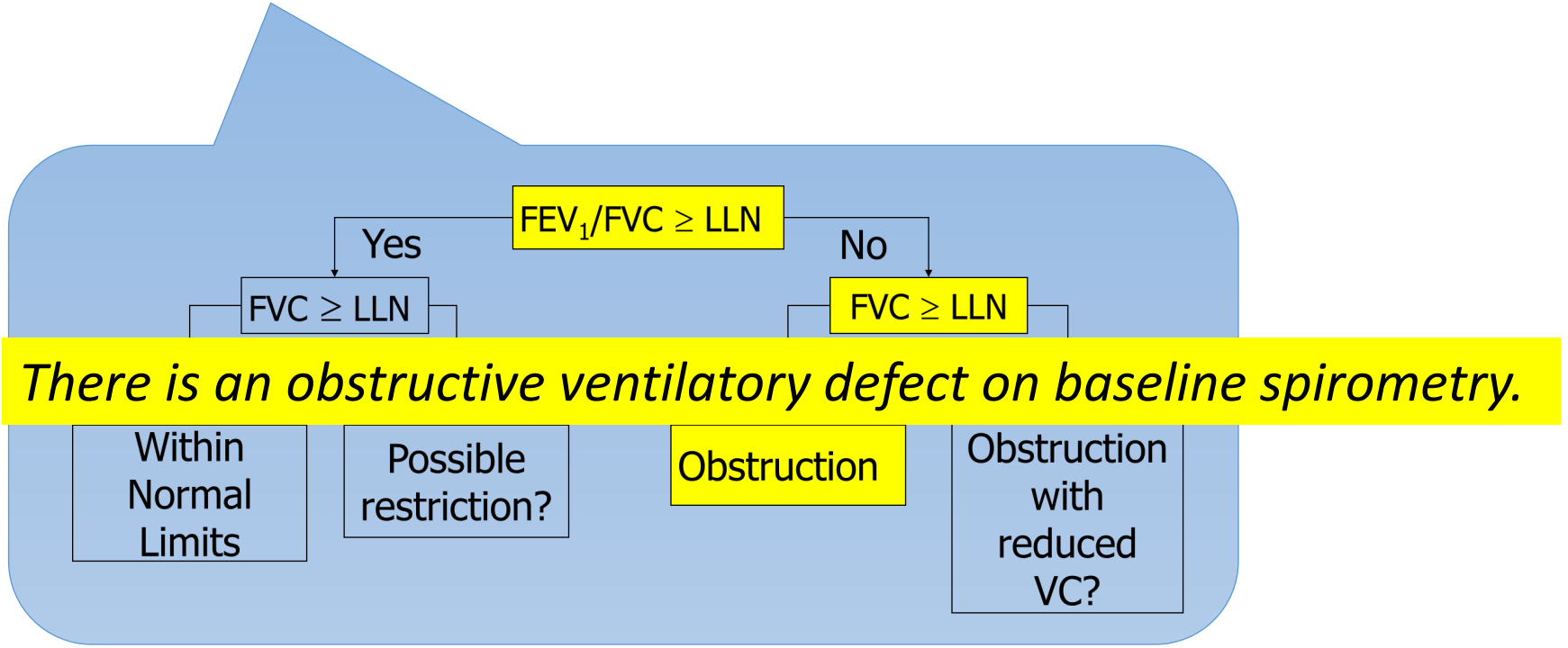
Case 8

Gender: Male
Age (yr): 47 **Weight (kg):** 87.3
Height (cm): 179.7 **Race:** Caucasian
Clinical Notes: Asthma for review

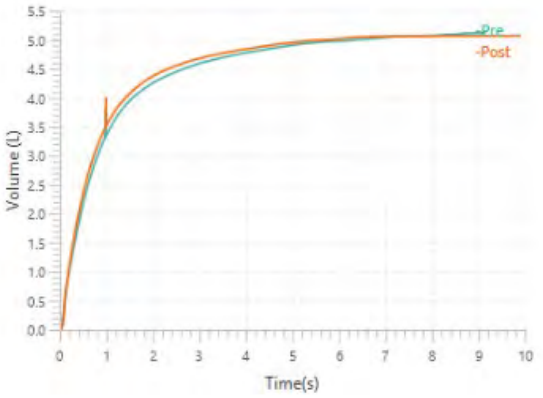
	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**3.44**	4.10	3.22	-1.24	**3.60**	-0.95	3.9
FVC (L)	**5.12**	5.19	4.08	-0.11	**5.07**	-0.18	-1.0
FEV_1/FVC	**0.67**	0.79	0.69	-1.87	**0.71**	-1.31	

Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A





There is an obstructive ventilatory defect on baseline spirometry.

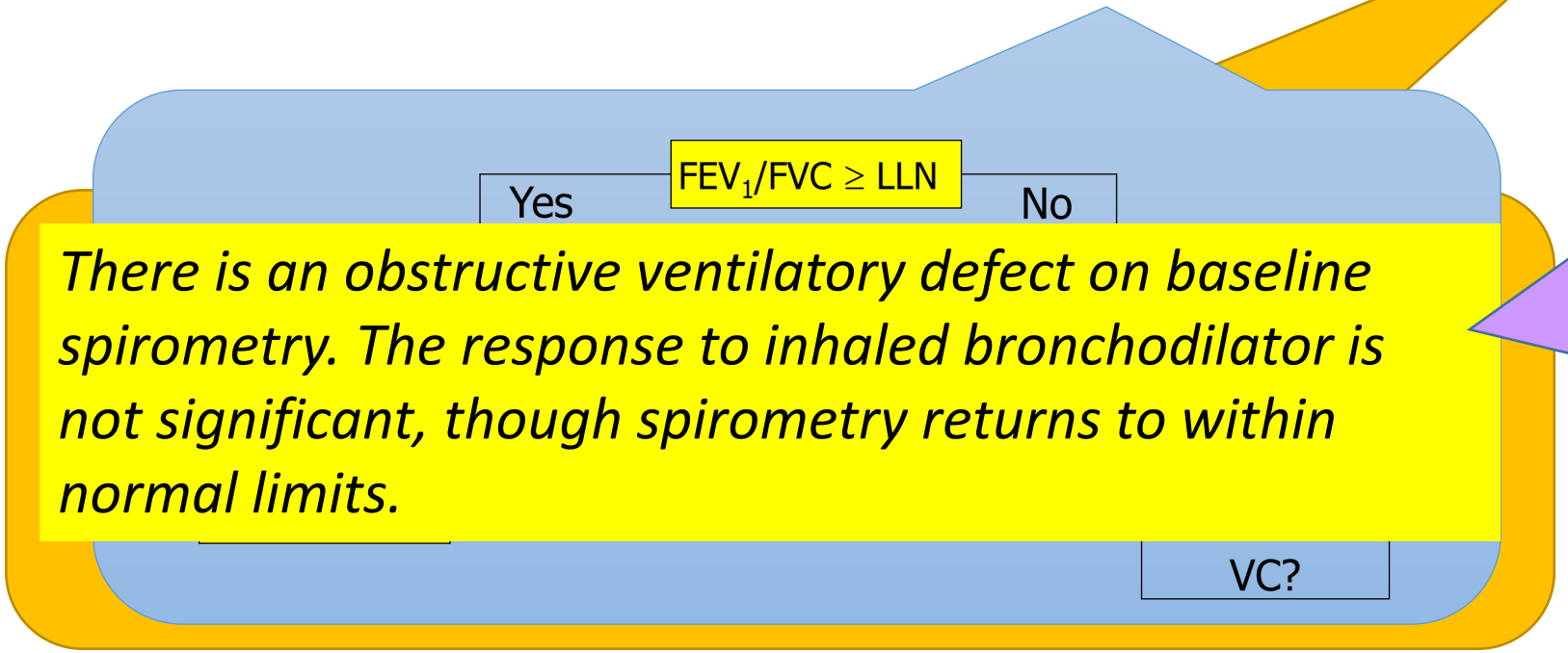


Case 8

Gender: Male
Age (yr): 47 **Weight (kg):** 87.3
Height (cm): 179.7 **Race:** Caucasian
Clinical Notes: Asthma for review

	Pre Bronchodilator				Post Bronchodilator		
	Best	Pred	LLN	Z-score	Best	Z-score	%Chng
Spirometry							
FEV_1 (L)	**3.44**	4.10	3.22	-1.24	**3.60**	-0.95	3.9
FVC (L)	**5.12**	5.19	4.08	-0.11	**5.07**	-0.18	-1.0
FEV_1/FVC	**0.67**	0.79	0.69	-1.87	**0.71**	-1.31	

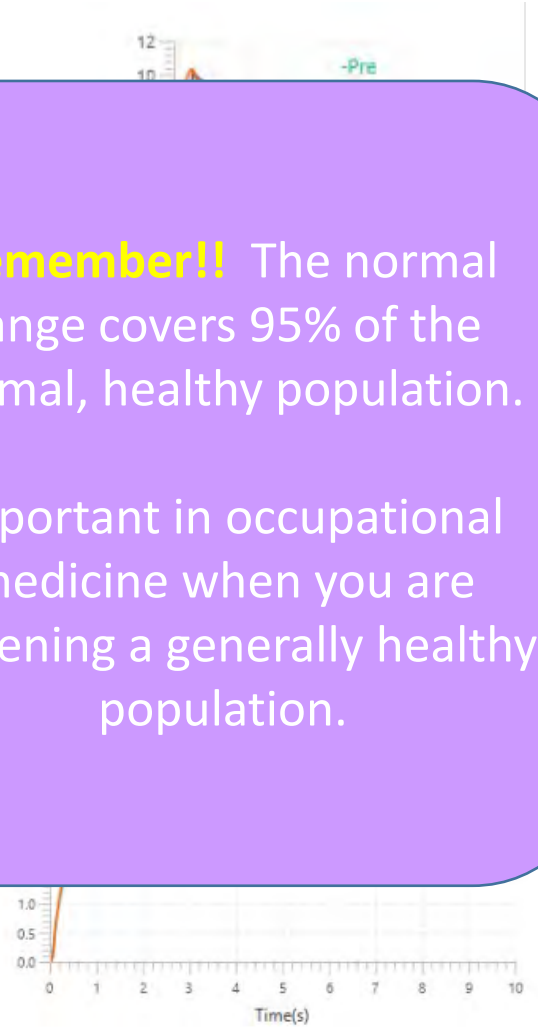
Technical Comment: Pre BD: FEV1 A FVC A Post BD: FEV1 A FVC A



There is an obstructive ventilatory defect on baseline spirometry. The response to inhaled bronchodilator is not significant, though spirometry returns to within normal limits.

Remember!! The normal range covers 95% of the normal, healthy population.

Important in occupational medicine when you are screening a generally healthy population.



Key messages

- Spirometry
  - International standards for test performance, QA and interpretation.
  - Standards have recently been updated – is your practice up to date?
  - Best practice to operate using standards
- Spirometry is one of a suite of lung function tests
  - May need additional tests to provide further information for decision making
- Interpretation strategies
  - Standard has recently been updated
  - What reference sets are you using? GLI 2012 Spirometry Reference Set
  - Be cautious in interpreting tests of suboptimal quality
  - Restrictive defect includes TLC in definition – be careful