

Pulmonary Function Tests

Summary and Practice Cases

Learning Objectives

- Identify a likely category of lung disease from a PFT report (e.g. obstructive, restrictive, mixed, vascular)
- Hypothesize a specific etiology of lung disease by synthesizing PFTs with a clinical history and chest radiograph.

Case 1

ID

56 y/o smoker presents with a progressive, productive cough and dyspnea over 3 months.

Exam

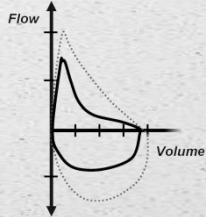
General: Thin, appears comfortable

Vitals: T 37.6, HR 95, BP 125/80, RR 24, O₂ sat 95% on room air

Chest: Diminished lung sounds throughout both lungs

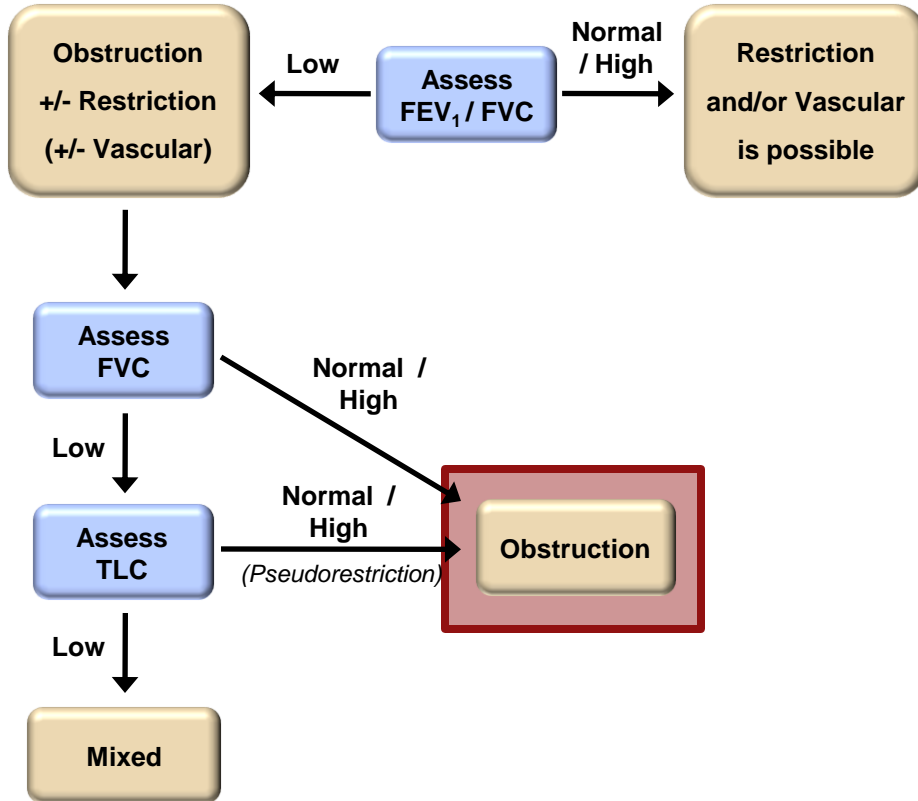
Cardiac: Regular rhythm, no murmurs, normal JVP

Patient: Ned Stark		Age: 56		Gender: Male		
		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	3.8	2.3	61	2.5	66
FEV1	Liters	3.1	1.2	39	1.3	42
FEV1/FVC	%	82	52		52	
PEF	L/sec	5.9	3.9	66	4.2	71
Lung Volumes						
TLC	Liters	5.9	7.1	120		
VC	Liters	4.0	3.0	75		
IC	Liters	3.2	2.5	78		
FRC	Liters	2.7	4.6	170		
RV	Liters	1.9	4.1	216		
RV/TLC	%	32	58			
Diffusing Capacity						
DLCO	mL/mmHg/min	31	23	73		
DL Adj	mL/mmHg/min	31	23	73		



Comments: Tests are pre and post 4 puffs albuterol

Case 1



Patient: Ned Stark Age: 56 Gender: Male

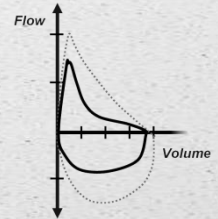
		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	3.8	2.3	61	2.5	66
FEV1	Liters	3.1	1.2	39	1.3	42
FEV1/FVC	%	82	52		52	
PEF	L/sec	5.9	3.9	66	4.2	71
Lung Volumes						
TLC	Liters	5.9	7.1	120		
VC	Liters	4.0	3.0	75		
IC	Liters	3.2	2.5	78		
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RV	Liters	1.9	4.1	216		
RV/TLC	%	32	58			
Diffusing Capacity						
DLCO	mL/mmHg/min	31	23	73		
DL Adj	mL/mmHg/min	31	23	73		

Comments: Tests are pre and post 4 puffs albuterol

Chronic Obstructive Pulmonary Disease



Patient: Ned Stark		Age: 56		Gender: Male		
		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	3.8	2.3	61	2.5	66
FEV1	Liters	3.1	1.2	39	1.3	42
FEV1/FVC	%	82	52		52	
PEF	L/sec	5.9	3.9	66	4.2	71
Lung Volumes						
TLC	Liters	5.9	7.1	120		
VC	Liters	4.0	3.0	75		
IC	Liters	3.2	2.5	78		
FRC	Liters	2.7	4.6	170		
RV	Liters	1.9	4.1	216		
RV/TLC	%	32	58			
Diffusing Capacity						
DLCO	mL/mmHg/min	31	23	73		
DL Adj	mL/mmHg/min	31	23	73		



Comments: Tests are pre and post 4 puffs albuterol

Case 2

ID

32 y/o animal trainer, presents with progressive dry cough and dyspnea over the past month.

Exam

General: Appears in mild respiratory discomfort

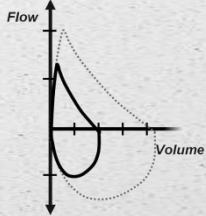
Vitals: T 37.2, HR 104, BP 135/80, RR 28, O₂ sat 88% on room air

Chest: Fine crackles throughout both lungs

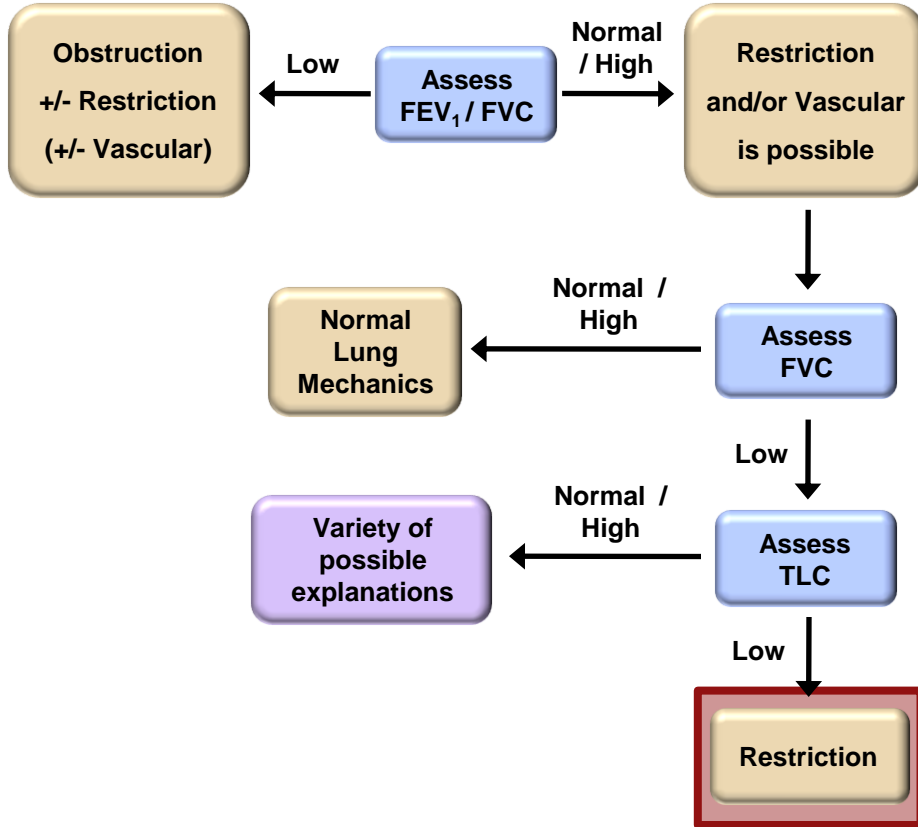
Cardiac: Regular rhythm, no murmurs, normal JVP

		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	4.4	1.7	39	1.7	39
FEV1	Liters	3.7	1.6	43	1.6	43
FEV1/FVC	%	84	94	94	94	94
PEF	L/sec	7.2	7.0	97	7.1	99
Lung Volumes						
TLC	Liters	5.7	2.5	44		
VC	Liters	4.3	1.8	42		
IC	Liters	3.2	1.5	47		
FRC	Liters	2.5	1.0	40		
RV	Liters	1.4	0.7	50		
RV/TLC	%	25	28			
Diffusing Capacity						
DLCO	mL/mmHg/min	26	10	38		
DL Adj	mL/mmHg/min	26	10	38		

Comments: Tests are pre and post 4 puffs albuterol



Case 2



Patient: Daenerys Targaryen Age: 32 Gender: Female

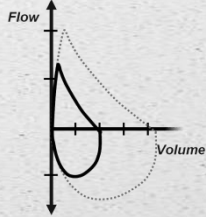
		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	4.4	1.7	39	1.7	39
FEV1	Liters	3.7	1.6	43	1.6	43
FEV1/FVC	%	84	94	94	94	94
PEF	L/sec	7.2	7.0	97	7.1	99
Lung Volumes						
TLC	Liters	5.7	2.5	44		
VC	Liters	4.3	1.8	42		
IC	Liters	3.2	1.5	47		
FRC	Liters	2.5	1.0	40		
RV	Liters	1.4	0.7	50		
RV/TLC	%	25	28			
Diffusing Capacity						
DLCO	mL/mmHg/min	26	10	38		
DL Adj	mL/mmHg/min	26	10	38		

Comments: Tests are pre and post 4 puffs albuterol

Interstitial Lung Disease: Most Likely Hypersensitivity Pneumonitis



		Ref	Pre	% Ref	Post	% Ref
Patient: Daenerys Targaryen Age: 32 Gender: Female						
Spirometry						
FVC	Liters	4.4	1.7	39	1.7	39
FEV1	Liters	3.7	1.6	43	1.6	43
FEV1/FVC	%	84	94	94	94	94
PEF	L/sec	7.2	7.0	97	7.1	99
Lung Volumes						
TLC	Liters	5.7	2.5	44		
VC	Liters	4.3	1.8	42		
IC	Liters	3.2	1.5	47		
FRC	Liters	2.5	1.0	40		
RV	Liters	1.4	0.7	50		
RV/TLC	%	25	28			
Diffusing Capacity						
DLCO	mL/mmHg/min	26	10	38		
DL Adj	mL/mmHg/min	26	10	38		



The graph shows a flow-volume loop. The vertical axis is labeled 'Flow' and the horizontal axis is labeled 'Volume'. A solid line represents the current loop, and a dotted line represents the normal loop. The current loop shows a concave expiratory phase and a flattened inspiratory phase, characteristic of obstructive lung disease.

Comments: Tests are pre and post 4 puffs albuterol

Case 3

ID

15 y/o boy with history of spinal cord injury, presents with dyspnea for 2 months.

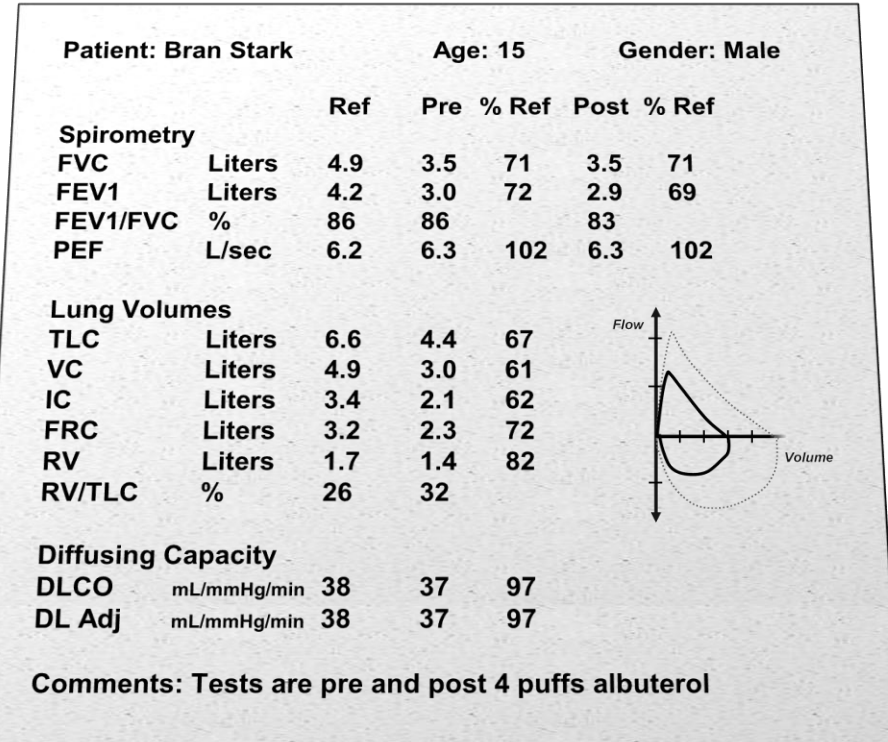
Exam

General: Appears in mild respiratory discomfort

Vitals: T 37.4, HR 94, BP 114/74, RR 26, O₂ sat 92% on room air

Chest: Clear to auscultation

Cardiac: Regular rhythm, no murmurs



Extrapulmonary Restrictive Lung Disease: Most Likely Spinal Cord Injury

ID

15 y/o boy with history of spinal cord injury, presents with dyspnea for 2 months.

Exam

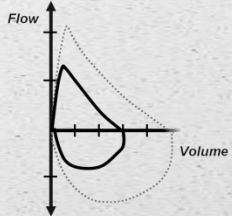
General: Appears in mild respiratory discomfort

Vitals: T 37.4, HR 94, BP 114/74, RR 26, O₂ sat 92% on room air

Chest: Clear to auscultation

Cardiac: Regular rhythm, no murmurs

Patient: Bran Stark		Age: 15		Gender: Male		
		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	4.9	3.5	71	3.5	71
FEV1	Liters	4.2	3.0	72	2.9	69
FEV1/FVC	%	86	86		83	
PEF	L/sec	6.2	6.3	102	6.3	102
Lung Volumes						
TLC	Liters	6.6	4.4	67		
VC	Liters	4.9	3.0	61		
IC	Liters	3.4	2.1	62		
FRC	Liters	3.2	2.3	72		
RV	Liters	1.7	1.4	82		
RV/TLC	%	26	32			
Diffusing Capacity						
DLCO	mL/mmHg/min	38	37	97		
DL Adj	mL/mmHg/min	38	37	97		



Comments: Tests are pre and post 4 puffs albuterol

Case 4

ID

41 y/o woman with no significant PMH, presents with dyspnea for 2 months.

Exam

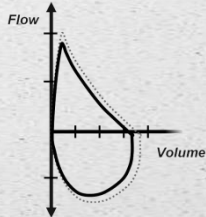
General: Appears comfortable

Vitals: T 37.6, HR 104, BP 110/76,
RR 26, O₂ sat 87% on room air

Chest: Clear to auscultation

Cardiac: Regular tachycardia, 2/6
systolic murmur at LLSB,
elevated JVP

Patient: Cersei Lannister		Age: 41		Gender: Female	
	Ref	Pre	% Ref	Post	% Ref
Spirometry					
FVC	Liters	3.7	3.5 95	3.5	95
FEV1	Liters	2.9	2.8 95	2.8	95
FEV1/FVC	%	78	80	80	
PEF	L/sec	5.2	5.1 98	5.1	98
Lung Volumes					
TLC	Liters	5.5	5.4 98		
VC	Liters	4.2	4.0 95		
IC	Liters	3.1	3.2 103		
FRC	Liters	2.4	2.2 92		
RV	Liters	1.3	1.4 108		
RV/TLC	%	24	26		
Diffusing Capacity					
DLCO	mL/mmHg/min	24	9 38		
DL Adj	mL/mmHg/min	24	9 38		

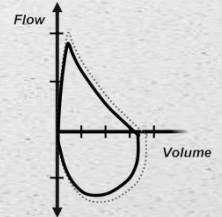


Comments: Tests are pre and post 4 puffs albuterol

Pulmonary Hypertension



Patient: Cersei Lannister		Age: 41		Gender: Female	
	Ref	Pre	% Ref	Post	% Ref
Spirometry					
FVC	Liters	3.7	3.5 95	3.5	95
FEV1	Liters	2.9	2.8 95	2.8	95
FEV1/FVC	%	78	80	80	
PEF	L/sec	5.2	5.1 98	5.1	98
Lung Volumes					
TLC	Liters	5.5	5.4 98		
VC	Liters	4.2	4.0 95		
IC	Liters	3.1	3.2 103		
FRC	Liters	2.4	2.2 92		
RV	Liters	1.3	1.4 108		
RV/TLC	%	24	26		
Diffusing Capacity					
DLCO	mL/mmHg/min	24	9 38		
DL Adj	mL/mmHg/min	24	9 38		



Comments: Tests are pre and post 4 puffs albuterol

Case 5

ID

48 y/o man, with history of smoking, presents with chronic progressive dyspnea and leg swelling.

Exam

General: Obese, but o/w appears well

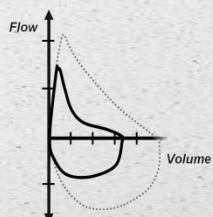
Vitals: T 37.6, HR 82, BP 155/82, RR 24,
O₂ sat 87% on room air, BMI 35

Chest: Diminished sounds throughout both lungs.

Cardiac: Regular rhythm, no murmurs,
JVP=12cm H₂O

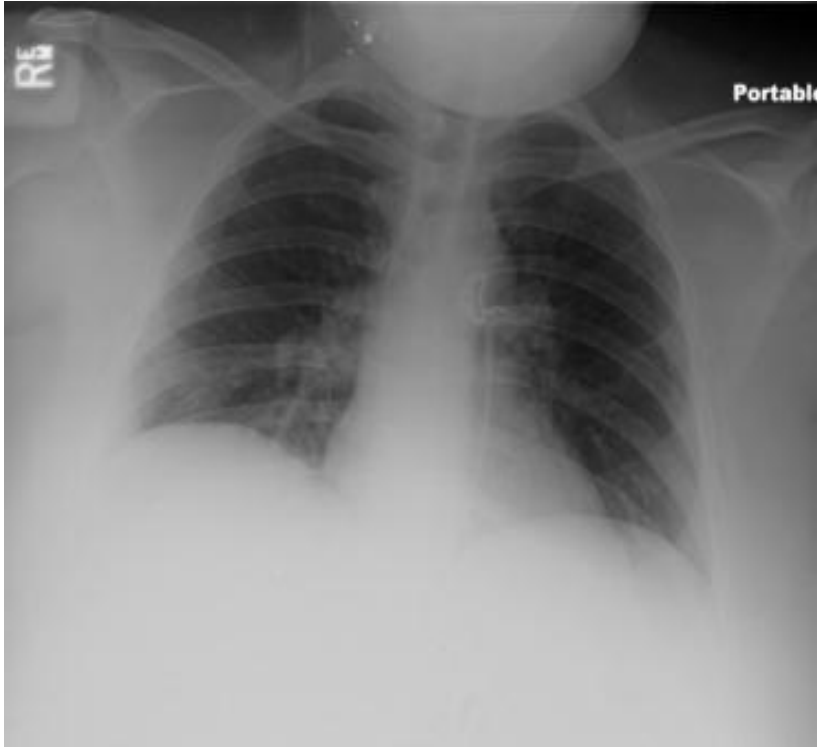
Ext: Mod pitting edema to upper shins bilaterally

Patient: Robert Baratheon		Age: 48		Gender: Male		
		Ref	Pre	% Ref	Post	% Ref
Spirometry						
FVC	Liters	5.5	4.0	73	4.0	73
FEV1	Liters	4.3	1.6	37	2.1	49
FEV1/FVC	%	78	40		53	
PEF	L/sec	7.1	4.0	56	5.1	72
Lung Volumes						
TLC	Liters	7.3	4.7	64		
VC	Liters	5.4	4.0	74		
IC	Liters	3.7	2.8	76		
FRC	Liters	3.6	1.9	53		
RV	Liters	1.9	0.7	37		
RV/TLC	%	26	15			
Diffusing Capacity						
DLCO	mL/mmHg/min	30	23	77		
DL Adj	mL/mmHg/min	32	25	77		

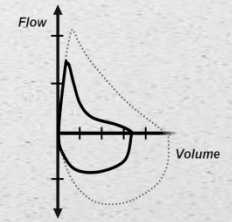


Comments: Tests are pre and post 4 puffs albuterol

COPD + Restrictive Lung Disease Secondary to Obesity



		Ref	Pre	% Ref	Post	% Ref
Patient: Robert Baratheon Age: 48 Gender: Male						
Spirometry						
FVC	Liters	5.5	4.0	73	4.0	73
FEV1	Liters	4.3	1.6	37	2.1	49
FEV1/FVC	%	78	40		53	
PEF	L/sec	7.1	4.0	56	5.1	72
Lung Volumes						
TLC	Liters	7.3	4.7	64		
VC	Liters	5.4	4.0	74		
IC	Liters	3.7	2.8	76		
FRC	Liters	3.6	1.9	53		
RV	Liters	1.9	0.7	37		
RV/TLC	%	26	15			
Diffusing Capacity						
DLCO	mL/mmHg/min	30	23	77		
DL Adj	mL/mmHg/min	32	25	77		
Comments: Tests are pre and post 4 puffs albuterol						





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