Interpreting PFTs McGill Family Medicine Refresher Course 2019

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Disclosures

Relationships with commercial interests:

- Grants/Research support:
  - AstraZeneca, Rossy, QCROC, JGH Internal Medicine Department
- Speakers bureau/Honoraria/Consulting:
  - Astra-Zeneca, EMD Sereno, Merck, Pfizer, Takeda, Novartis, BI, BMS, Purdue, Roche, Bayer

Objectives

- As a result of attending this session, participants will be able to:
  - Identify the indications to order a pulmonary function test
  - Interpret a basic pulmonary function test.
  - Differentiate obstructive vs. restrictive lung disease

Components of PFTS

- Spirometry
- Flow Volume Loop
- Bronchodilator response
- Lung volumes
- Diffusion capacity (DLCO)
- Bronchoprovocation testing

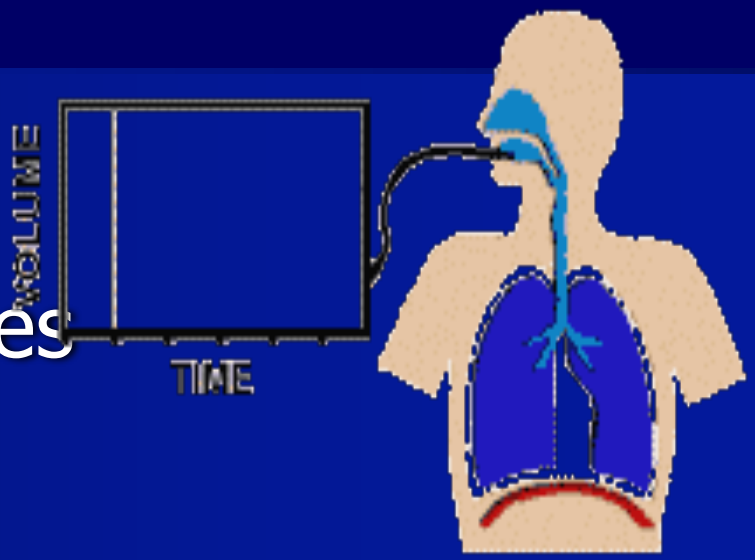
Indications — Diagnosis

- Evaluation of signs and symptoms
  - SOB, exertional dyspnea, chronic cough
- Screening at-risk populations
- Monitoring pulmonary drug toxicity
- Abnormal study
  - CXR, EKG, ABG, hemoglobin
- Preoperative assessment

Indications — Prognostic

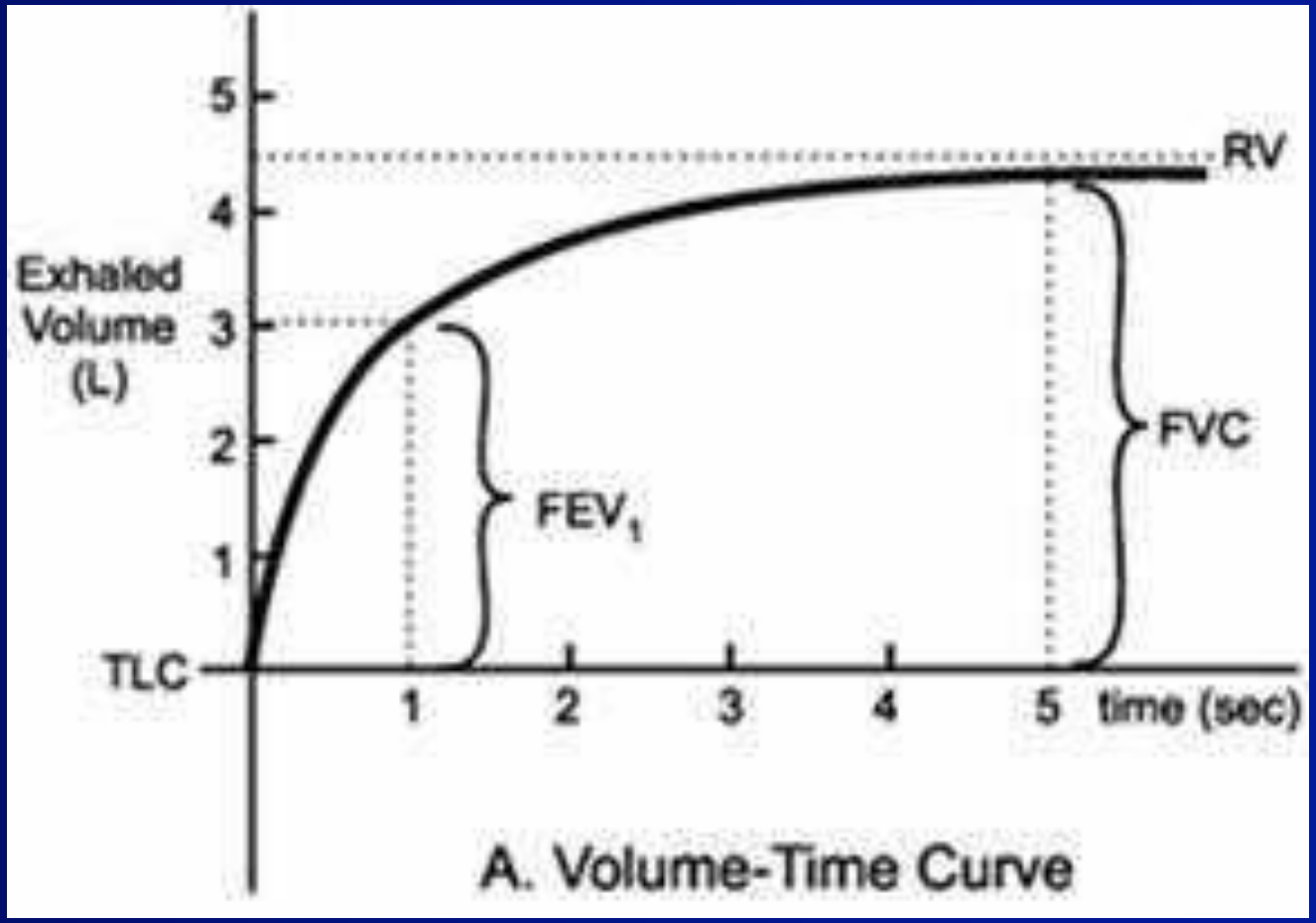
- Assess severity
- Follow response to therapy
- Determine further treatment goals
- Referral for surgery
- Disability

Spirometry



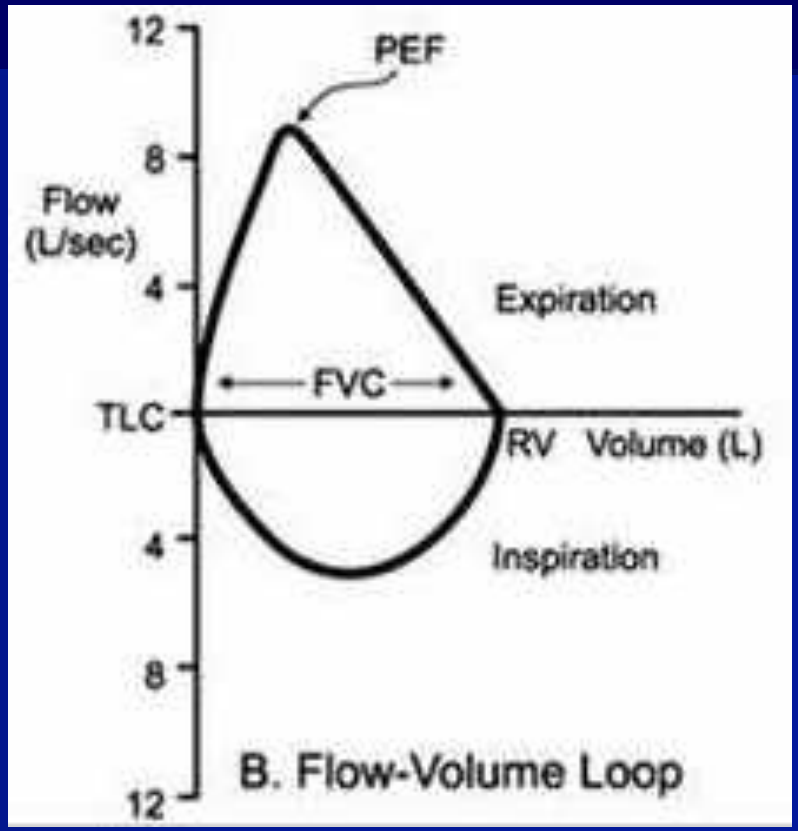
- Simple, office-based
- Measures flow, volumes
- Volume vs. Time
- Can determine:
  - Forced expiratory volume in one second (FEV_1)
  - Forced vital capacity (FVC)
  - FEV_1/FVC
  - Forced expiratory flow 25%-75% (FEF_{25-75})

The volume is plotted against the time, it displays the expiration.



Flow-volume loops

- Is a plot of inspiratory and expiratory flow in the vertical axis against volume in the horizontal axis, during the performance of maximally forced inspiratory and expiratory maneuvers.

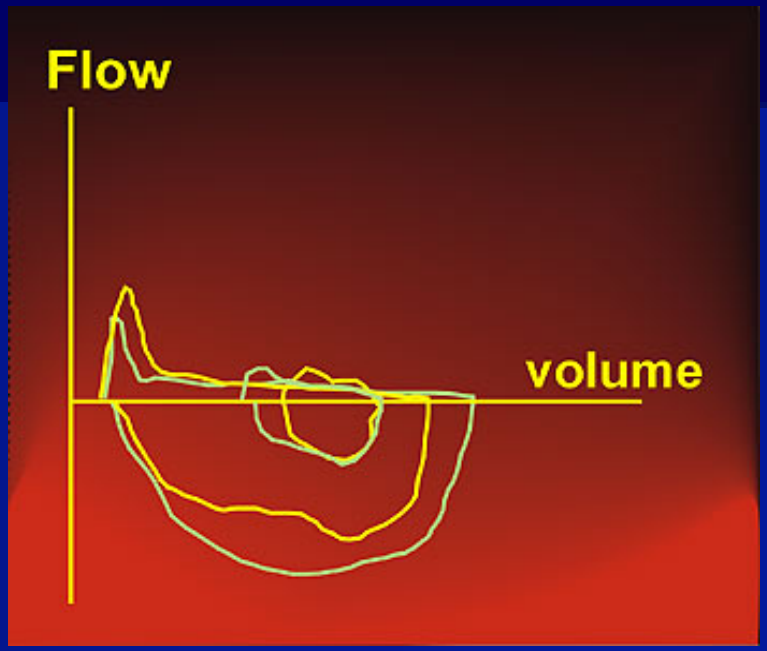


Normal Values

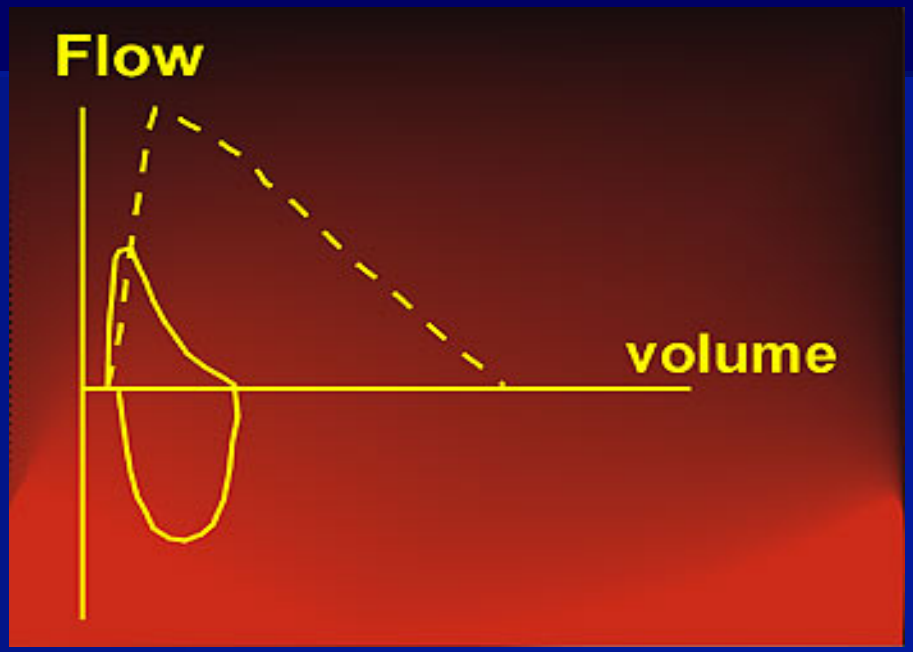
- Compared to population norms
- Normal is within 2 standard deviations from the mean
- Generally 80-120% predicted
- Predicted values
  - Age
  - Sex
  - Height
  - Race

Obstructive Pattern

- Decreased FEV_1
- Decreased FVC
- Decreased FEV_1/FVC
  - <75%



Restrictive Pattern

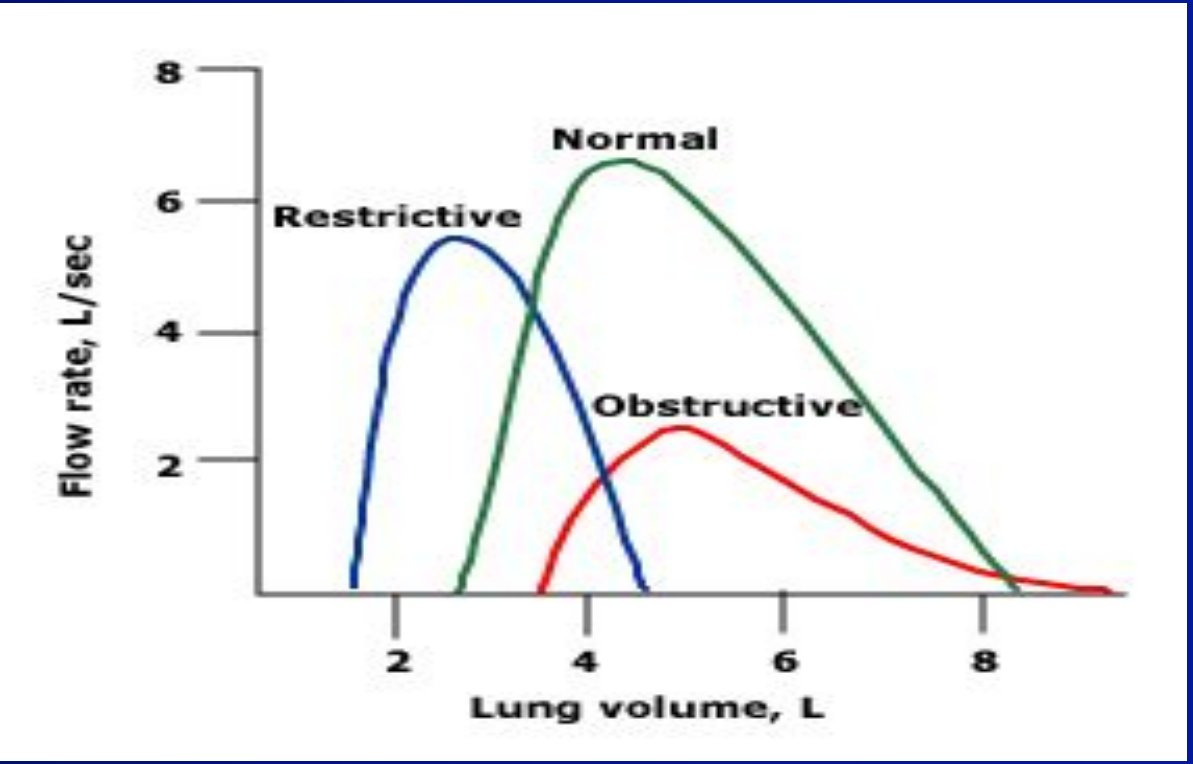


- Decreased FEV_1
- Decreased FVC
- FEV_1/FVC *normal* or *increased*

Obstructive & restrictive defects

Parameter	Obstruction	Restriction
FEV1	Reduced	Reduced
FVC	Normal	Reduced
FEV1/FVC	Reduced	Normal/Increased

Spirometry Patterns



Bronchodilator Response

- Degree to which FEV_1 improves with inhaled bronchodilator
- Documents *reversible* airflow obstruction
- Significant response if:
  - FEV_1 increases by 10% and >200ml
- Request if obstructive pattern on spirometry

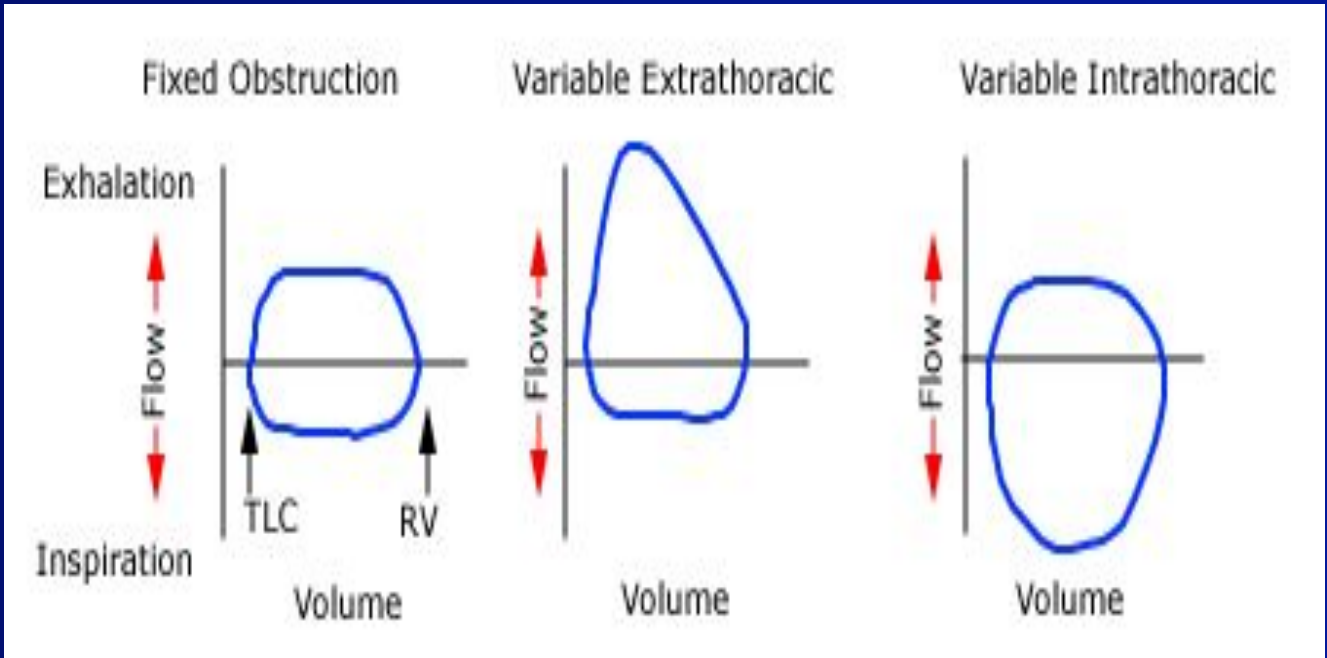
Bronchoprovocation

- Useful for diagnosis of asthma in the setting of *normal* pulmonary function tests
- Common agents:
  - Methacholine, Histamine
- Diagnostic if: ≥20% decrease in FEV_1

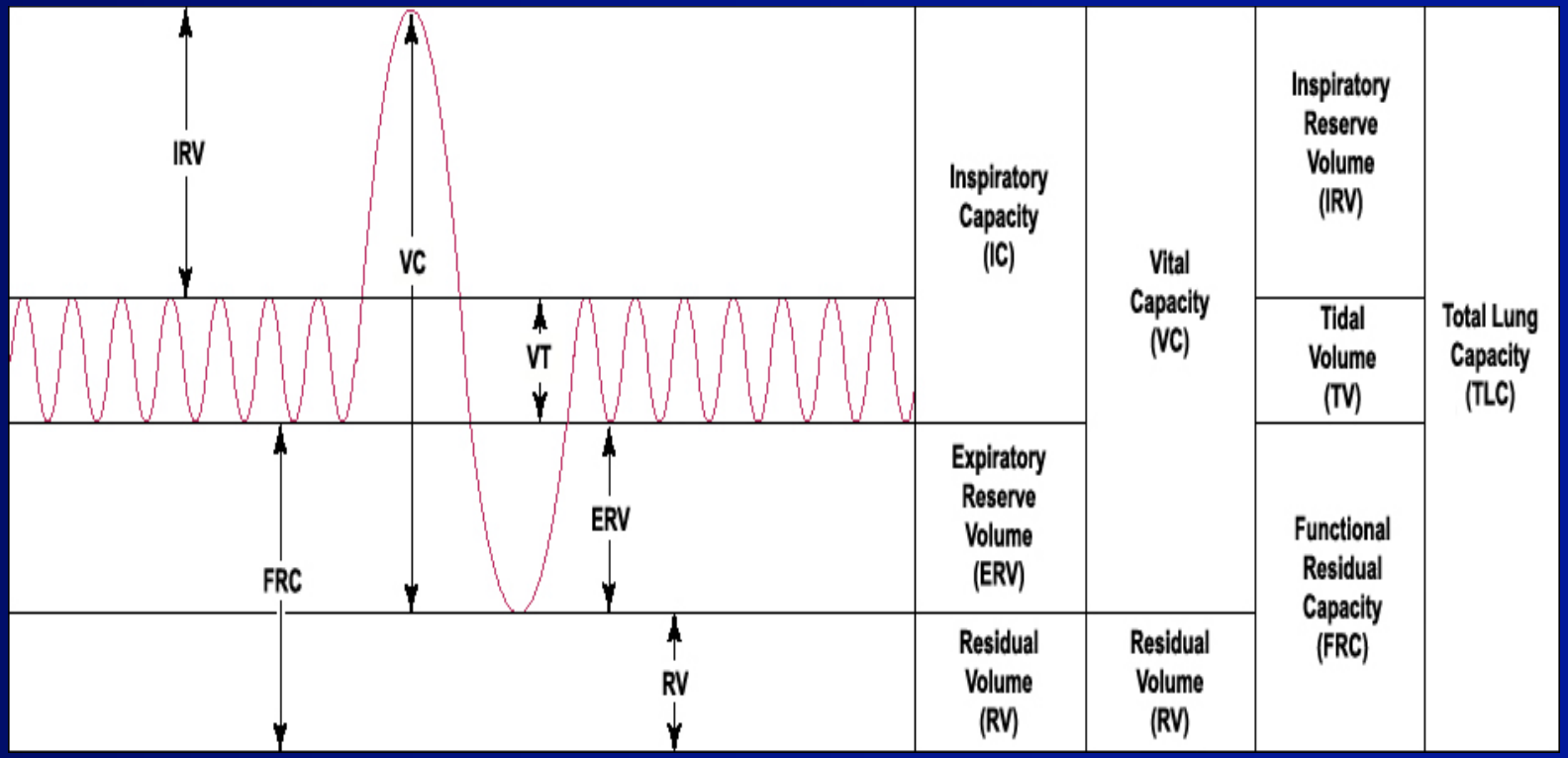
Upper Airway Obstruction

- Variable intrathoracic obstruction
- Variable extrathoracic obstruction
- Fixed obstruction

Upper Airway Obstruction



Lung Volumes



Lung Volumes

- Measurement:
  - helium
  - body plethsmography
- Indications:
  - Diagnose restrictive component

Lung Volumes – Patterns

- Obstructive
  - TLC > 120% predicted
  - RV > 120% predicted
- Restrictive
  - TLC < 80% predicted
  - RV < 80% predicted

Diffusing Capacity

- Diffusing capacity of lungs for CO
- Measures ability of lungs to transport inhaled gas from alveoli to pulmonary capillaries
- Depends on:
  - alveolar—capillary membrane
  - hemoglobin concentration
  - cardiac output

Diffusing Capacity

- **Decreased DLCO**
  (<80% predicted)
  - Obstructive lung disease
  - Parenchymal disease
  - Pulmonary vascular disease
  - Anemia
- **Increased DLCO**
  (>120-140% predicted)
  - Asthma (or normal)
  - Pulmonary hemorrhage
  - Polycythemia
  - Left to right shunt

Obstructive Pattern — Evaluation

- **Spirometry**
  - FEV_1, FVC: decreased
  - FEV_1/FVC: decreased (<70% predicted)
- **FV Loop** "scooped"
- **Lung Volumes**
  - TLC, RV: increased
- Bronchodilator responsiveness

Restrictive Pattern – Evaluation

- **Spirometry**
  - FVC, FEV_1: decreased
  - FEV_1/FVC: normal or increased
- **FV Loop** "witch's hat"
- **DLCO** decreased
- **Lung Volumes**
  - TLC, RV: decreased
- Muscle pressures may be important

Examples

Case 1

- A 27 year old male with episodic dyspnea worsened by cold weather, exposure to cats and severe exercise.

RESPIRATORY PHYSIOLOGY DEPT.

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

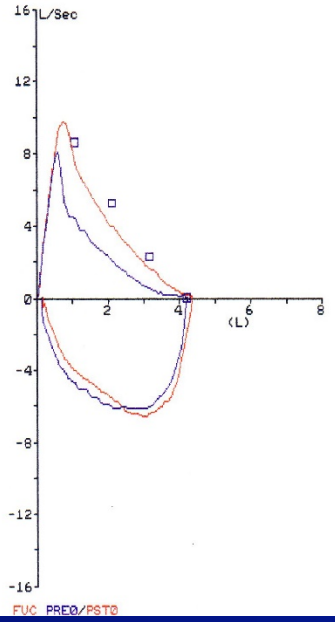
PT#: 515294 ADDL.ID: T54052 RM#: DATE: 02/19/2003
PT: SEX: M AGE: 27 HT: 172.0 cm
TAPJ75032911 BP: 752 TEMP: 22.8 PRED-COLLINS2 RACE: B WT: 81.0 kg
PHYSICIAN: A.HIRSCH TECH: P. KUPFER
SMK HX: QUIT 5Y;(CIGARETTES 0 0.2P/DAY 0PACK/YRS)

		Pre-Drug* A			Post-Drug* A VENTOLIN200MCG		
Spirometry		ACTUAL	%PRED	PREDICTED	ACTUAL	%PRED	%CHG
FVC	(L)	4.21	100	4.19	4.36	104	3
FEV1	(L)	2.78	79	3.51	3.50	100	26
FEV1/FVC	(%)	66	79	84	80	96	21
FEF25-75%	(L/S)	1.55	35	4.46	3.18	71	105
FEF50%	(L/S)	1.96	37	5.24	3.69	71	88
FIF50%	(L/S)	6.17			5.89		-4
FEF50/FIF50	(%)	32			63		97

		Pre-Drug* Avg		
Lung Volumes		ACTUAL	%PRED	PREDICTED
TLC	(L)	5.94	106	5.61
FRC	(L)	2.98	105	2.84
RV	(L)	1.73	123	1.41
VC	(L)	4.22	101	4.19
ERV	(L)	1.26	88	1.43

	Pre-Drug* Avg		
Diffusion	ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg	30.68	96	32.08

NOTES:



Case 2

- A 72 year old male with a 60 pack year history of smoking. Denies respiratory symptoms.
- Pre-op CABG

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

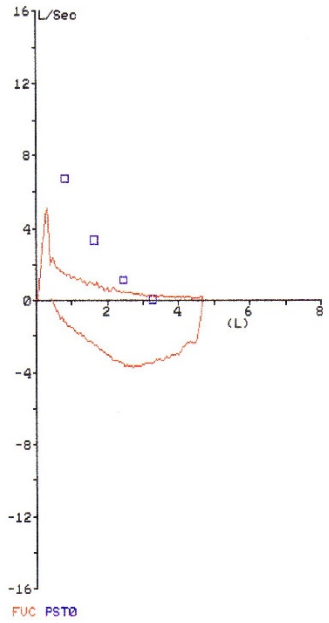
PT#: 827706 ADDL.ID: T53104 RM#: CCU DATE: 08/21/2002
PT: SEX: M AGE: 72 HT: 168.0 cm
GAUR30060619 PRED-COLLINS2 RACE: C WT: 54.0 kg
PHYSICIAN: TECH: R.MATTOSCIO
HX: QUIT 0 ;(CIGARETTES 62Y 1.0P/DAY 62PACK/YRS)

Spirometry		PREDICTED	Post-Drug* M COMBIVENT ACTUAL	%PRED
FVC	(L)	3.25	4.63	142
FEV1	(L)	2.55	1.58	62
FEV1/FVC	(%)	79	34	43
FEF25-75%	(L/S)	2.60	0.44	17
FEF50%	(L/S)	3.32	0.42	13
FIF50%	(L/S)		3.62	
FEF50/FIF50	(%)		12	

Lung Volumes		PREDICTED	Post-Drug* Avg COMBIVENT ACTUAL	%PRED
TLC	(L)	5.55	7.50	135
FRC	(L)	3.62	5.07	140
RV	(L)	2.31	2.81	122
VC	(L)	3.25	4.69	144
ERV	(L)	1.31	2.25	173

Diffusion	PREDICTED	Post-Drug* Avg COMBIVENT ACTUAL	%PRED
Dsb ml/min/mmHg	23.72	18.12	76

DX: PRE-OP CABG; MVV= 74% PRED.; HGB= 126 ON 08/21.



Case 3

- Progressive dyspnea with a history of construction work, asbestos exposure.

RESPIRATORY PHYSIOLOGY DEPT.

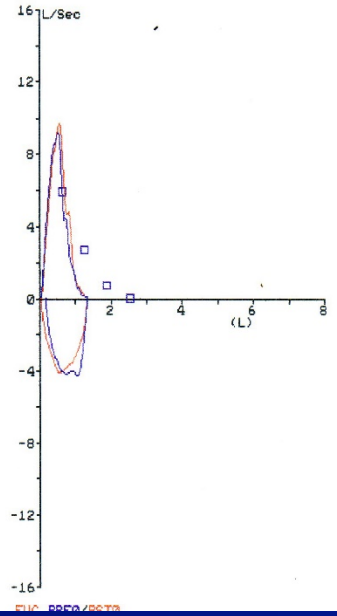
HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

PT#: 534359 ADDL.ID: T51408 RM#: DATE: 11/13/2001
: SEX: M AGE: 77 HT: 161.0 cm
BLAG24031617 BP: 761 TEMP: 22.7 PRED-COLLINS2 RACE: C WT: 69.0 kg
PHYSICIAN: DR.D.SMALL TECH: W.KLEBANSKYJ
SMK HX: QUIT 2M;(CIGARETTES 64Y 0.8P/DAY 48PACK/YRS)

		Pre-Drug* M			Post-Drug* M VENTOLIN200MCG		
Spirometry		ACTUAL	%PRED	PREDICTED	ACTUAL	%PRED	%CHG
FVC	(L)	1.31	52	2.51	1.31	52	0
FEV1	(L)	1.20	62	1.94	1.24	64	3
FEV1/FVC	(%)	91	116	79	94	120	3
FEF25-75%	(L/S)	2.85	142	2.01	3.55	177	24
FEF50%	(L/S)	4.53	171	2.65	6.47	244	42
FIF50%	(L/S)	4.20			4.01		-4
FEF50/FIF50	(%)	108			161		49

		Pre-Drug* Avg		
Lung Volumes		ACTUAL	%PRED	PREDICTED
TLC	(L)	2.11	44	4.81
FRC	(L)	1.12	40	2.83
RV	(L)	0.75	34	2.21
VC	(L)	1.36	54	2.51
ERV	(L)	0.37	59	0.62

	Pre-Drug* Avg		
Diffusion	ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg	4.87	22	22.14



Case 4

- A 52 year old woman with childhood asthma that she "outgrew". She now complains of episodic dyspnea.

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

RESPIRATORY PHYSIOLOGY DEPT.

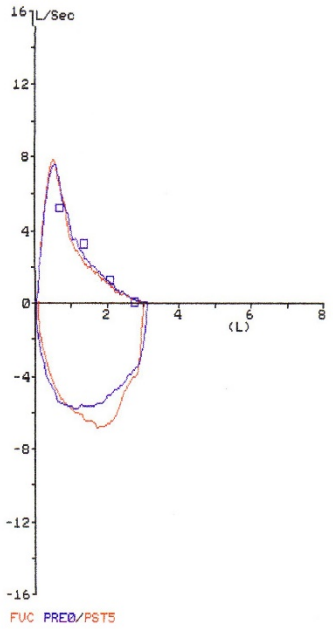
PT#: 415852 ADDL.ID: T53155 RM#: DATE: 09/03/2002
PT: SEX: F AGE: 52 HT: 153.5 cm
POMB50582215 BP: 749 TEMP: 25.2 PRED-COLLINS2 RACE: C WT: 54.5 kg
PHYSICIAN: DR.J.FOX TECH: W.KLEBANSKYJ
HX: NEVER

		Pre-Drug* M			Post-Drug*	VENTOLIN200MCG	
Spirometry		ACTUAL	%PRED	PREDICTED	ACTUAL	%PRED	%CHG
FVC	(L)	3.12	113	2.75	3.02	110	-3
FEV1	(L)	2.32	101	2.29	2.24	98	-3
FEV1/FVC	(%)	74	89	83	74	89	0
FEF25-75%	(L/S)	1.69	66	2.55	1.61	63	-5
FEF50%	(L/S)	2.01	62	3.22	1.96	61	-2
FIF50%	(L/S)	5.64			6.48		14
FEF50/FIF50	(%)	36			30		-14

		Pre-Drug* Avg		
Lung Volumes		ACTUAL	%PRED	PREDICTED
TLC	(L)	4.39	104	4.22
FRC	(L)	2.18	88	2.47
RV	(L)	1.35	91	1.48
VC	(L)	3.05	111	2.75
ERV	(L)	0.84	85	0.99

	Pre-Drug* Avg		
Diffusion	ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg	21.93	117	18.80

NOTES: HX:HAD CHILDHOOD ASTHMA; C/O RECENT EPISODES OF SOBOE; MVV=162% PRED.;



Case 4

- What do you order next?

HÔPITAL GÉNÉRAL JUIF – SIR MORTIMER B. DAVIS – JEWISH GENERAL HOSPITAL

3755 CHEMIN DE LA CÔTE-STE-CATHERINE, MONTRÉAL, QUÉBEC H3T 1E2

DÉPARTEMENT PHYSIOLOGIE RESPIRATOIRE – RESPIRATORY PHYSIOLOGY DEPARTMENT

RESPIRATORY PHYSIOLOGY DEPT

ÉPREUVE DE PROVOCATION BRONCHIQUE – BRONCHIAL CHALLENGE REPORT

DIAGNOSTIC RELATIF À L'EXAMEN REQUIS / DIAGNOSIS RELATIVE TO TEST REQUESTED	# DE TEST #	NOM - NAME AT BIRTH	PRÉNOM – FIRST NAME
recurrent bronchitis, SOBOE, occ. wheeze	T53163		
	☒ HISTAMINE ☐ METHACHOLINE	#RAMQ-MEDICARE #	JGH UNIT # U- 859240
FUMEUR - SMOKING HX: smoker 37yrs 1 PPD	HEIGHT TAILLE: 167 cm / WEIGHT POIDS: 72.5 kg	DATE DE NAISSANCE – DATE OF BIRTH: 1960/05/23	AGE: 42 / SEX: F
ALLERGIES: Pollen, cats, dogs, horses, dust		MÉDECIN – PHYSICIAN: A. HIRSCH	TECH: [illegible]

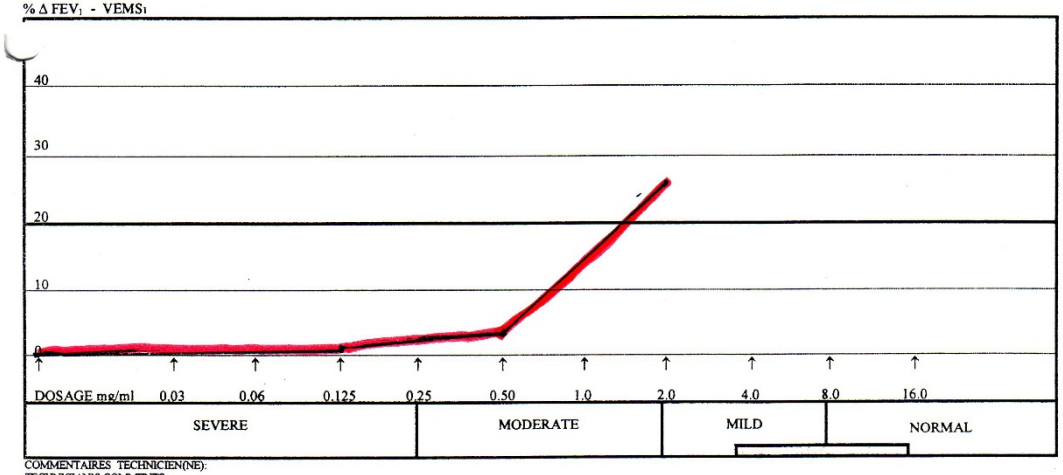
	OBSERVED MESURÉ	% PRED	PREDICTED PREDITES	POST SALINE(PBS)
FVC(L) - CVF(L)	3.78	105	3.50	3.52
FEV_1(L) - $VEMS_1$(L)	2.42	83	2.91	3.31
FEV_1/FVC(%) / $VEMS_1$/CVF(%)	65			65

PC_{20} 2.0 mg/ml

MEDS Effexor

CONCENTRATION MG/ML	FEV_1 (L) $VEMS_1$(L)	%CHG
0.03		
0.06		
→ 0.125	2.28	1
0.25		
→ 0.50	2.21	4
1.0		
→ 2.0	1.71	26
4.0		
8.0		
16.0		
200µg VENTOLIN	2.50	

% Δ FEV_1 - $VEMS_1$



COMMENTAIRES TECHNICIEN(NE):
TECHNICIAN'S COMMENTS:

INTERPRETATION:

_____ M.D.
PNEUMOLOGUE / PNEUMOLOGIST

FORM RP-28
(HISTAMINE.REQ)

DR. DAVID SWEET

DATE: 02 09 05
YY MM DD

Case 5

- A 56 yo male with a 66 pack year history of smoking and progressive SOB.

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

RESPIRATORY PHYSIOLOGY DEPT.

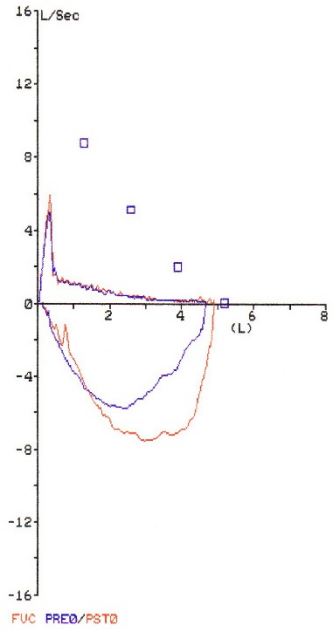
PT#: 816890 ADDL.ID: T53136 RM#: DATE: 08/29/2002
PT: SEX: M AGE: 56 HT: 185.0 cm
BP: 760 TEMP: 22.7 PRED-COLLINS2 RACE: C WT: 75.0 kg
PHYSICIAN: DR.J.FOX TECH: W.KLEBANSKYJ
HX: QUIT 1Y;(CIGARETTES 44Y 1.5P/DAY 66PACK/YRS)

		Pre-Drug* M			Post-Drug* M VENTOLIN200MCG		
Spirometry		ACTUAL	%PRED	PREDICTED	ACTUAL	%PRED	%CHG
FVC	(L)	4.65	90	5.16	4.89	95	5
FEV1	(L)	1.42	34	4.15	1.45	35	2
FEV1/FVC	(%)	30	38	81	30	37	-2
FEF25-75%	(L/S)	0.39	9	4.16	0.40	10	1
FEF50%	(L/S)	0.44	9	5.06	0.41	8	-6
FIF50%	(L/S)	5.82			7.10		21
FEF50/FIF50	(%)	8			6		-23

		Pre-Drug* Avg		
Lung Volumes		ACTUAL	%PRED	PREDICTED
TLC	(L)	8.78	119	7.38
FRC	(L)	5.95	138	4.32
RV	(L)	3.91	157	2.50
VC	(L)	4.86	94	5.16
ERV	(L)	2.04	112	1.82

	Pre-Drug* Avg		
Diffusion	ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg	17.09	61	28.22

NOTES: C/O SOBOE X 1.5 YRS.; MVV=45%PRED.; N. HGB 147 02/08/02;



Case 6

- A 39 yo male with severe respiratory distress and inspiratory wheezing

RESPIRATORY PHYSIOLOGY DEPT.

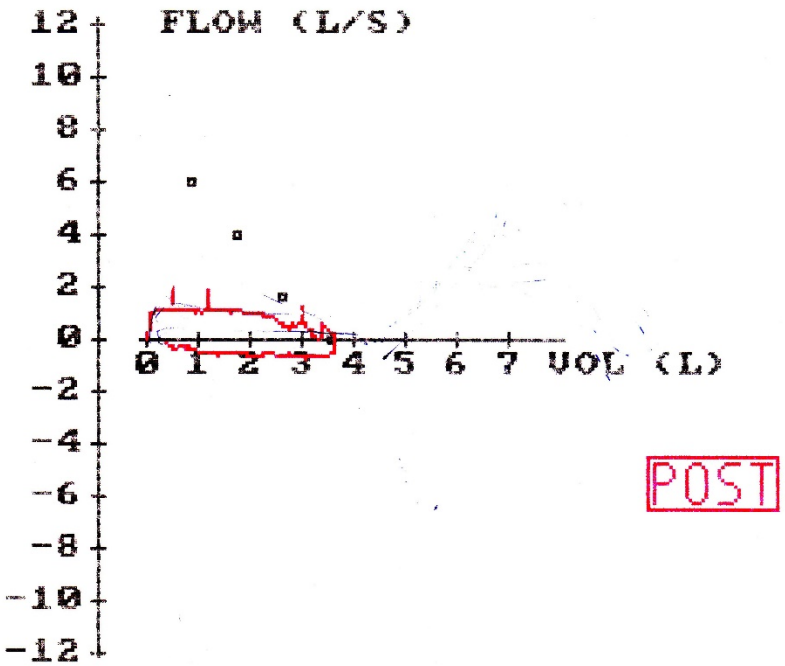
SIR MORTIMER B. DAVIS JEWISH GENERAL HOSPITAL
RESPIRATORY PHYSIOLOGY DEPARTMENT

PATIENT ID: 35052
PATIENT :
LOCATION : 8NW
PHYSICIAN : U-285209
TECHNICIAN: P.KUPFER

STUDY NO. : 1
TEMP(C) : 24.3
BP(mm) : 760.0

STUDY DATE : 07-19-1994
HEIGHT(cm) : 167.00
WEIGHT(kg) : 75.00
SEX : F
AGE : 39

SPIROMETRY (BTPS)		PREBRONCHODILATOR ACTUAL	%PRED	PREDICTED	POSTBRONCHODILATOR ACTUAL	%PRED	%CHG	SEE
FVC	(L)			3.54	3.91	110		
FEV1	(L)			2.04	1.17	40		
FEV1/FVC	(%)			83	30	36		
FEF25-75	(L/SEC)			3.20	0.54	20		
FEF50	(L/SEC)			3.98	1.13	29		
FIF50	(L/SEC)				0.59			
FEF50/FIF50	(%)				193			



Case 7

- A 66 year old male with scleroderma and SOB

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

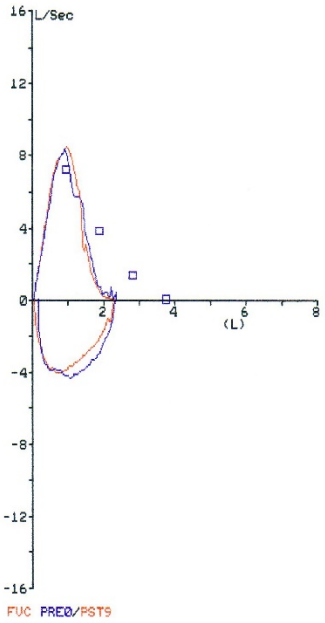
RESPIRATORY PHYSIOLOGY DEPT.

PT#: 98689 ADDL.ID: T49507 RM#: DATE: 12/05/2000
PT: SEX: M AGE: 66 HT: 171.5 cm
GLEK34062419 BP: 751 TEMP: 21.0 PRED-COLLINS2 RACE: C WT: 78.0 kg
PHYSICIAN: H.FRANK TECH: R.MATTOSCIO
HX: NEVER

		Pre-Drug* M			Post-Drug*	VENTOLIN200MCG	
Spirometry		ACTUAL	%PRED	PREDICTED	ACTUAL	%PRED	%CHG
FVC	(L)	2.34	63	3.73	2.29	61	-1
FEV1	(L)	2.02	68	2.96	1.97	66	-2
FEV1/FVC	(%)	86	108	80	86	108	0
FEF25-75%	(L/S)	4.25	141	3.02	3.75	124	-11
FEF50%	(L/S)	5.81	154	3.77	7.20	191	23
FIF50%	(L/S)	4.12			3.52		-14
FEF50/FIF50	(%)	141			205		45

		Pre-Drug* Avg		
Lung Volumes		ACTUAL	%PRED	PREDICTED
TLC	(L)	3.39	57	5.96
FRC	(L)	1.84	55	3.36
RV	(L)	1.02	44	2.31
VC	(L)	2.37	64	3.73
ERV	(L)	0.82	77	1.06

		Pre-Drug* Avg		
Diffusion		ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg		17.80	71	25.12



Case 8

- Scleroderma with SOB

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

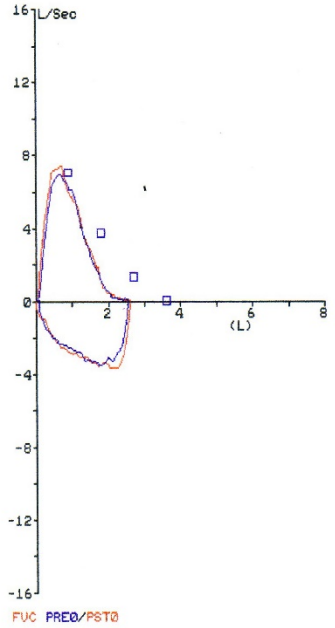
RESPIRATORY PHYSIOLOGY DEPT.

PT#: 812927 ADDL.ID: T52725 RM#: DATE: 06/14/2002
PT: SEX: M AGE: 65 HT: 169.5 cm
GRAJ36071912 BP: 750 TEMP: 22.1 PRED-COLLINS2 RACE: C WT: 88.5 kg
PHYSICIAN: DR.D.LANGLEBEN TECH: D.ZINNO/B.WELDRICK
HX: QUIT 38Y;(CIGARETTES 27Y 1.5P/DAY 40PACK/YRS)

		Pre-Drug* M			Post-Drug* M VENTOLIN200MCG		
Spirometry		ACTUAL	%PRED	PREDICTED	ACTUAL	%PRED	%CHG
FVC	(L)	2.51	70	3.59	2.60	72	3
FEV1	(L)	2.05	72	2.86	2.07	72	0
FEV1/FVC	(%)	82	102	80	80	100	-2
FEF25-75%	(L/S)	2.56	87	2.94	2.10	71	-18
FEF50%	(L/S)	3.88	106	3.67	3.60	98	-7
FIF50%	(L/S)	3.15			3.10		-1
FEF50/FIF50	(%)	123			116		-5

		Pre-Drug* Avg		
Lung Volumes		ACTUAL	%PRED	PREDICTED
TLC	(L)	4.27	74	5.79
FRC	(L)	2.04	67	3.04
RV	(L)	1.72	77	2.23
VC	(L)	2.56	71	3.59
ERV	(L)	0.32	40	0.81

	Pre-Drug* Avg		
Diffusion	ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg	10.08	40	25.10



Case 9

- Episodic SOB, and cough
- R/O asthma

HOPITAL GENERAL JUIF SMBD JEWISH GENERAL HOSPITAL, MTL, QUE.
RESPIRATORY PHYSIOLOGY DEPT. PHYSIOLOGIE RESPIRATOIRE

RESPIRATORY PHYSIOLOGY DEPT.

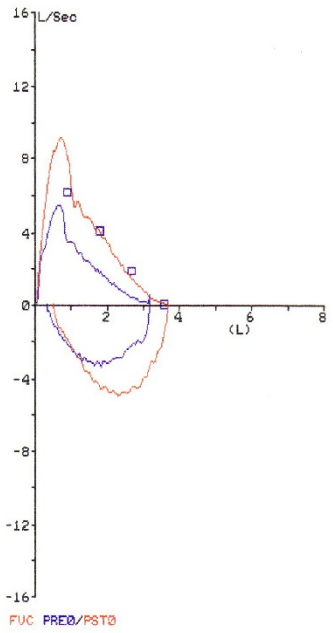
PT#: T53826 ADDL.ID: T53826 RM#: DATE: 01/09/2003
PT: SEX: F AGE: 34 HT: 165.0 cm
JODS68602516 BP: 732 TEMP: 21.6 PRED-COLLINS2 RACE: C WT: 105.0 kg
PHYSICIAN: G.RUBIN TECH: R.MATTOSCIO
HX: NEVER

Spirometry		Pre-Drug* M ACTUAL	%PRED	PREDICTED	Post-Drug* M VENTOLIN200MCG ACTUAL	%PRED	%CHG
FVC	(L)	3.15	89	3.55	3.68	103	16
FEV1	(L)	2.38	79	3.01	3.04	101	27
FEV1/FVC	(%)	76	89	85	83	98	9
FEF25-75%	(L/S)	1.91	56	3.41	3.11	91	62
FEF50%	(L/S)	2.11	52	4.05	3.72	92	76
FIF50%	(L/S)	3.16			4.68		47
FEF50/FIF50	(%)	67			79		19

Lung Volumes		Pre-Drug* Avg ACTUAL	%PRED	PREDICTED
TLC	(L)	4.37	83	5.27
FRC	(L)	2.03	91	2.22
RV	(L)	1.14	68	1.69
VC	(L)	3.23	91	3.55
ERV	(L)	0.89	166	0.53

Diffusion	Pre-Drug* Avg ACTUAL	%PRED	PREDICTED
Dsb ml/min/mmHg	22.41	101	22.19

C/O OCC CHEST TIGHTNESS, SOB, COUGH X 3 YRS; R/O ASTHMA;
MVV= 48% PRED.



Case 11

- SOB since prolonged intubation for ARDS 2 years ago.

RESPIRATORY PHYSIOLOGY DEPT.

SIR MORTIMER B. DAVIS JEWISH GENERAL HOSPITAL
RESPIRATORY PHYSIOLOGY DEPARTMENT

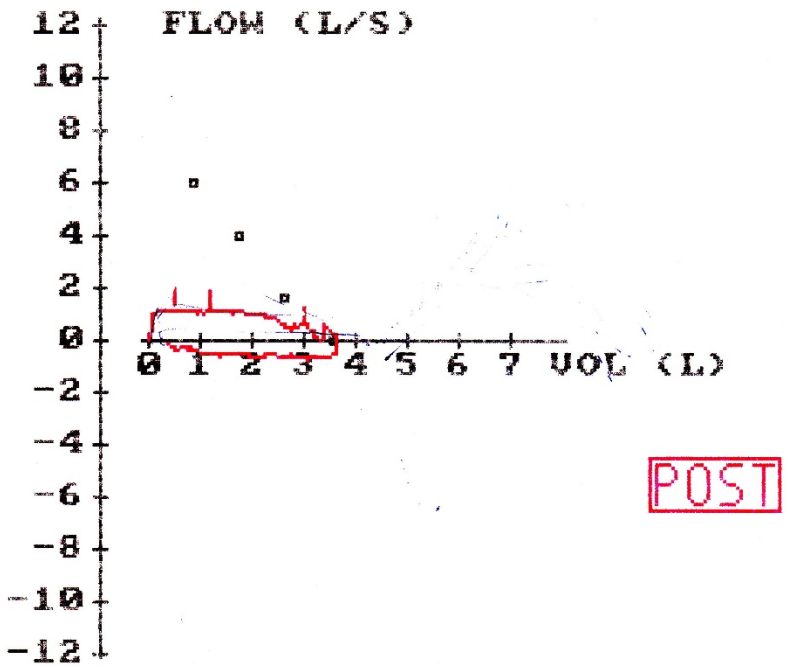
PATIENT ID: 35052
PATIENT : --
LOCATION : 8NW
PHYSICIAN : U-285209
TECHNICIAN: P.KUPFER

STUDY NO. : 1
TEMP(C) : 24.3
BP(mm) : 760.0

STUDY DATE : 07-19-1994
HEIGHT(cm) : 167.00
WEIGHT(Kg) : 75.00
SEX : F
AGE : 39

SPIROMETRY (BTPS)		PREBRONCHODILATOR ACTUAL	%PRED	PREDICTED	POSTBRONCHODILATOR ACTUAL	%PRED	%CHG	SEE
FVC	(L)			3.54	3.91	110		
FEV1	(L)			2.94	1.17	40		
FEV1/FVC	(%)			83	30	36		
FEF25-75	(L/SEC)			3.20	1.04	33		
FEF50	(L/SEC)			3.95	1.13	29		
FIF50	(L/SEC)				0.59			
FEF50/FIF50	(%)				193			

NOTES.
POST TEST ONLY, PATIENT RECEIVED RACIMIC EPINEPHRINE PRIOR TO TESTING
HX: METASTATIC BREAST CA AND SUBGLOTTIC MASS FOR PRE-OP
NON SMOKER




ANY
QUESTIONS
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