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Spirometry - Concurrent Workshop Repeated

Saturday, 30 July 2011

Start 11:00am

Start 12:05pm

Duration: 55mins

Duration: 55mins

Heritage Room

Heritage Room




South GP CME 2011

General Practice Conference & Medical Exhibition

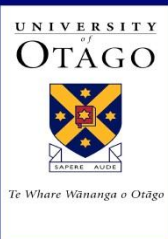
28-31 July 2011 | The Dunedin Town Hall | Dunedin

SPIROMETRY in GENERAL PRACTICE

Jim Reid

Faculty of Medicine

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SPIROMETRY in GENERAL PRACTICE

- **Would you manage hypertension without a sphygmomanometer???**
- **Would you manage diabetes without a glucometer???**

SPIROMETRY in GENERAL PRACTICE

PEAK EXPIRATORY FLOW RATE (PEFR)

- Measures flow in large airways
- Of limited use in COPD
- Relationship between FEV1 and PEFR is poor in COPD (closer in asthma)

SPIROMETRY in GENERAL PRACTICE

Spirometry measures airflow and lung volumes, and is the preferred lung function test in COPD

SPIROMETRY in GENERAL PRACTICE

TERMINOLOGY

- **FEV1** = the amount of air maximally exhaled in 1st second of exhalation
- **FVC** = the total volume of air that can be exhaled with maximum force, from maximum inhalation to maximal exhalation

SPIROMETRY in GENERAL PRACTICE

- **FVC & FEV1 expressed as volumes (litres)**
- **Also expressed as % of predicted values**
- **Predicted values dependent on age, height, and gender.**
- **Ratio FEV1/FVC expressed as a percentage**

SPIROMETRY in GENERAL PRACTICE

Factors that influence normal values

- **Height - tall people have larger lungs**
- **Age - Respiratory function declines with age**
- **Sex - Lung volumes smaller in females**
- **Race - Peculiarly studies show Blacks and Asians as a whole have smaller lung volumes (-12%) No studies for Maoris and Pacific People.**
- **Posture - little difference between sitting and standing. Reduced in supine position.**

SPIROMETRY in GENERAL PRACTICE

OBSTRUCTION

- $FEV1 / FVC < 70\%$
- $FEV1 < 80\%$ of predicted value
- In severe COPD the FVC may be $< 80\%$ predicted - Much less in fact

SPIROMETRY in GENERAL PRACTICE

Severity of Obstruction

FEV1

Mild

>70% Predicted

Moderate

50 - < 69% Predicted

Severe

<50% Predicted

SPIROMETRY in GENERAL PRACTICE

RESTRICTION

- **Both FEV1 and FVC < 80% BUT the FEV1/FVC ratio is normal or high**

SPIROMETRY in GENERAL PRACTICE

Severity of Restriction

FVC

Mild

>65 - 80% predicted

Moderate

>50 - 65% predicted

Severe

<50% predicted.

SPIROMETRY in GENERAL PRACTICE

Asthma

- **Both FEV1 & FVC are reduced, but can demonstrate reversibility of at least 12%.**

SPIROMETRY in GENERAL PRACTICE

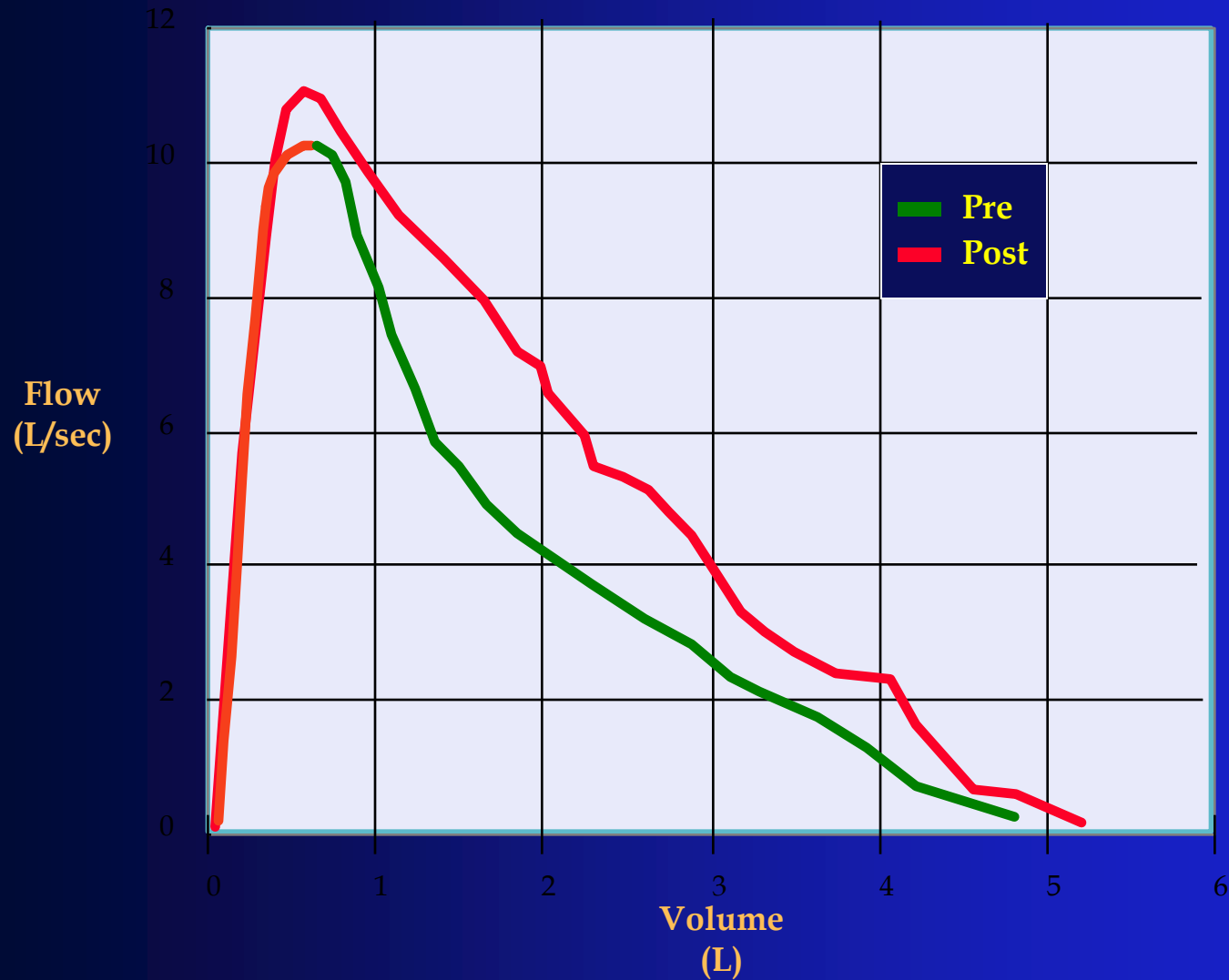
Two types of measurement

- **Flow / Volume Curve**
- **Volume / Time Curve**

Flow / Volume Curve

- X axis represents volume
- Y axis represents flow rate
- Shape depends on mechanical properties of lung.

Flow / Volume Curve



SPIROMETRY in GENERAL PRACTICE

Volume / time curve

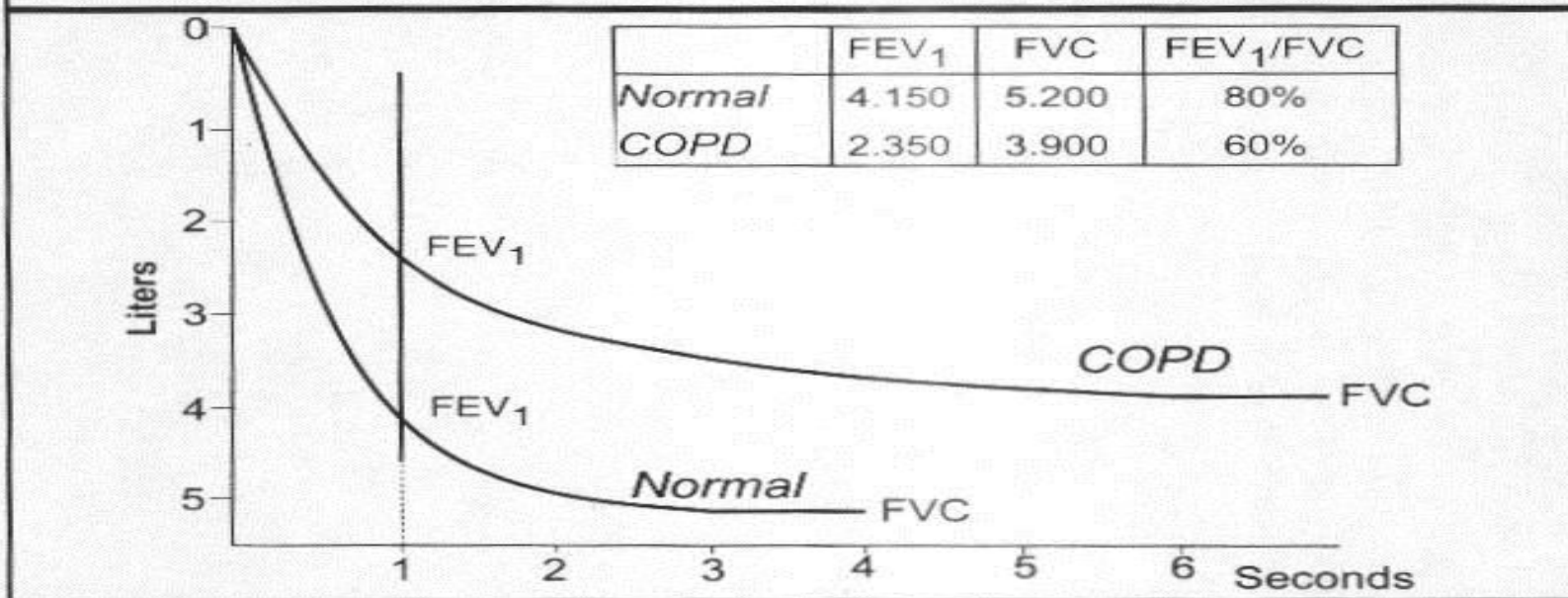
- Must be smooth
- Must plateau

ie Spirometry is only worth doing if it is done properly

COPD DIAGNOSIS

Vol / Time Curve

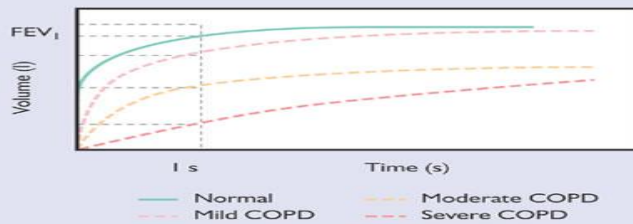
Figure 2: Example of Spirometric Tracings and Calculation of FEV₁, FVC, and FEV₁/FVC Ratio



Patients with COPD typically show a decrease in both FEV₁ and FEV₁/FVC. The degree of spirometric abnormality generally reflects the severity of COPD. However, both symptoms and spirometry should be considered when developing an individualized management strategy for each patient.

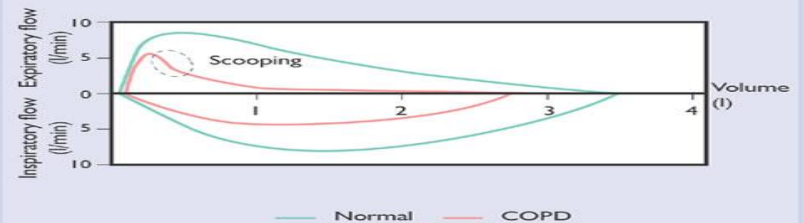
SPIROMETRY

Spirograms in COPD of varying severity



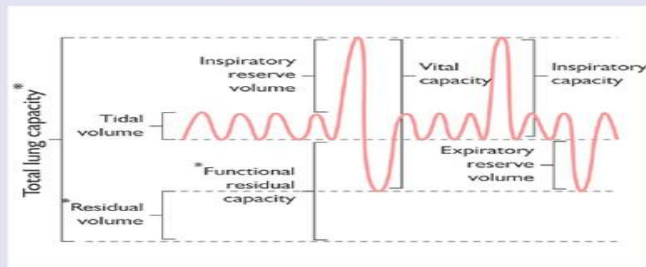
Forced vital capacity (FVC) plateau can take > 12 s

Flow volume loop: single breath forced maneuver



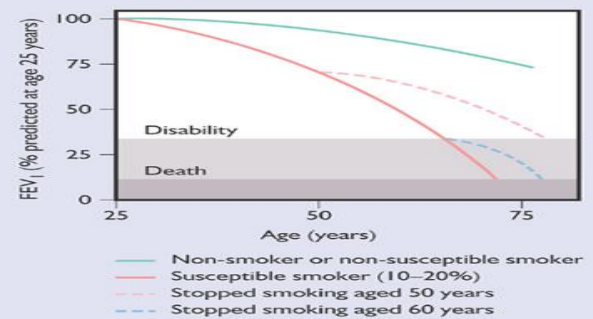
Pneumotachograph: 'scooping' caused by expiratory airway collapse

Lung volumes



* Total lung capacity, residual volume and functional residual capacity are measured by plethysmography

Natural history: decline in FEV₁ with age



Fletcher C, Peto R. *Br Med J* 1977;1:1645–8

SPIROMETRY in GENERAL PRACTICE

John, 42 years, is an area sales manager. “Chesty as a child” - Smoker - 10 pack years. He suffers from frequent “chest infections”.

Spirometry

FEV1 = 3.24 (76% pred)

FVC = 4.82 (91% pred)

FEV1/FVC = 67%

Post bronchodilator

FEV1 = 4.17 (29% improvement)

SPIROMETRY in GENERAL PRACTICE

Brian - 65 yrs. Cough + SOB. Smoker 20 pack years

Spirometry

FEV1 = 1.67 (57% pred) Reduced

FVC = 2.07 (55% pred) Reduced

FEV1 / FVC = 81% Normal

Reversibility 6%

SPIROMETRY in GENERAL PRACTICE

Rose 55 yrs. Smoker for 30 years - 45 Pack years. Increasing SOB. Smoker's cough

Spirometry

FEV1 = 1.39 (56% pred) Reduced

FVC = 2.53 (86% Pred) Normal

FEV1/FVC = 55% Reduced

Reversibility = 5% Nil significant

SPIROMETRY in GENERAL PRACTICE

Mal 50 years. Cough and SOB. Smoker 10 pack years.

Spirometry

FEV1 = 1.6	(60% pred)	Reduced
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FVC = 2.0	(70% Pred)	Reduced
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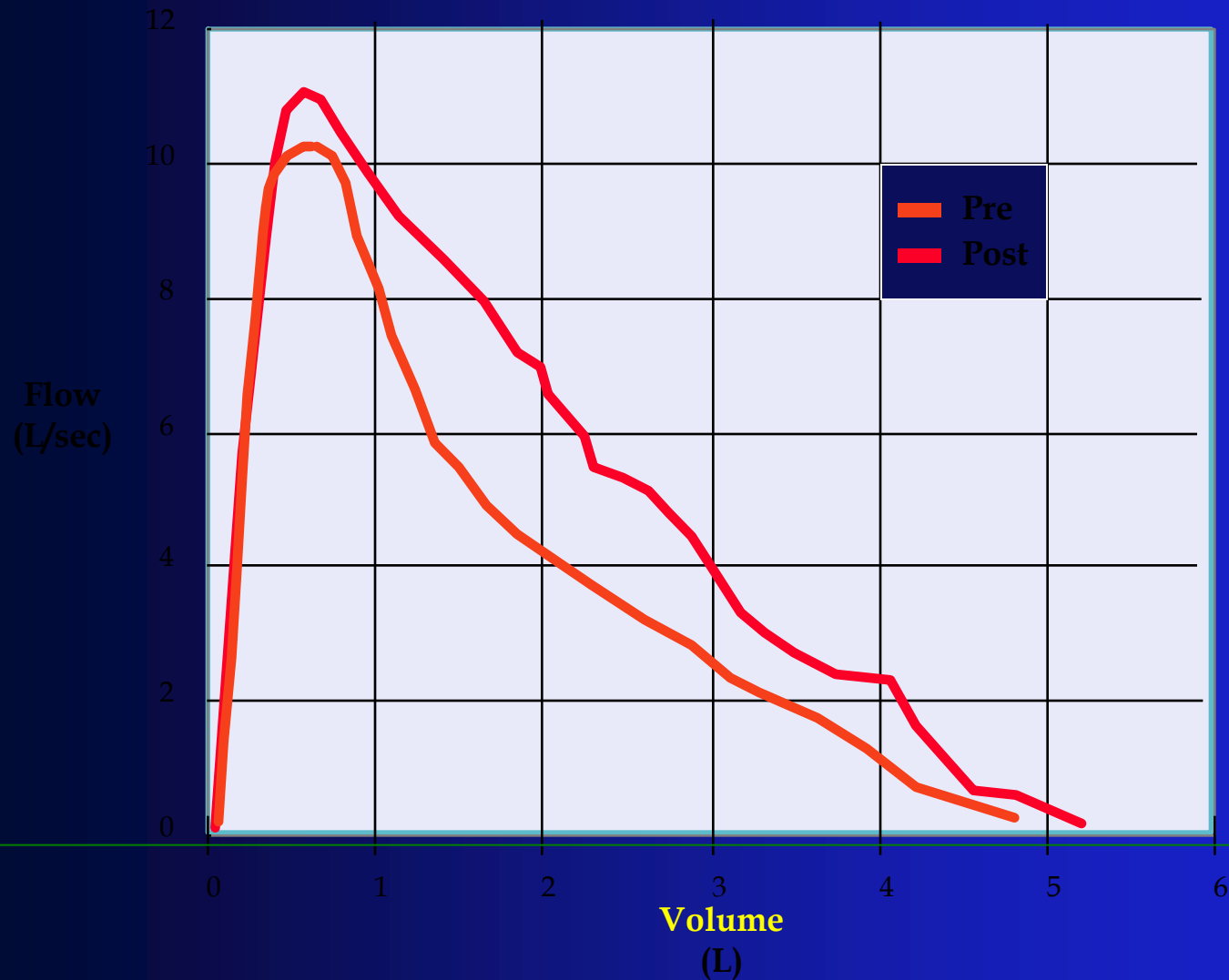
FEV1/FVC	80%	Normal
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Post Bronchodilator 15% Reversibility

SPIROMETRY in GENERAL PRACTICE

- 18 year old male
- Presented with SOBOE
- HX of childhood asthma
- This prompted his office visit
- Also has family HX of allergies

CASE #1: SPIROMETRY RESULTS



CASE #1: SPIROMETRY

	<u>PRE</u>		<u>POST</u>	
	<u>Meas.</u>	<u>%</u>	<u>Meas.</u>	<u>Change</u>
FVC	5.35L	99%	5.67L	6%
FEV₁	3.84L	86%	4.60L	20%
FEV₁/FVC	71.8%		81%	

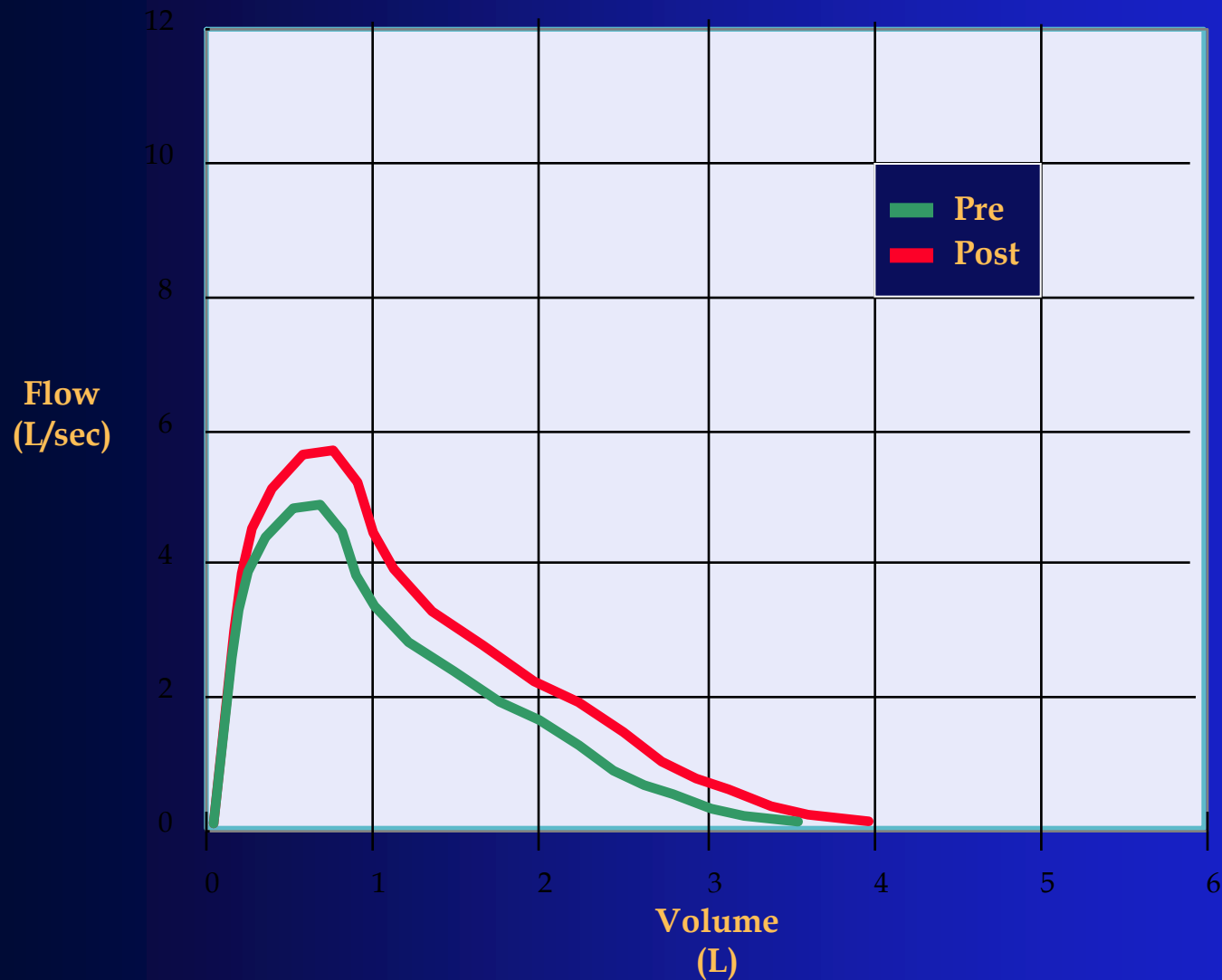
CASE #1: Diagnosis

- Asthma

CASE #2: HISTORY

- 44 year old woman
- cc: fatigue with dry cough, SOBOE
- Past HX:
 - Ex-smoker
 - Chronic asthma
 - A few extrinsic allergies
- Family HX = positive for emphysema

CASE #2: SPIROMETRY RESULTS



CASE #2: SPIROMETRY

	<u>PRE</u>		<u>POST</u>	
	<u>Meas.</u>	<u>%</u>	<u>Meas.</u>	<u>Change</u>
FVC	4.65L	109%	4.85L	4%
FEV₁	2.60L	79%	2.80L	8%
FEV₁/FVC	56%		58%	

CASE #2: Diagnosis And TREATMENT

- Query Moderate COPD
- Needs
 - Full PFTs
 - CXR

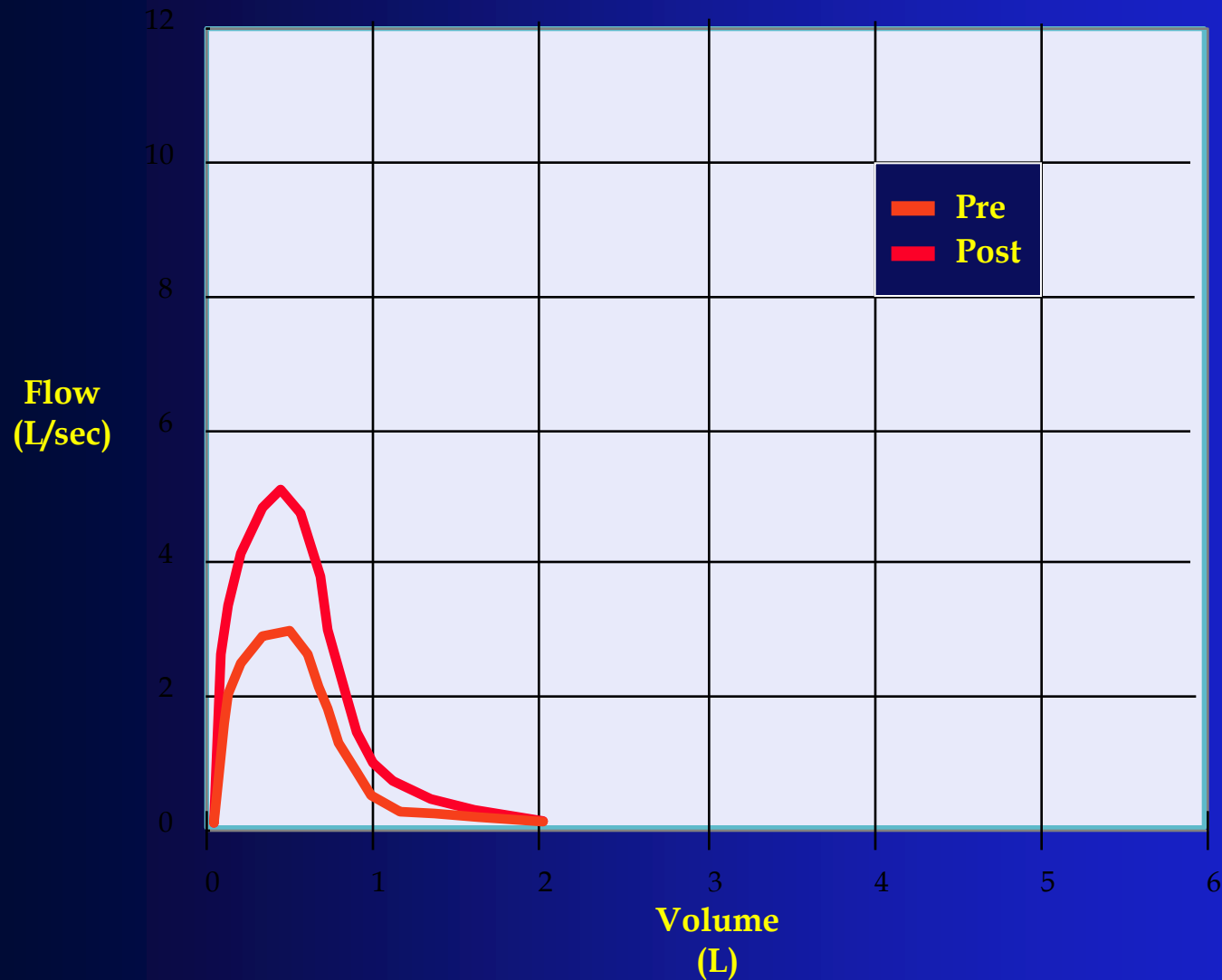
CASE #3: HISTORY

- 39 year old woman
- Smoker
- ++Extrinsic allergies
- SOBOE with white sputum x
1 week

CASE #3: HISTORY

- 3 visits to the ER in previous 2 days
- No previous measure of airflow(ie PEF or Spirometry).
- Treated with Antibiotics
- Little improvement
- Family history is positive for asthma

CASE #3: SPIROMETRY RESULTS



CASE #3: SPIROMETRY

	<u>PRE</u>		<u>POST</u>	
	<u>Meas.</u>	<u>%</u>	<u>Meas.</u>	<u>Change</u>
FVC	1.75L	49%	2.50L	43%
FEV₁	1.10L	39%	1.50L	36%
FEV₁/FVC	63%		60%	

CASE #3: Diagnosis

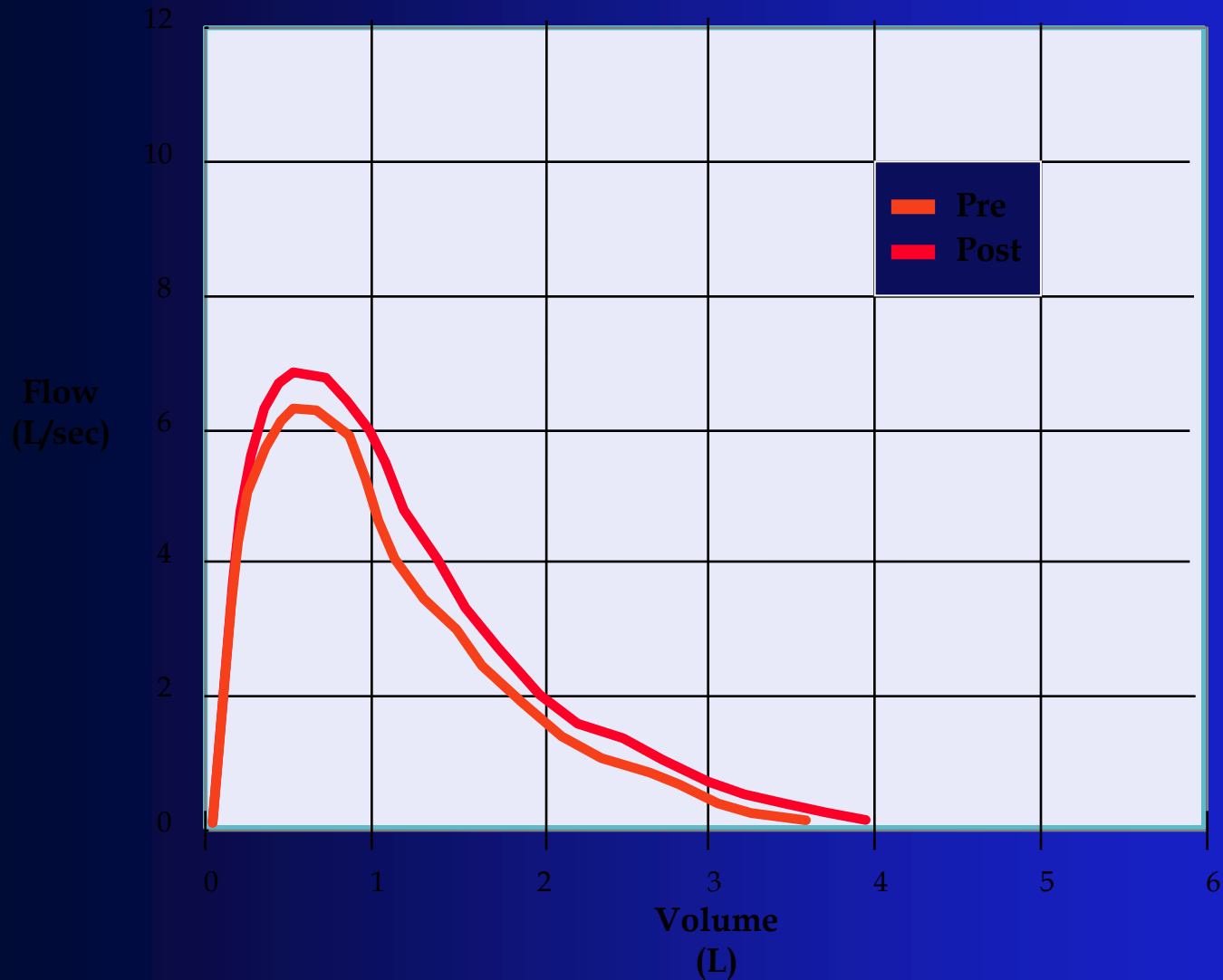
- Reversible obstruction
- Does not reverse to normal-Why?

**Severe untreated asthma or
COPD**

CASE #4: HISTORY

- 32 year old man
- Recent pneumonia with persistent SOBOE
- No wheezing
- No sputum production

CASE #4: SPIROMETRY RESULTS



CASE #4: SPIROMETRY

	<u>PRE</u>		<u>POST</u>	
	<u>Meas.</u>	<u>%</u>	<u>Meas.</u>	<u>Change</u>
FVC	2.87L	52%	3.00L	5%
FEV₁	2.38L	56%	2.50L	5%
FEV₁/FVC	83%		83%	

CASE #4: Diagnosis And TREATMENT: Moderate Restriction

- ? Further pulmonary function tests to confirm etiology
- Many potential causes
- This case: Restriction with decreased residual volume and Normal CO diffusion capacity
- Diaphragmatic eventration/paralysis due to old MVA
- Moral: Look at the x-Ray



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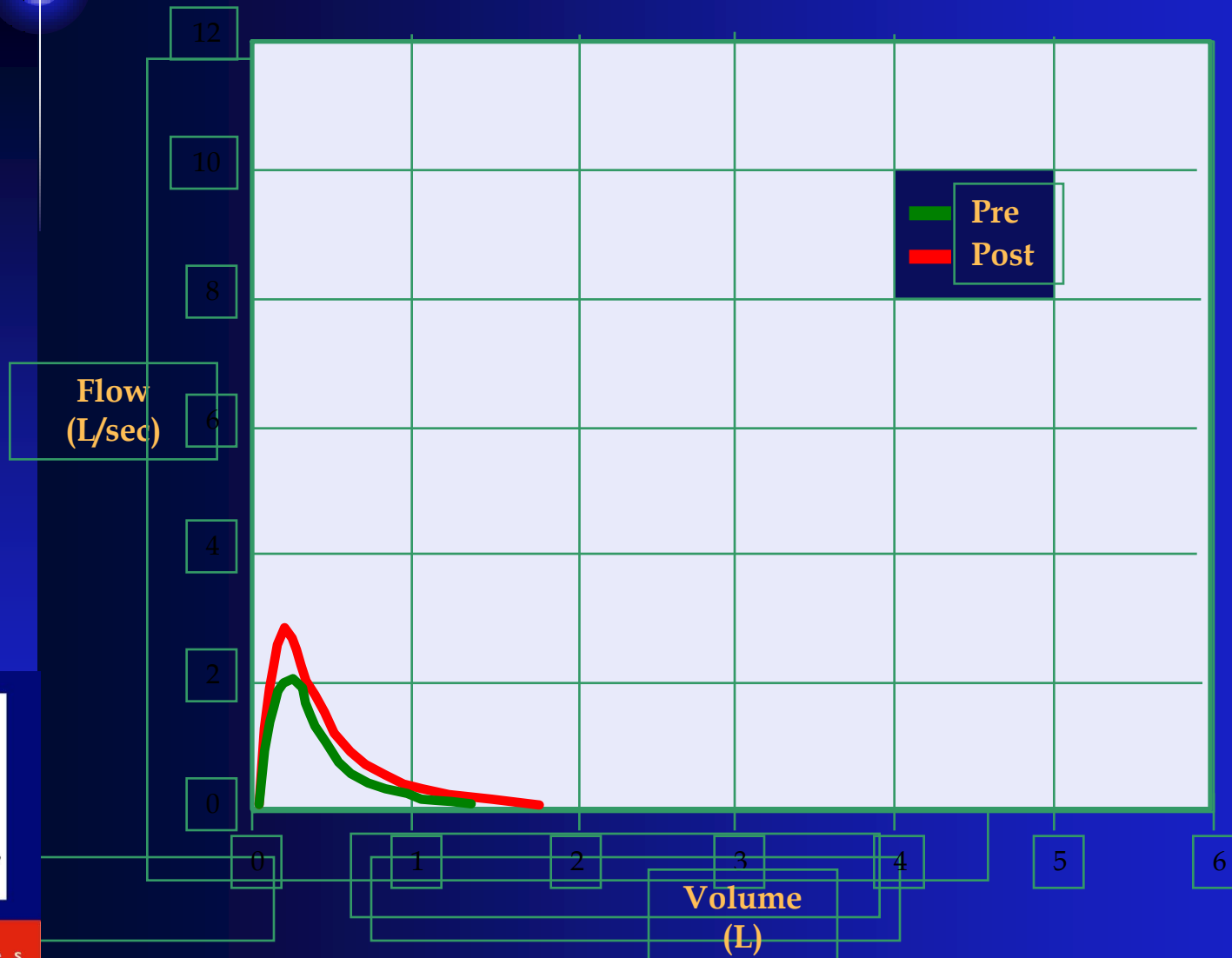
Te Whare Wānanga o Ōtāgo

Health
Sciences

CASE # 5: HISTORY

- 52 Year old woman
- SOBOE X 4 years
- Limited to walking less than 1 block
- No hemoptysis
- History of breast cancer

CASE #5: SPIROMETRY RESULTS



CASE #5: SPIROMETRY

	<u>PRE</u>		<u>POST</u>	
	<u>Meas.</u>	<u>%</u>	<u>Meas.</u>	<u>Change</u>
FVC	1.36L	42%	1.92L	41%
FEV₁	0.60L	22%	0.86L	43%
FEV₁/FVC	44%		45%	

CASE #5: Diagnosis And TREATMENT: COPD+/- Asthma

- CXR?
- Treat for asthma or COPD?
- Steroid trial?
- Pulmonary Rehab