CLINICAL APPLICATIONS OF LUNG FUNCTION TEST (SPIROMETRY) IN HEALTH AND DISEASE

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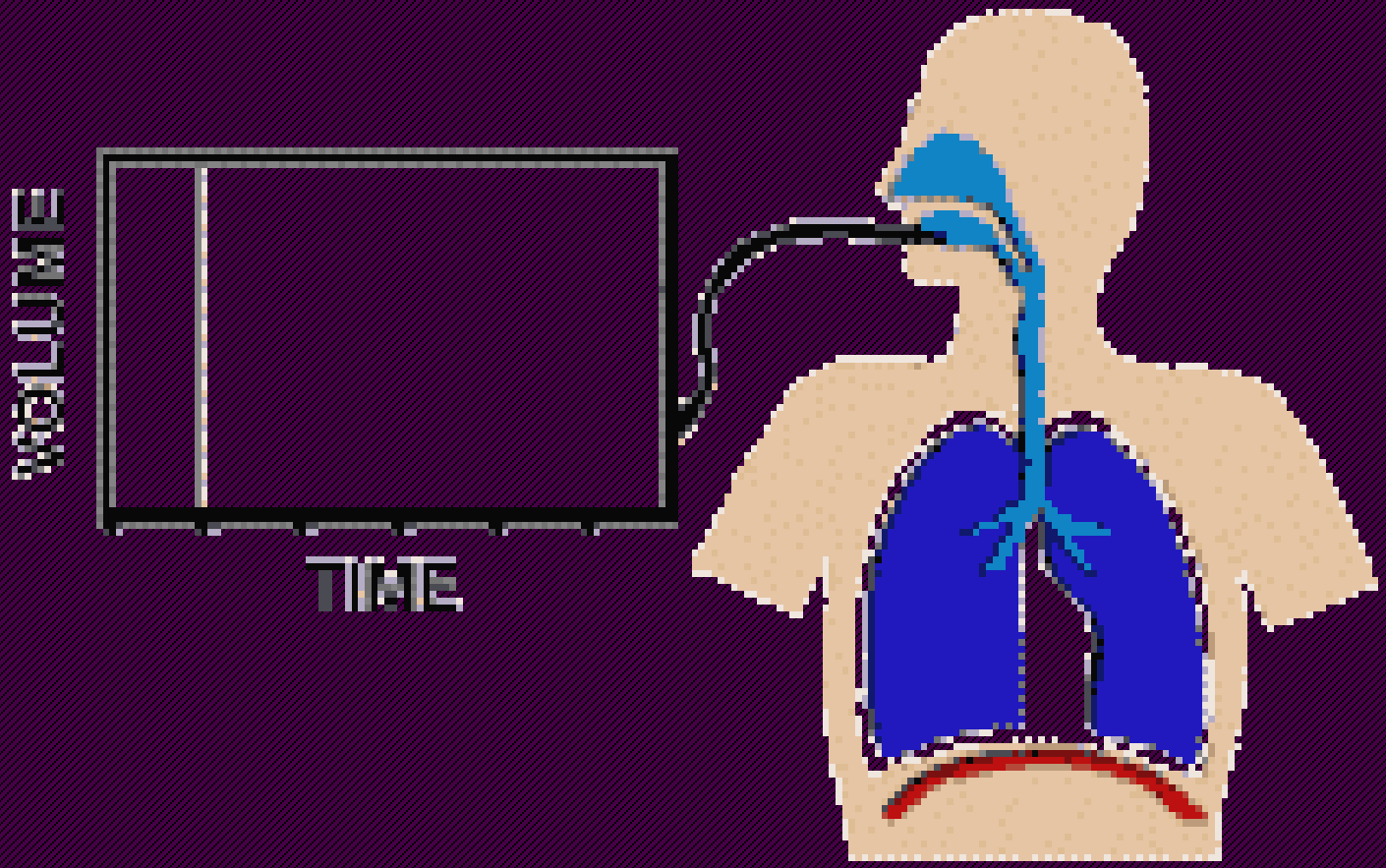
PULMONARY / LUNG VOLUMES AND CAPACITIES



SPIROMETRY

- Spirometry is a widely used, effort depended basic lung function test
- Assess the lung performance
- Assess physiological parameters; lung volumes, capacities & flow rate
- Differentiate between the obstructive and restrictive lung conditions
- Play a critical role in the diagnosis, differentiation and management of respiratory illness.

Ruppel, Res Care Clin N Am 1997;
Pierce William, Aus Fam Phy J , 2005

PHYSIOLOGICAL CONDITIONS AND SPIROMETRY

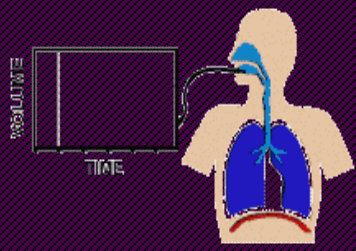
Physiology conditions:

- **Age, Gender, Height, Weight**
- **Ethnic group**
- **Exercise**
- **Posture**
- **Pregnancy**
- Diurnal variation, seasonal, climate
- Customary activity
- Geographical location

All pulmonary volumes and capacities are about 20 to 25 % less in women than in men, and they are greater in large and athletic people than in small and asthenic people

Cotes, 1995

INDICATIONS OF SPIROMETRY



Based on clinical features / abnormal lab tests

Symptoms: Dsyponea, cough, phlegm production, chest pain

Signs: Cyanosis, clubbing, chest deformity, diminished chest expansion, diminished breath sounds

Arterial blood gas analysis: Hypoxemia, hypercapnia

Abnormal chest X Ray:

Cotes, 1995

INDICATIONS OF SPIROMETRY

Occupations settings:

Pre employment

periodic lung function examination for workers exposed to toxic substances including dust and fumes in industrial sectors such as:

Cement / Asbestoses

Welding / Wood / Steel

Flour / Coal mine / Oil

Meo et al., J Occup Envir Med, 2004
Meo et al., Int J Occup Med & Env Health, 2005
Meo et al., Int J Env Health Res 2006
Meo et al., Marine pollution Bulletin, 2008

INDICATIONS OF SPIROMETRY

Describe the course of diseases affecting PFTs

Neuromuscular diseases: Gullian Barre Syndrome, Myasthenia gravis

Pulmonary diseases: Obstructive airway diseases, Interstitial lung diseases

Adverse reactions: Drugs with known pulmonary toxicity [Pulmonary fibrosis]

INDICATIONS OF SPIROMETRY

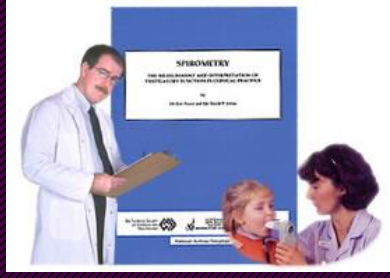
PRE OPERATIVE INDICATIONS

To determine the suitability for and management during and after anesthesia

To assess the risk for surgical procedures known to affect lung function

Cotes 1995; ACCP Chest 2003; Regli et al., Anaesthesia, 2006

INDICATIONS OF SPIROMETRY



Monitoring indications

To assess the therapeutic interventions:

Bronchodilator therapy

Steroid treatment for asthma

Chronic obstructive lung disease

Interstitial lung disease

DIAGNOSIS OF COPD

SYMPTOMS

cough
sputum
dyspnea

EXPOSURE TO RISK FACTORS

tobacco
occupation
indoor/outdoor pollution

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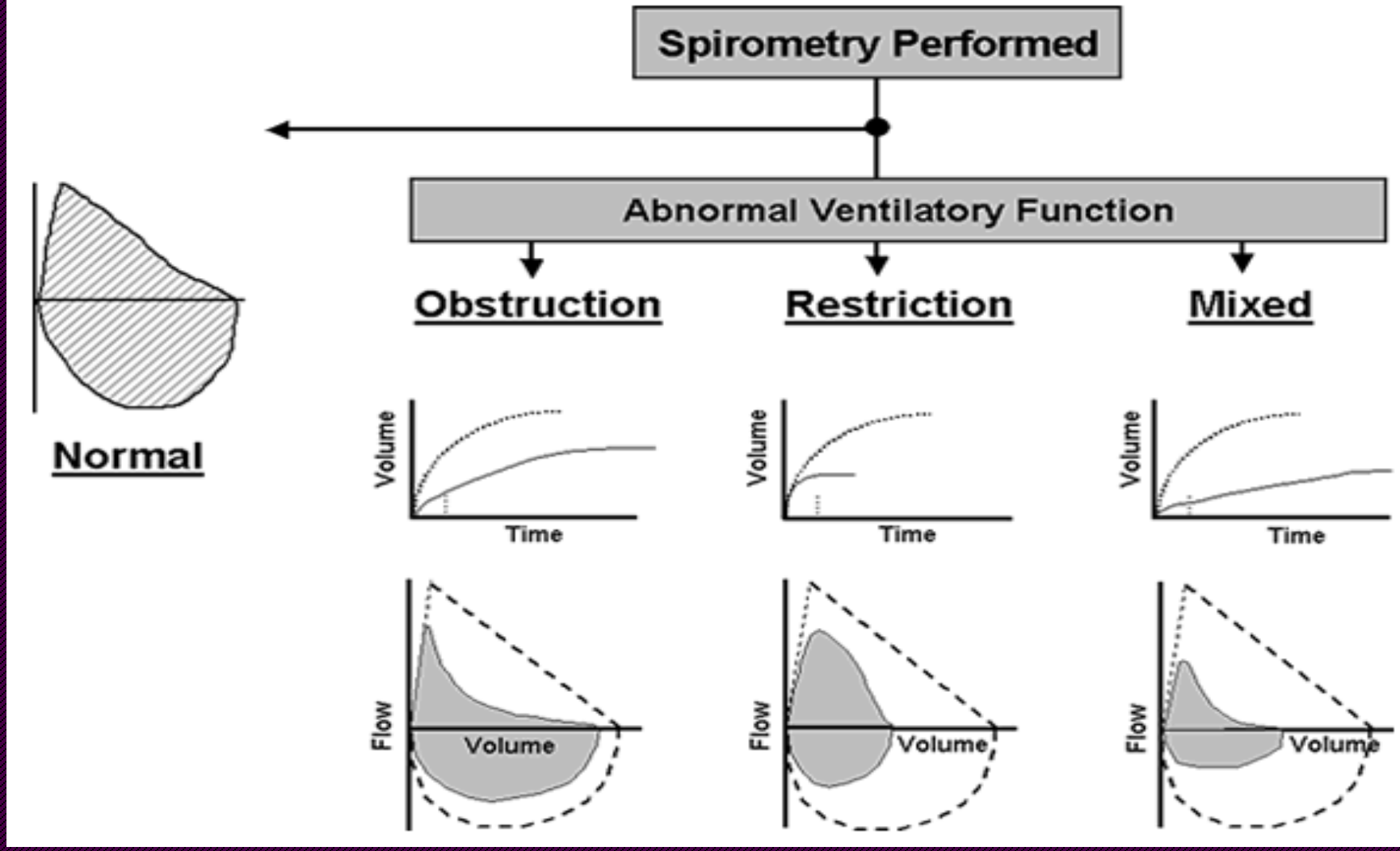
SPIROMETRY

SPIROMETRY IN RESPIRATORY DISEASES



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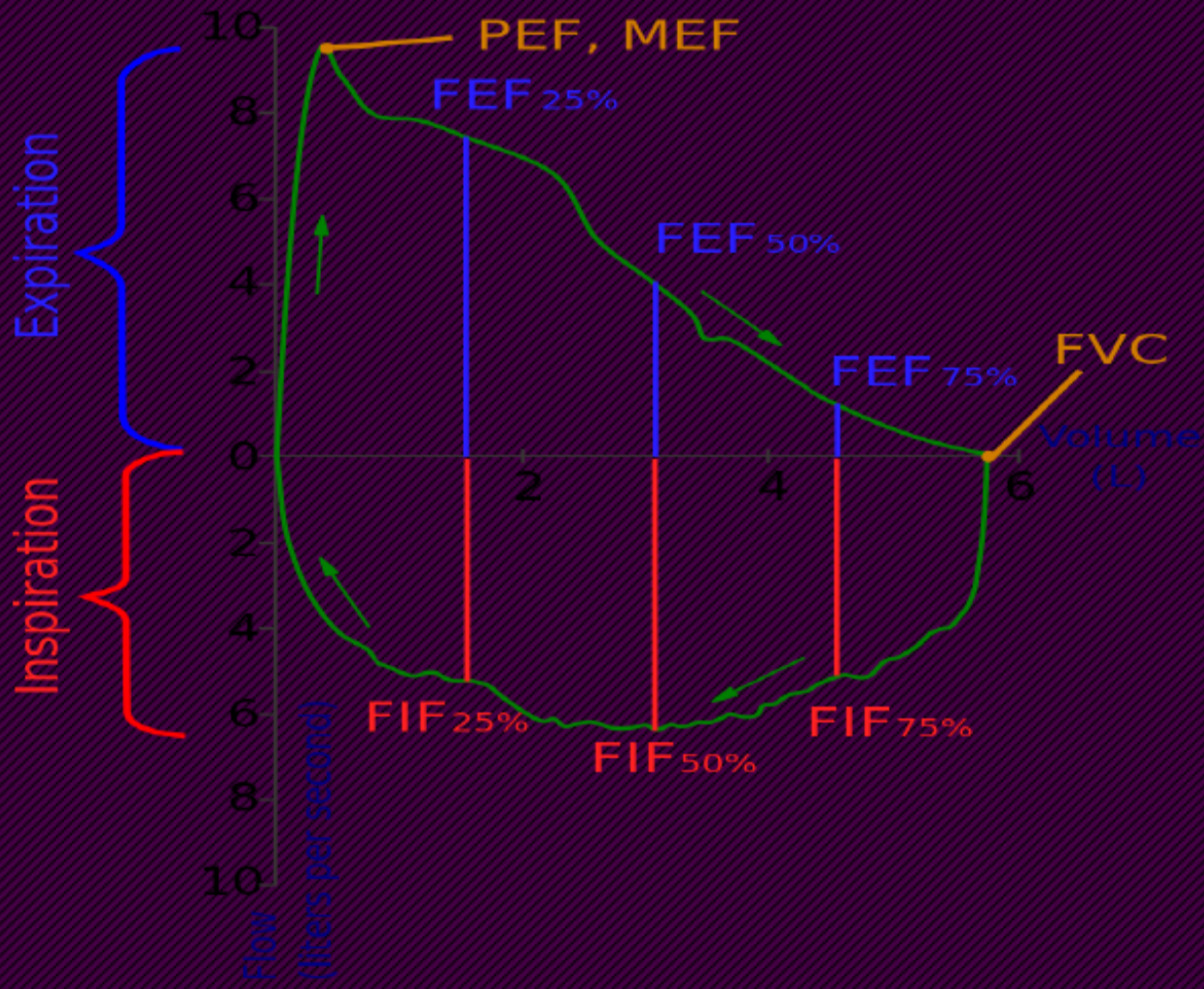

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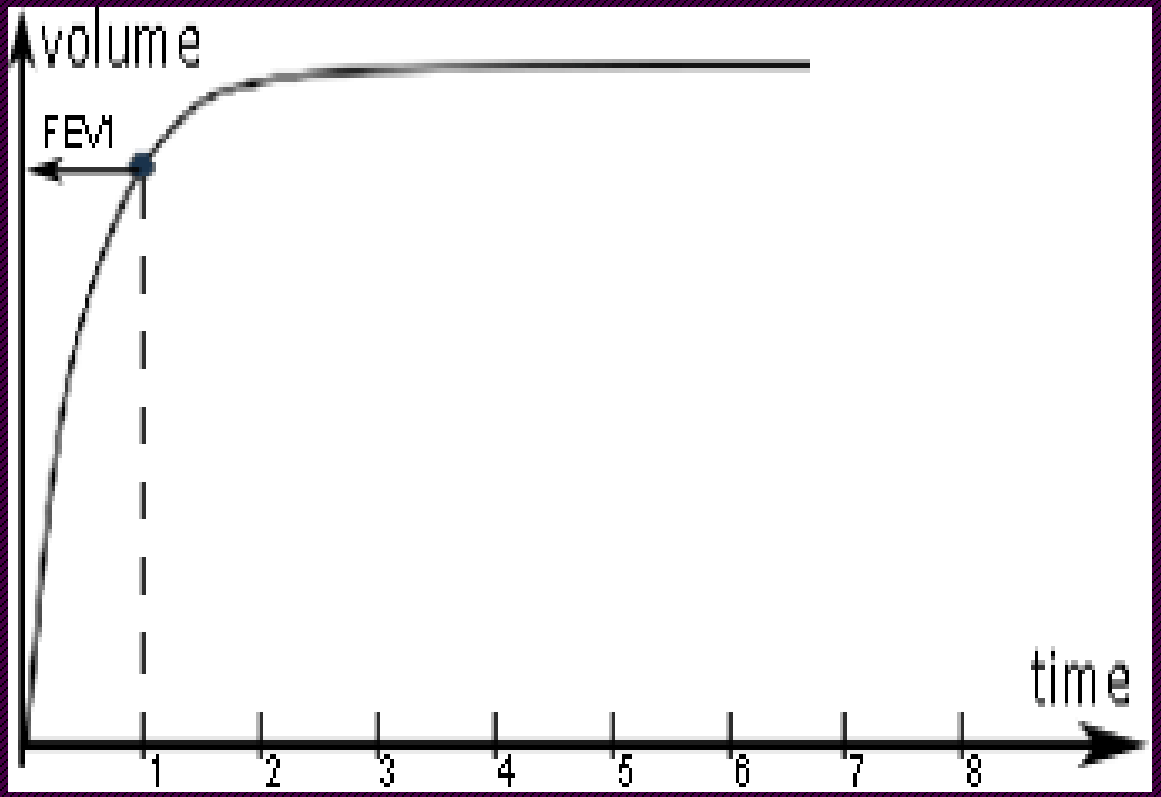

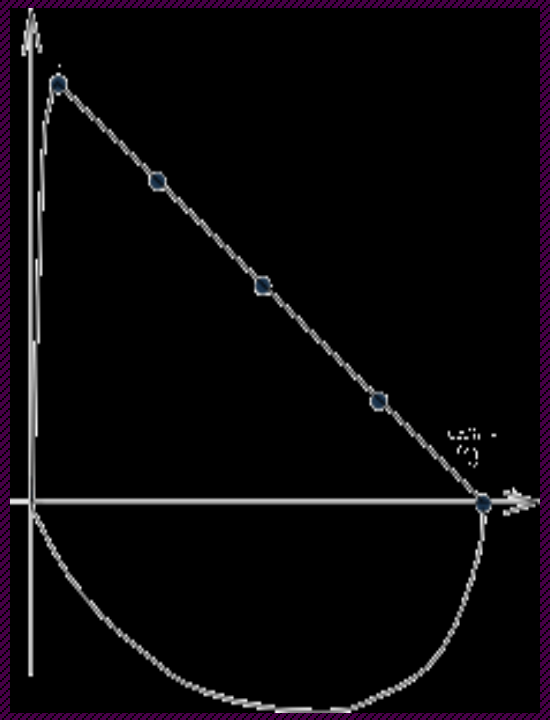

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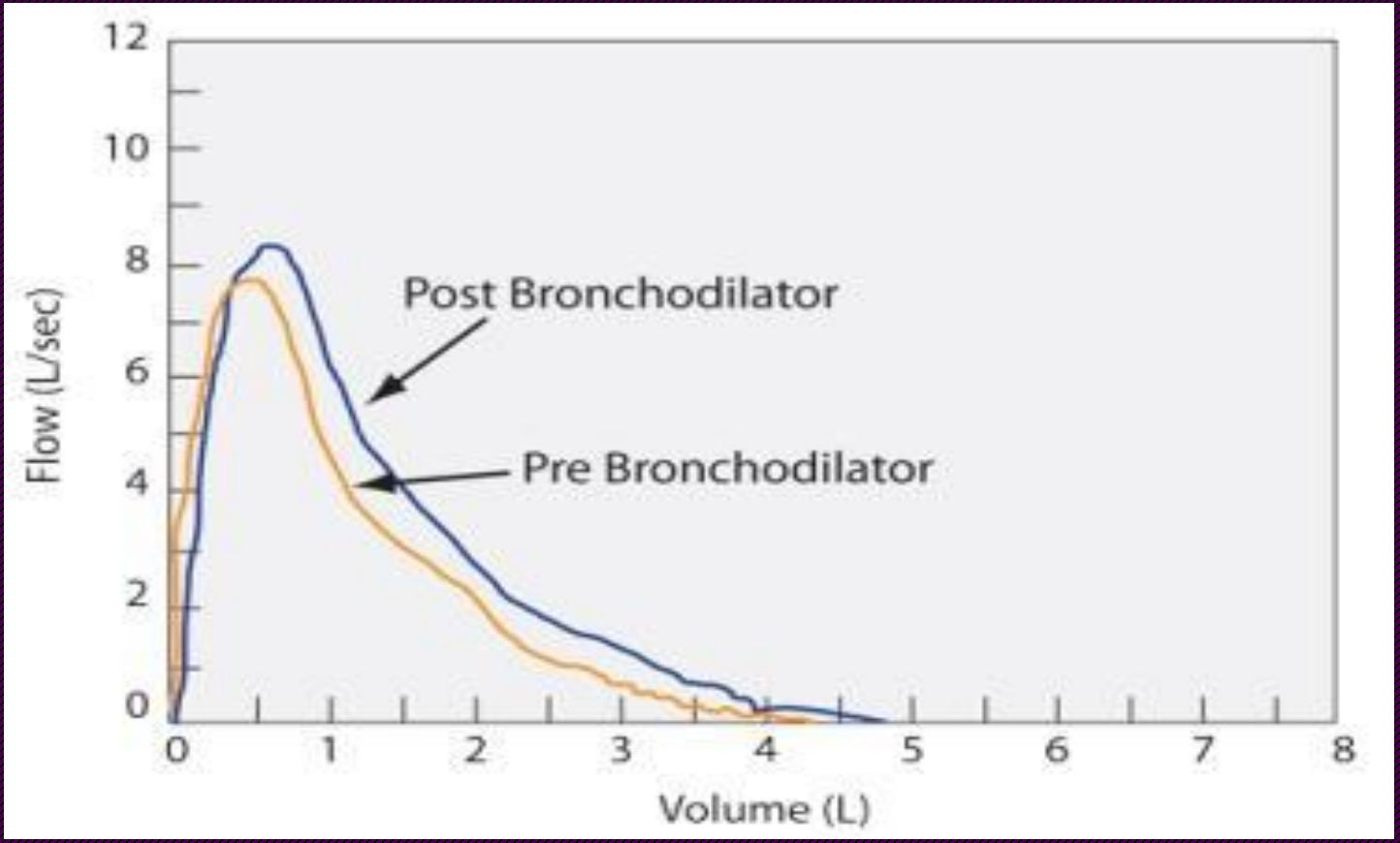

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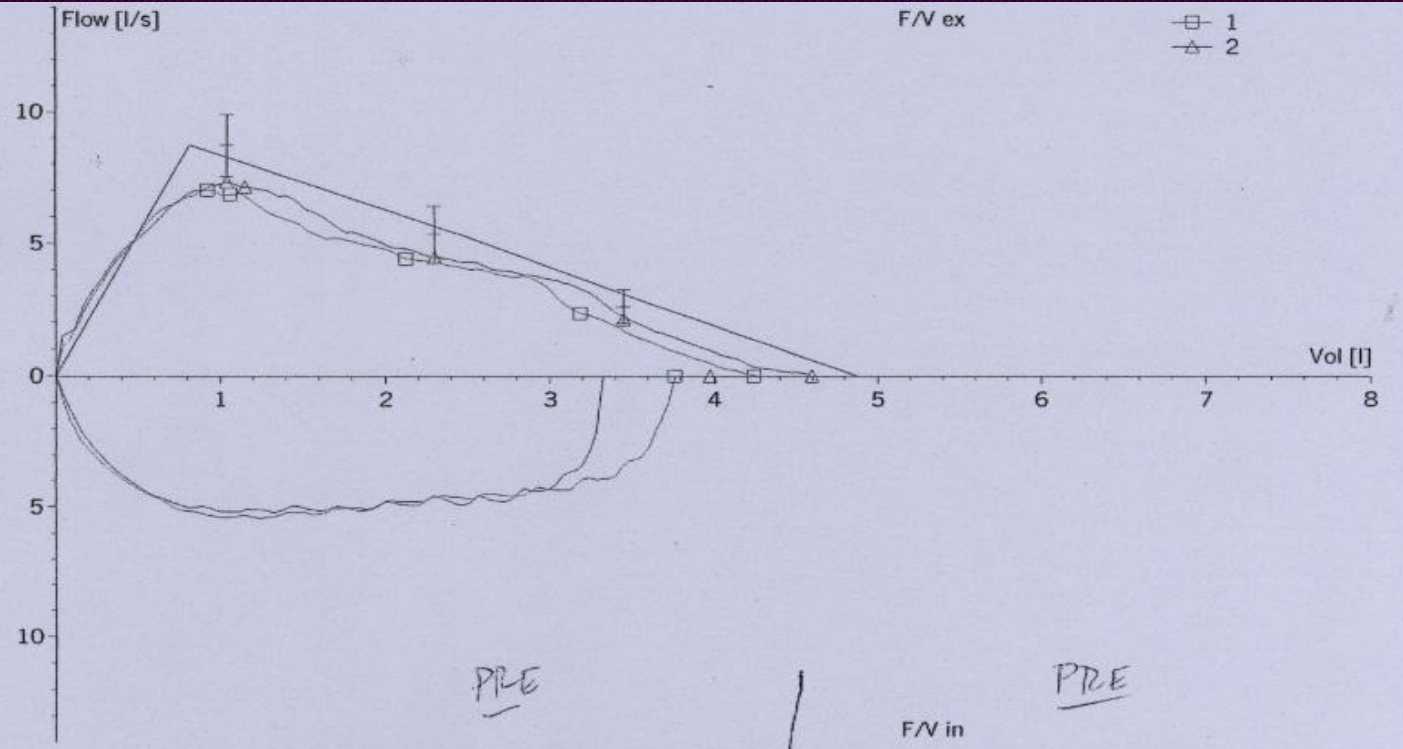


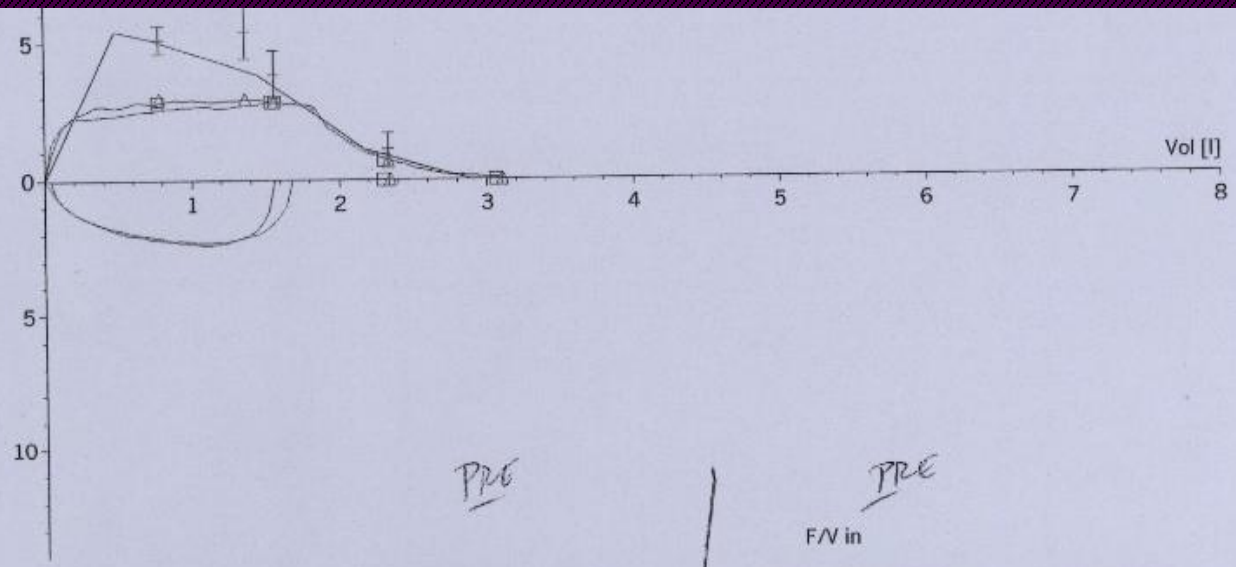
PRE

PRE

F/V in

	Pred	Act1	%Act1/Pred	Act2	%Act2/Pred	%Act2/1
VC IN	7.33	3.74	51.1	3.29	44.9	87.8
IC	1.81					
ERV	1.68					
FVC	4.89	4.24	86.8	4.59	94.0	108.3
FEV 1	4.01	3.76	93.9	3.97	99.2	105.7
FEV1%F	88.69	88.62	99.9	86.49	97.5	97.6
PEF	8.69	6.99	80.5	7.27	83.7	104.0
FEF 25		6.82		7.09		104.0
FEF 50	5.34	4.38	82.1	4.44	83.0	101.2
FEF 75	2.59	2.33	89.9	2.09	80.6	89.7
MMEF	4.85	4.53	93.5	4.40	90.8	97.1

SPIROMETRY IN RESPIRATORY DISEASES



PRE

PRE

F/V in

	Pred	Act1	%Act1/Pred	Act2	%Act2/Pred	%Act2/1
VC IN	3.01	1.64	54.5	1.52	50.6	92.9
IC	1.82					
ERV	1.27					
FVC	2.89	3.06	105.8	3.11	107.4	101.5
FEV 1	2.44	2.29	94.0	2.34	95.9	102.0
FEV1%F	83.96	74.92	89.2	75.31	89.7	100.5
PEF	5.41	2.80	51.8	2.92	53.9	104.2
FEF 25	5.11	2.80	54.9	2.92	57.2	104.2
FEF 50	3.84	2.80	72.9	2.81	73.1	100.2
FEF 75	1.10	0.71	64.7	0.66	60.2	93.0
MMEF	2.90	1.91	65.9	1.89	65.4	99.1
Date		16/02/20		16/02/2015		
Time		11:26:08		11:29:06AM		

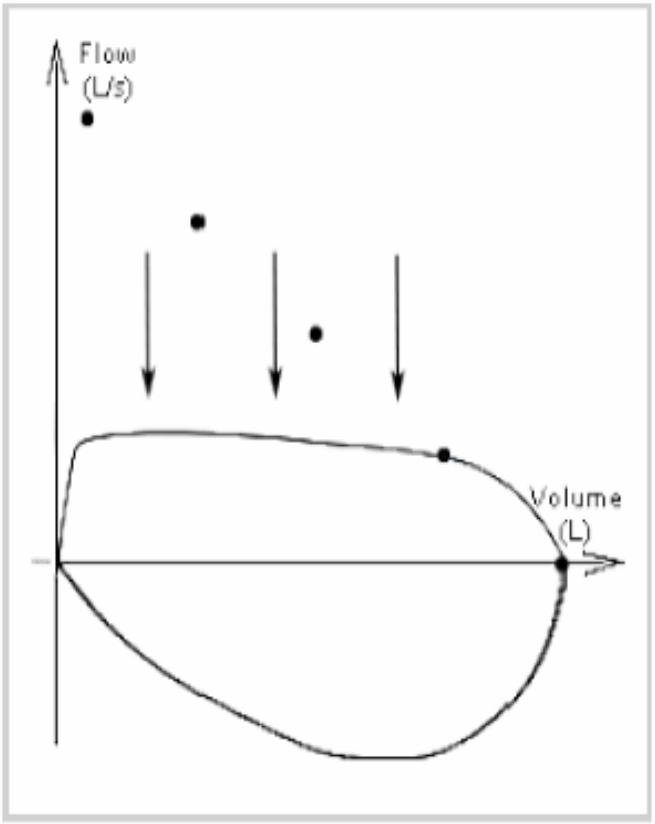
SPIROMETRY IN RESPIRATORY DISEASES

	Pred	Act1	%Act1/Pred	Act2	%Act2/Pred	%Act2/1
VC IN	4.19	3.14	74.9	3.25	77.6	103.6
IC	2.28					
ERV	1.52					
FVC	3.99	4.61	115.5	4.92	123.3	106.7
FEV 1	3.50	3.37	96.4	3.59	102.5	106.4
FEV1%F	85.83	73.20	85.3	72.94	85.0	99.6
PEF	8.09	8.57	105.9	7.59	93.9	88.6
FEF 25		6.87		7.59		110.5
FEF 50	4.62	2.73	59.0	2.83	61.2	103.6
FEF 75	2.02	0.90	44.5	0.91	44.9	100.9
MMEF	4.02	2.29	57.1	2.40	59.8	104.7

SPIROMETRY IN RESPIRATORY DISEASES

	Pred	Act1	%Act1/Pred	Act2	%Act2/Pred	%Act2/1
VC IN	2.53	1.38	54.7	1.40	55.3	101.1
IC	1.88					
ERV	1.20					
FVC	3.01	2.21	73.5	2.35	78.3	106.5
FEV 1	2.77	1.94	70.3	1.92	69.5	98.9
FEV1%F	92.90	88.00	94.7	81.73	88.0	92.9
PEF	5.69	3.15	55.3	3.38	59.4	107.5
FEF 25	5.57	3.15	56.5	2.90	52.1	92.3
FEF 50	4.55	2.04	44.9	1.89	41.5	92.5
FEF 75	1.86	1.20	64.9	0.98	53.0	81.6
MMEF	3.71	1.91	51.4	1.74	46.8	91.0

SPIROMETRY IN RESPIRATORY DISEASES



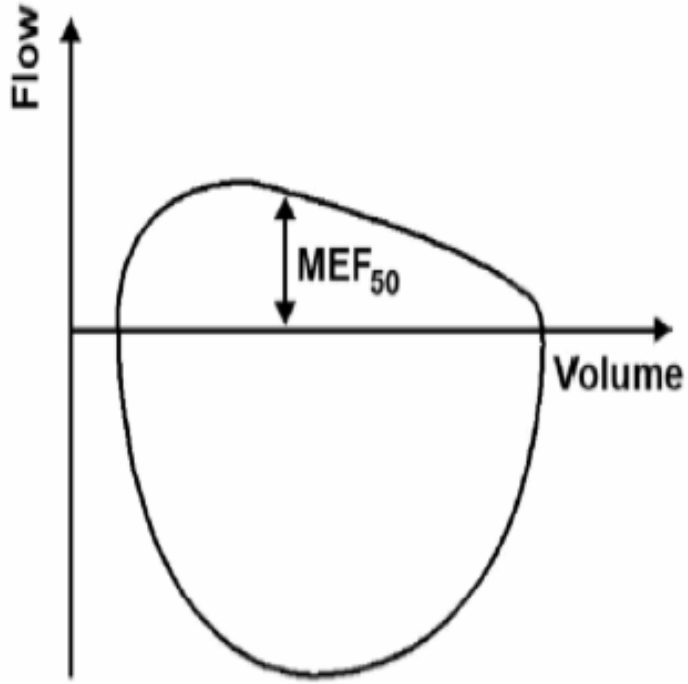
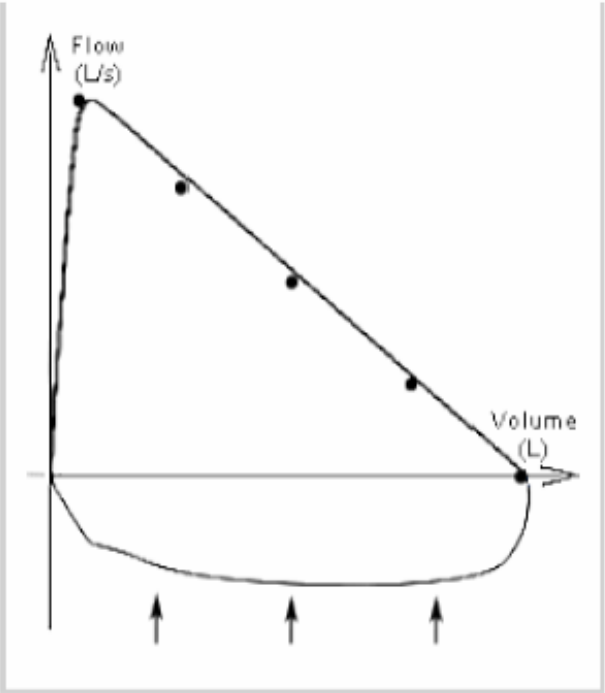


Figure-7: Intrathoracic obstruction.

SPIROMETRY IN RESPIRATORY DISEASES



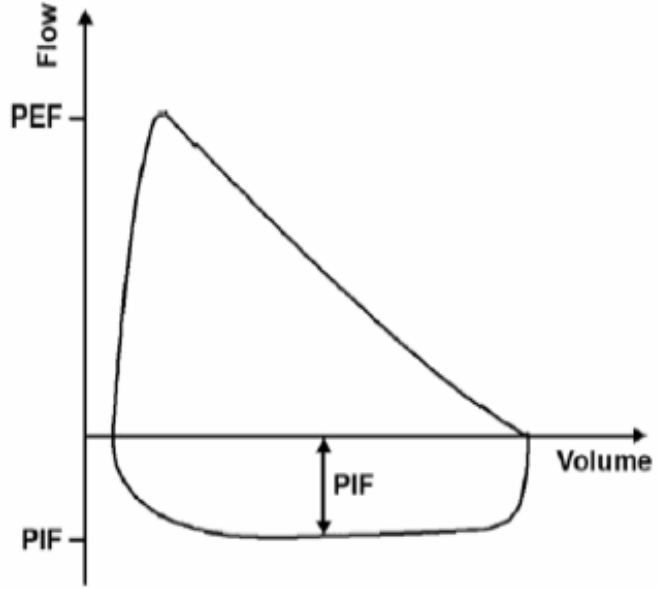
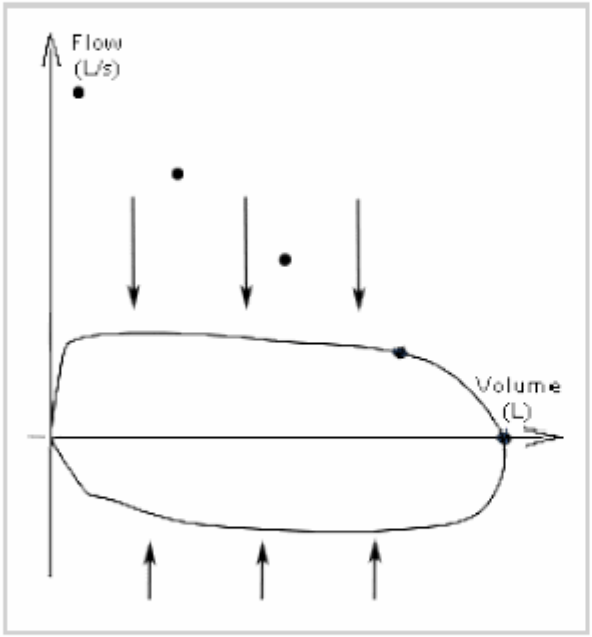


Figure-6: Extracellular obstruction (e.g., tracheal involvement above the sternal notch).

SPIROMETRY IN RESPIRATORY DISEASES



Typical flattening of flow-volume loop in fixed airway obstruction

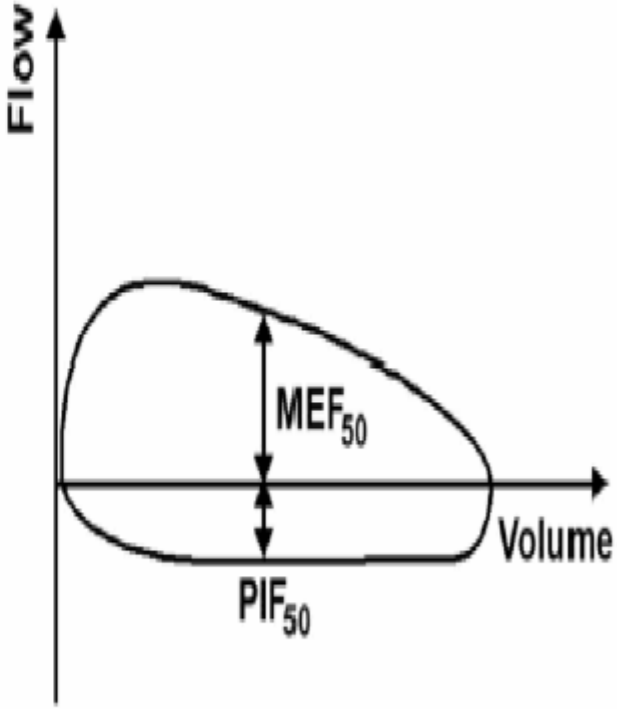


Figure-8: Fixed airway obstruction.

SMOKERS AND SPIROMETRY

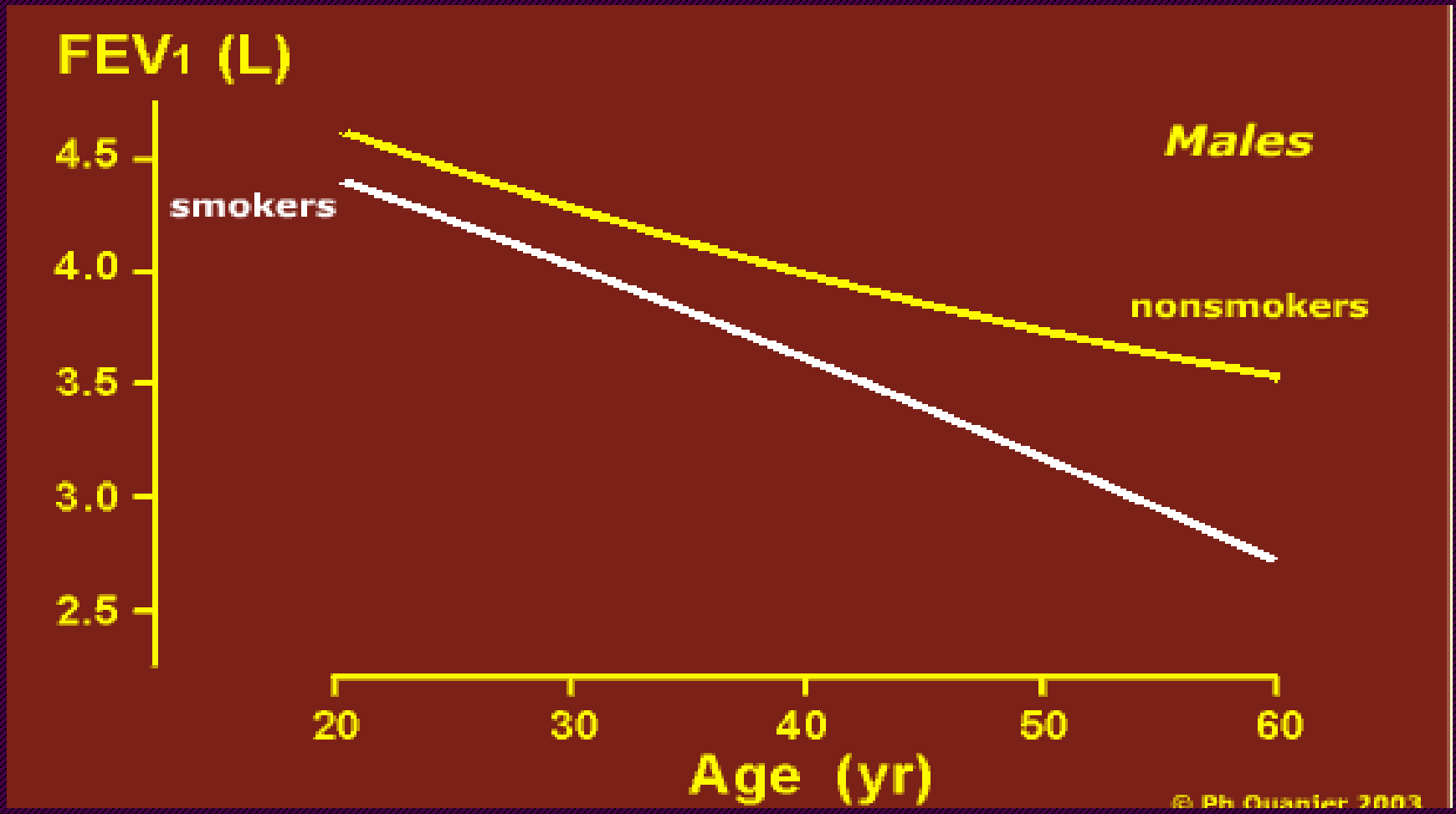
Smoker & Non Smoker:

Non Smoker: In normal healthy non smoker subject after the age of 30 the expected decline in Lung function parameter [FEV1] is 25–30 ml/ annum

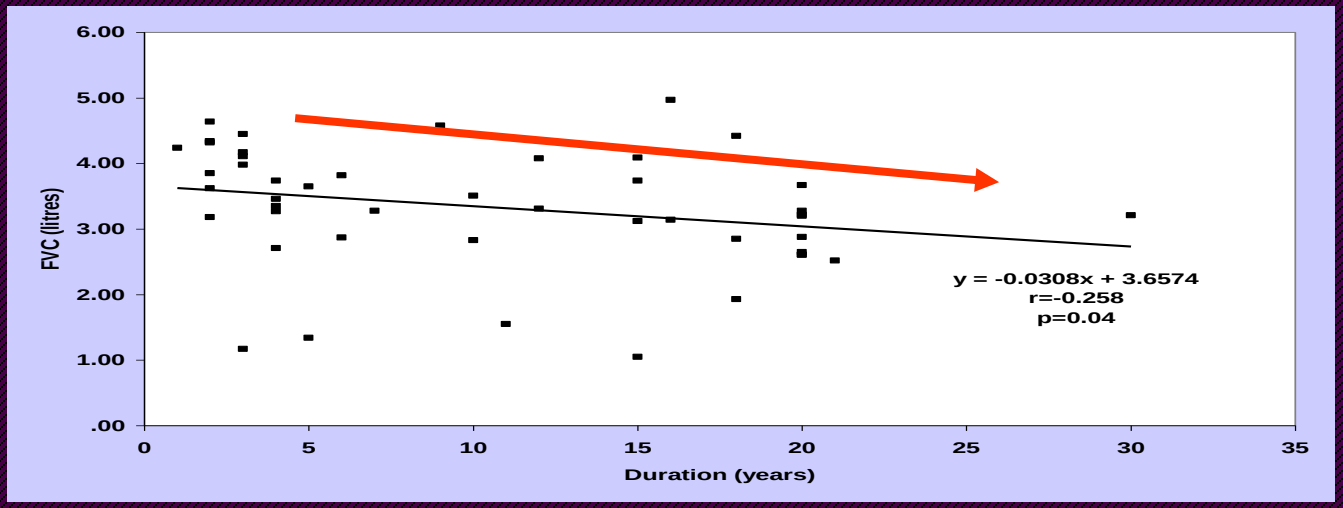
Smoker: The average rate of decline of lung function in smokers as measured by Forced Expiratory Volume in 1 sec [FEV1] is 60-70 ml / annum

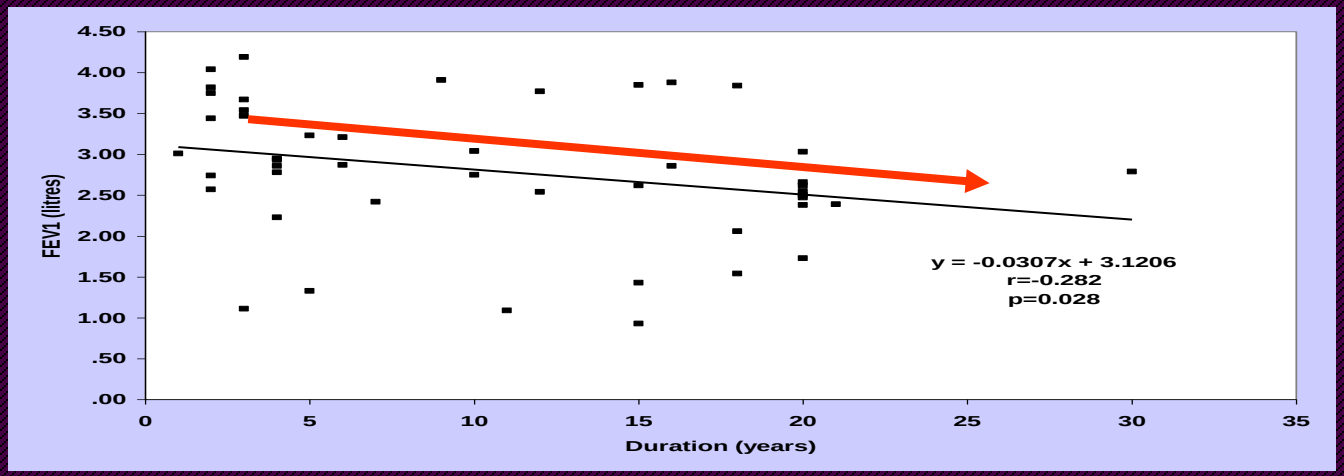
Davis et al., Diabetes Care, 2004

SMOKERS AND SPIROMETRY



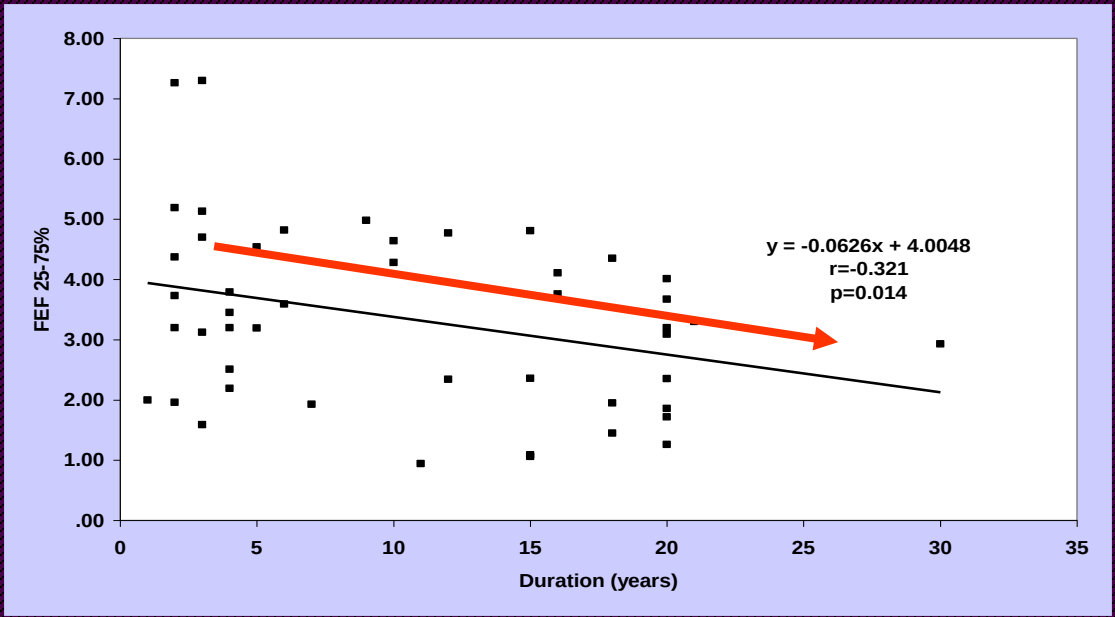
IMPAIRED LUNG FUNCTION IN DM

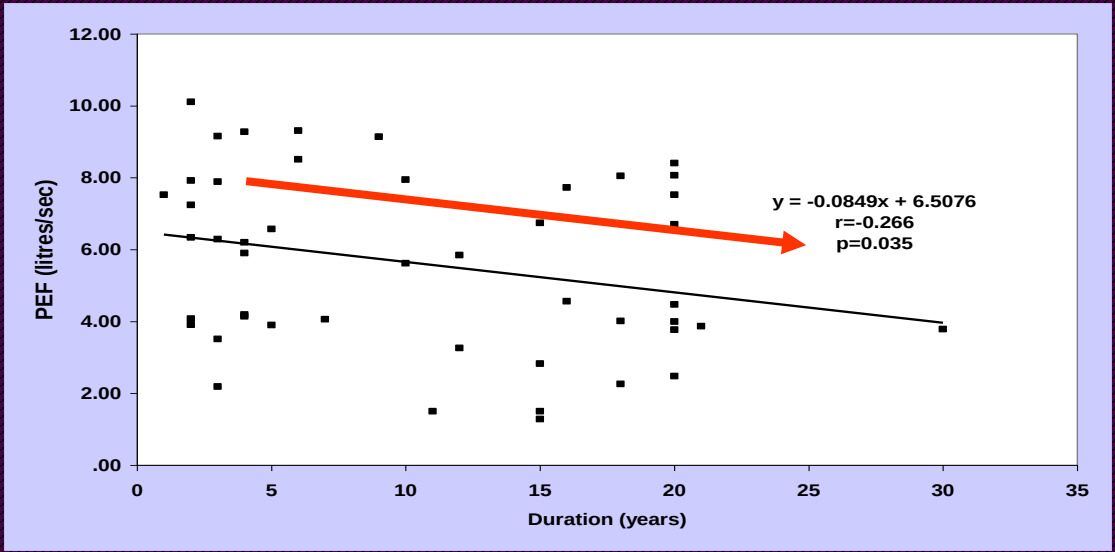




Meo and Al -Rubeaan, Saudi Med J; 2006

IMPAIRED LUNG FUNCTION IN DM

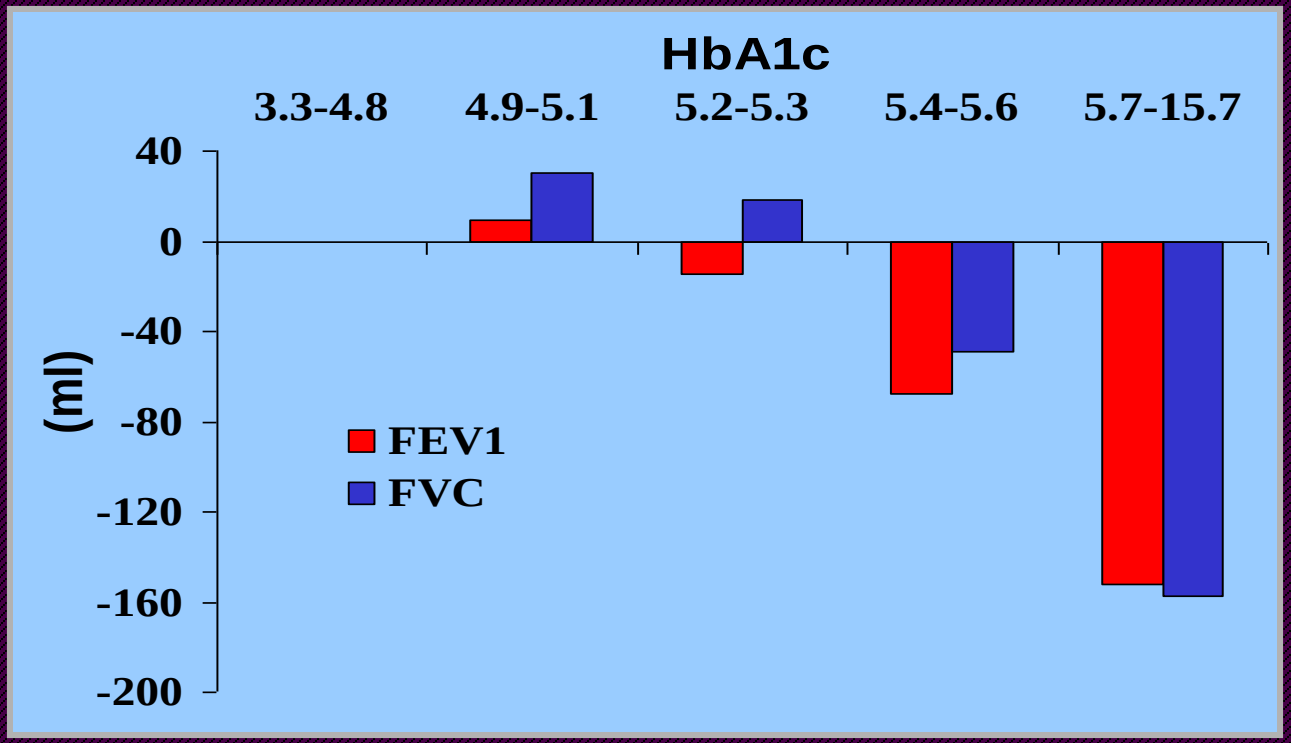




Meo and Al Rubeaan, Saudi Med J; 2006

SPIROMETRY& HbA1c

Increase in mean HbA1c is associated with decrease in lung function parameters FVC & FEV1



Davis et al., Diabetes Care 2004

Mc Keever et al., Am J Epidemiol, 2005

SIROMETRY AND CEMENT INDUSTRY

Lung Function Parameters

- **FVC**
- **FEV1**
- **FEF 25-75 % and**
- **PEF**

were significantly decreased in cement mill workers compared to their matched controls

Meo et al., Int J Occup Med Environ Health, 2006

SIROMETRY AND WELDING INDUSTRY

Lung Function Parameters

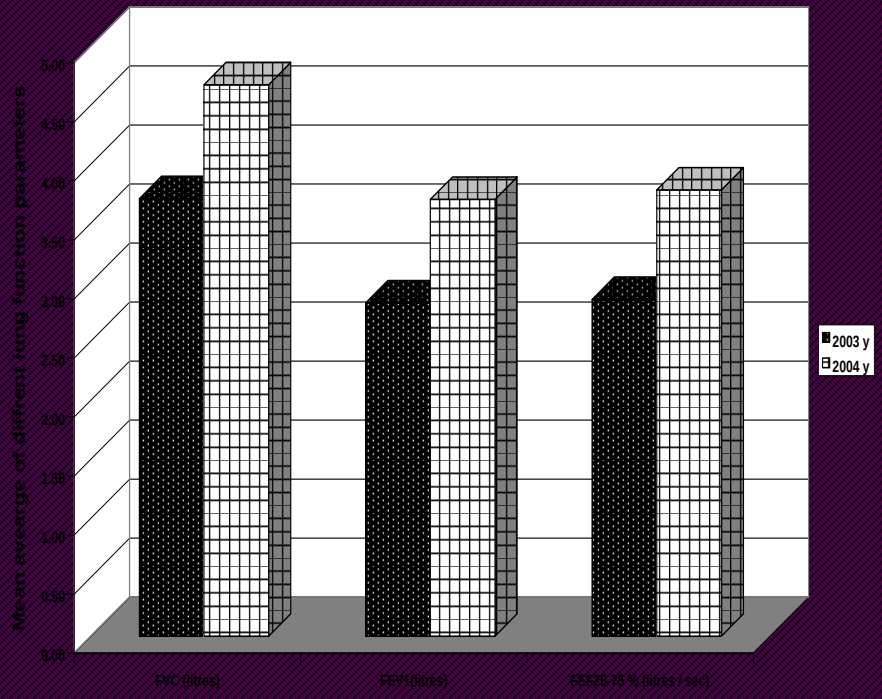
- FVC
- FEV1
- PEF

were significantly impaired in welding workers compared to their matched controls

Meo et al., Am J Occup and Environ Med, 2003

SIROMETRY AND OIL SPILL Y

Lung Function Parameters FVC, FEV_1, and FEF 25-75% were impaired in subjects exposed to crude oil spill in sea water



Meo et al., Marine pollution Bulletin, 2008, Meo, et al., Int J Occup Med and Envirm Health, 2009

TAKE HOME MESSAGE

- The incidence of respiratory diseases has been increased, hence the importance of lung function test can not be ignored
- Respiratory assessment through Spirometry may be mandatory at all the levels of respiratory care / clinical settings

TAKE HOME MESSAGE

- As we can not treat the patient with high blood pressure without knowing the blood pressure

- Similarly, we can not treat the patients with respiratory problems without knowing the lung function test [Spirometry]

THANK

YOU