Spirometrie

Spirometrieavond huisartsen en praktijkondersteuners regio Emmen

Steven Rutgers, longarts SZE

12-2-’08

Disclosure belangen spreker

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(potentiële) belangenverstrengeling	Geen / Zie hieronder
Voor bijeenkomst mogelijk relevante relaties met bedrijven	Bedrijfsnamen
• Sponsoring of onderzoeksgeld	• Geen
• Honorarium of andere (financiële) vergoeding	• Geen
• Aandeelhouder	• Neen
• Andere relatie, namelijk …	• Neen

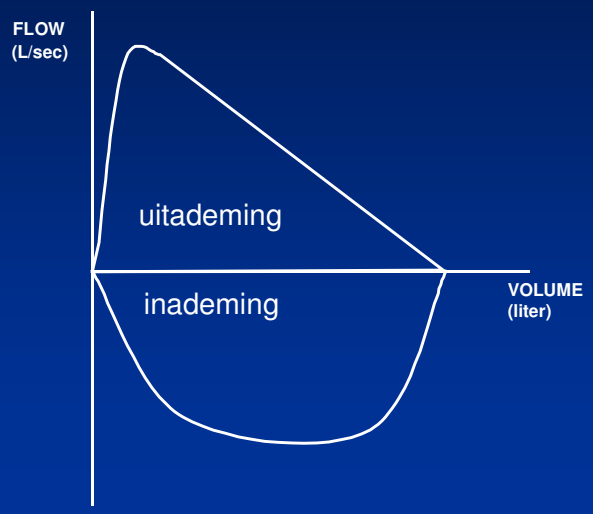
Inleiding

- Leerdoelen:
  - Theorie spirometrie analyse bespreken
  - Casusbespreking n.a.v.
    - Meegenomen spirogram uit huisartsenpraktijk
    - Spirogrammen uit poli(kliniek)

Planning onderwerpen

- Flow-volume curve
- Obstructie
- Reversibiliteit
- Restrictieve longaandoeningen
- Bronchiale hyperreactiviteit
- Astma/COPD overlap syndroom

Flow-volume curve



Fases van expiratie

- volumeversnelling
  - lucht uit alveoli en luchtwegen
  - bereiken maximale flow
  - inspanningsafhankelijk
- stroombeperking
  - lucht uit alveoli
  - nauwelijks inspanningsafhankelijk
- eind-expiratoir
  - inspanningsafhankelijk

Beoordeling flow-volume curve

- let op correcte blaastechniek
- interpretatie van de vorm
- flowwaarden
- reactie op luchtwegverwijders

Goede blaastechniek

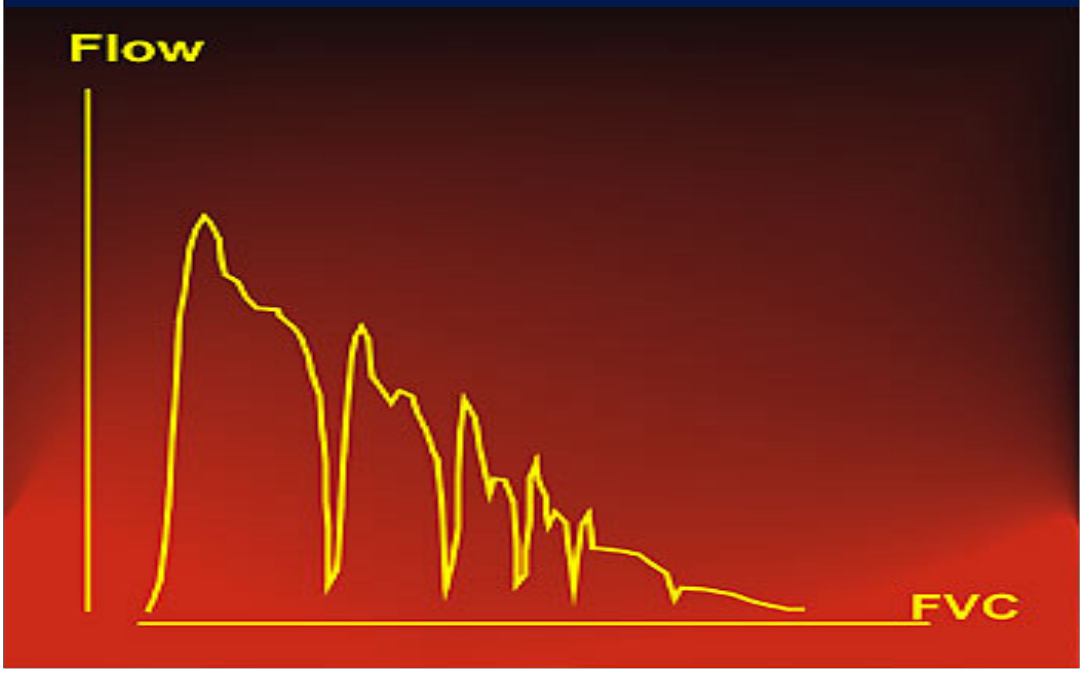
- let op de inzet van patiënt
- snelle stijging van het opgaande deel
- spitse of iets afgeronde top
- “gladde curve”
- in- en expiratie hebben hetzelfde volume
- reproduceerbaarheid bij herhaald meten

Beoordeling vorm van de curve

- hoogte piek
- afdalend deel convex of concaaf
- smoorklepfenomeen
- tekenen restrictie
- inspiratoire curve bol/vlak
- verhouding in- en expiratoire curve
- zaagtandfenomeen

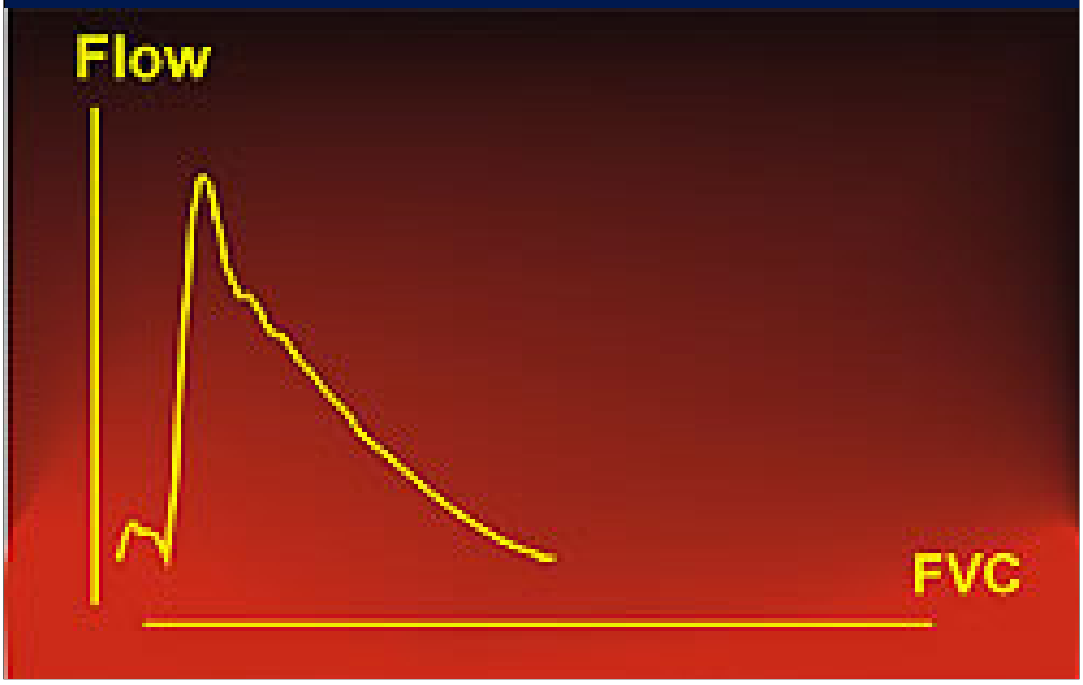
Niet-reversibele luchtwegobstructie

Hoesten

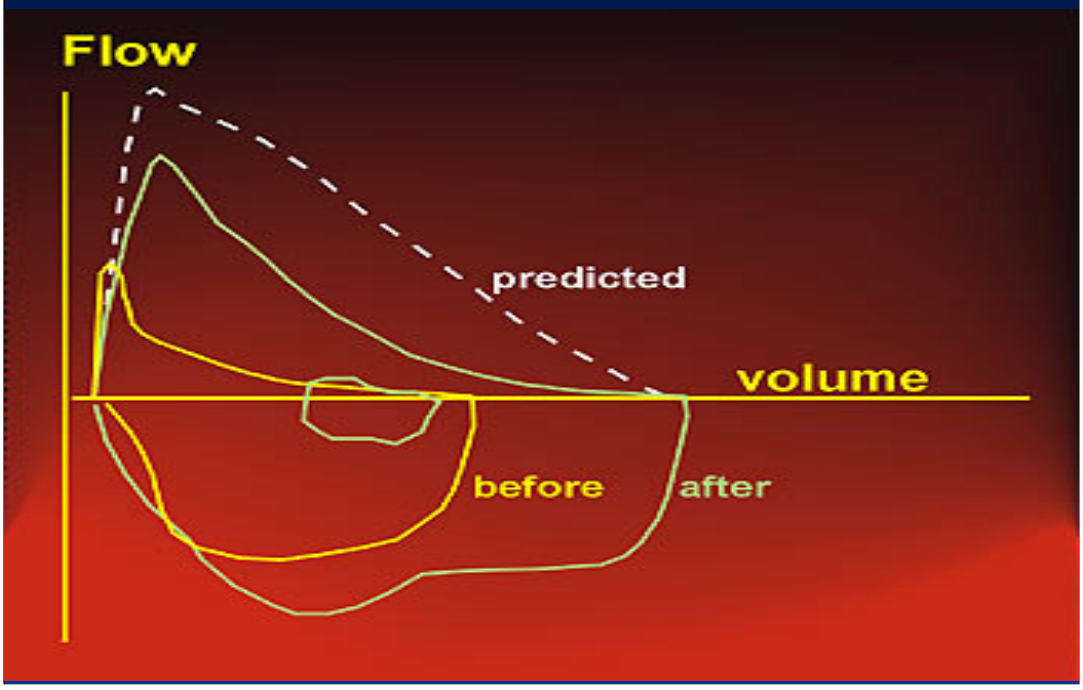


Onvoldoende ingespannen

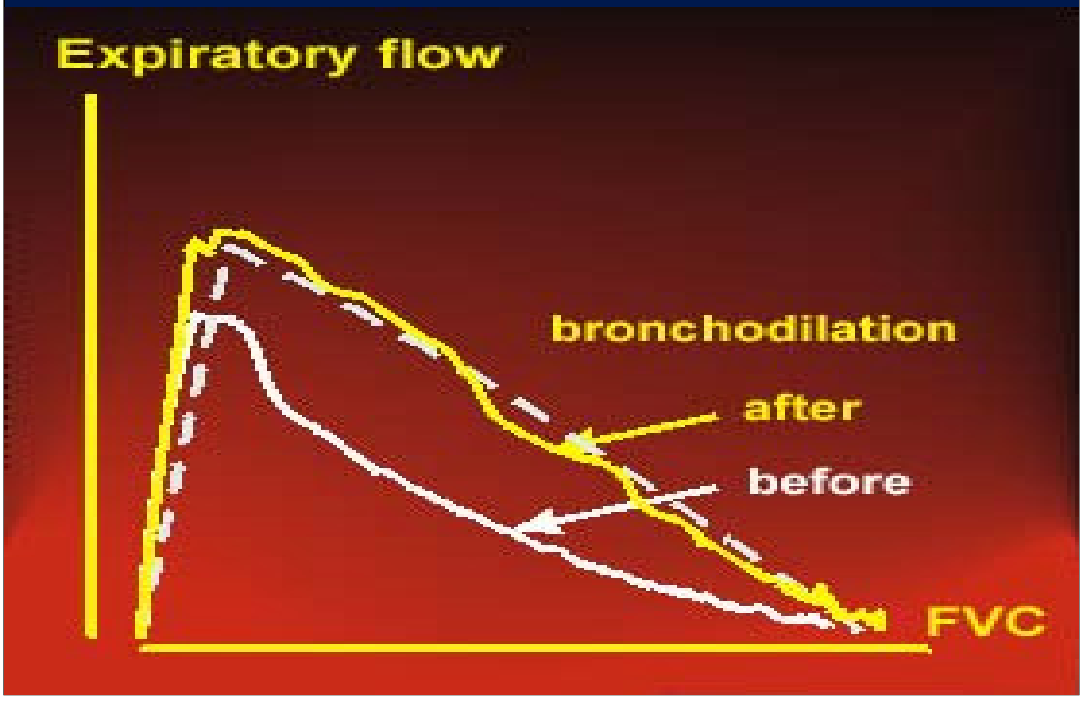
Onvoldoende hard uitgeblazen



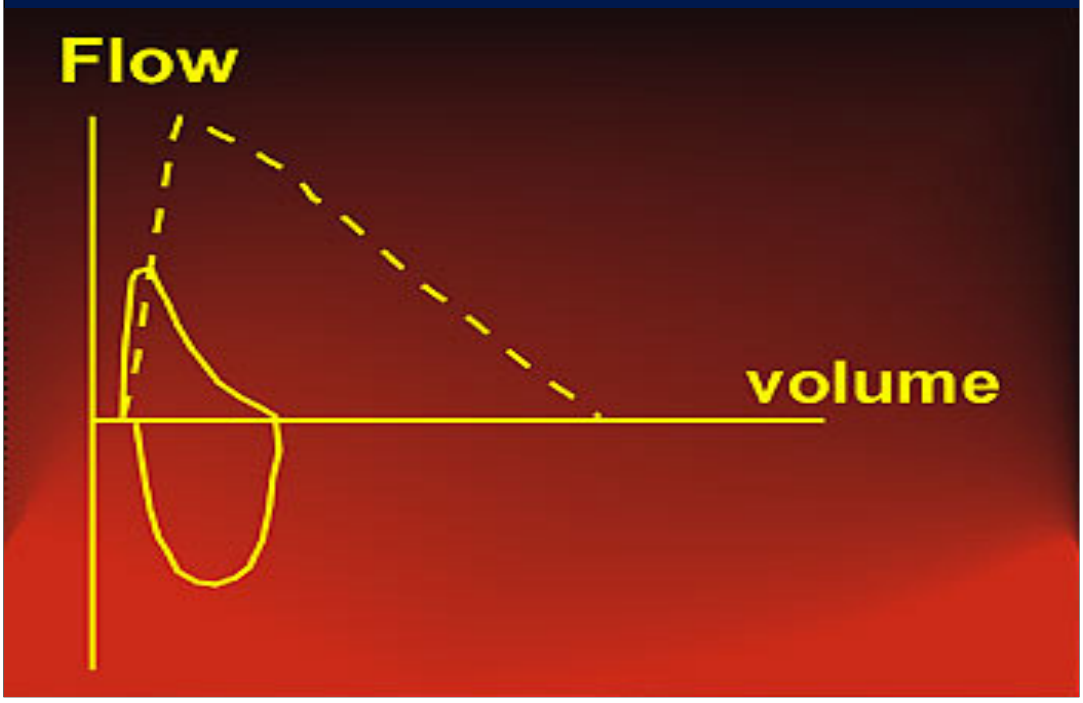
Reversibele luchtwegobstructie



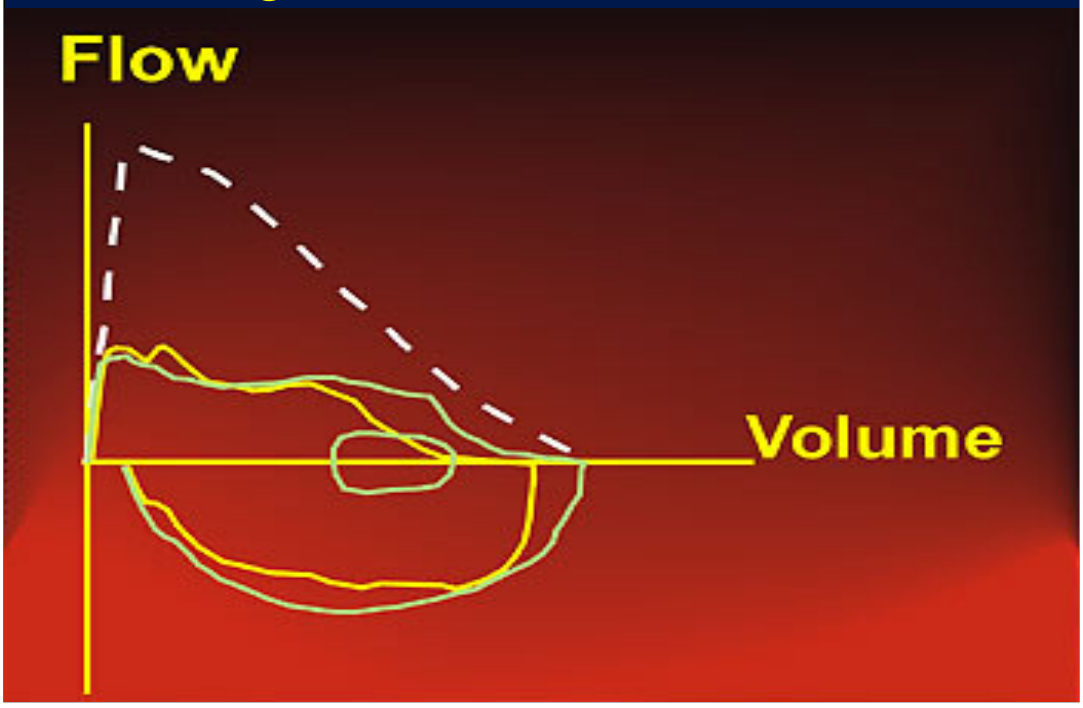
Astma



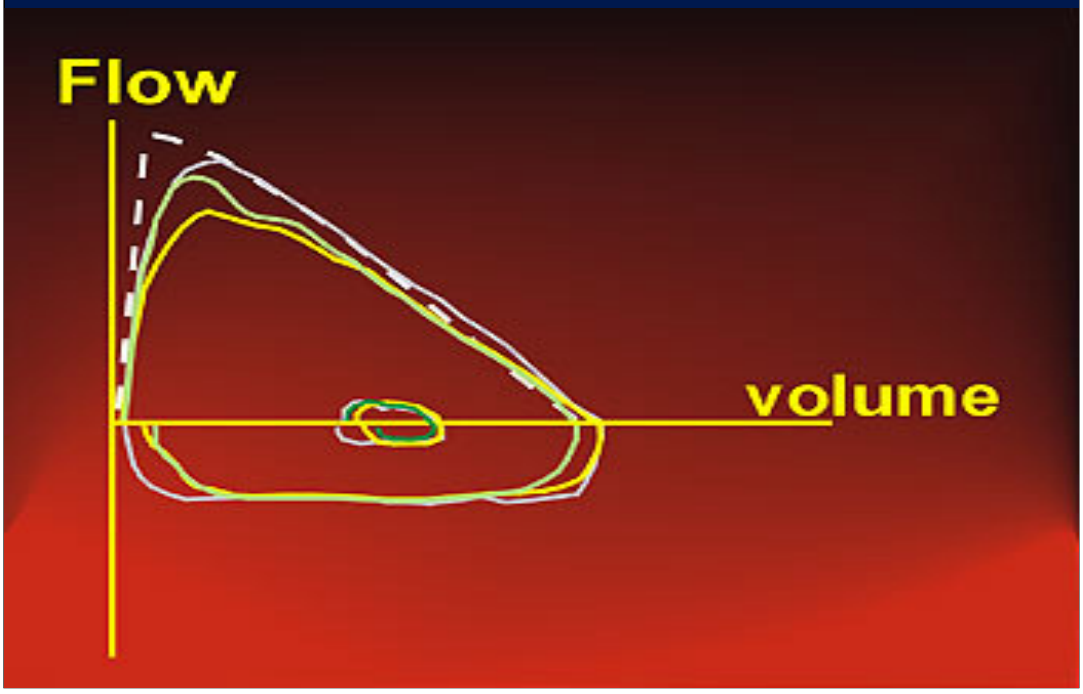
Restrictieve longfunctie



Hoog intrathoracale obstructie



Extrathoracale obstructie

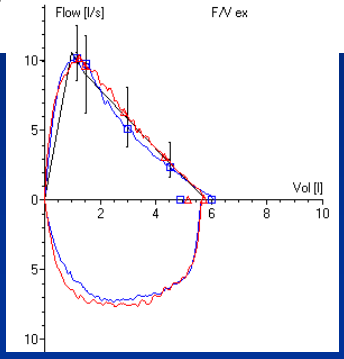


Flowwaarden

- PEF (peak expiratory flow)
- FEV_1 (forced expiratory flow in 1 sec)
- FVC (forced vital capacity)
- FEV_1/FVC
- MEF_{50} (mid expiratory flow at 50% FVC)

	Pred	Pre	%(1/P)	Post	%(2/P)	2/1%
Date		20-02-2001		20-02-2001		
Time		14:09:03		14:21:44		
VC IN .....[l]	6.09	5.81	95.4	5.85	96.0	100.6
FVC.....[l]	5.82	6.00	103.2	5.73	98.5	95.5
FEV 1.....[l]	4.83	4.89	101.2	5.15	106.5	105.2
FEV 1 % VC MAX.....[%]	82.4	81.5	99.0	88.0	106.8	107.9
MEF 75.....[l/s]	9.04	9.76	108.0	9.67	106.9	99.0
MEF 50.....[l/s]	5.96	5.08	85.3	6.33	106.2	124.5
MEF 25.....[l/s]	2.88	2.31	80.3	3.09	107.2	133.6
PEF.....[l/s]	10.56	10.18	96.4	10.21	96.6	100.3
TLC-He.....[l]	7.98	7.47	93.6			
RV-He.....[l]	1.83	2.06	112.5			
VIN.....[l]	6.09	5.41	88.8			
TLCO SB....[mmol/min/kPa]	13.13	12.35	94.1			
TLCO/VA..[mmol/min/kPa/l]	1.65	1.70	103.0			

Age:	23 Years	Date of Birth:	27-05-1977
Height:	188,5 cm	Weight:	85,0 kg
Sex:	male	Operator:	NAF



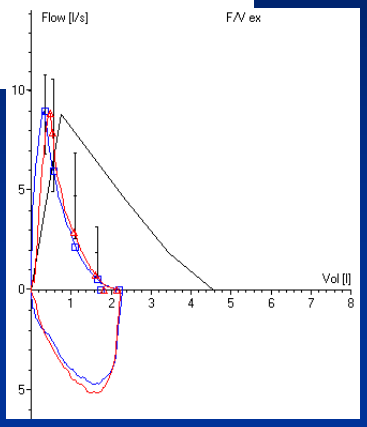
Casus 1

Heer V.: normale longfunctie

Uitleg over de lay-out eerst.

	Pred	Pre	%(1/P)	Post	%(2/P)
Date		04-01-1996		04-01-1996	
Time		13:53:47		14:01:03	
VC IN .....[l]	4.77	2.27	47.5	2.40	50.3
FVC.....[l]	4.58	2.21	48.3	2.28	49.9
FEV 1.....[l]	3.61	1.75	48.6	1.87	51.6
FEV 1 % VC MAX.....[%]	76.8	77.4	100.9	77.7	101.2
MEF 75.....[l/s]	7.73	5.94	76.8	7.42	96.0
MEF 50.....[l/s]	4.71	2.13	45.3	2.47	52.3
MEF 25.....[l/s]	1.88	0.50	26.7	0.65	34.8
PEF.....[l/s]	8.77	8.97	102.2	8.08	92.1
TLC-He.....[l]	7.38	3.27	44.3		
RV-He.....[l]	2.42	1.17	48.3		
VIN.....[l]	4.77	2.10	44.1		
TLCO SB....[mmol/min/kPa]	10.25	4.70	45.9		
TLCO/VA..[mmol/min/kPa/l]	1.39	1.51	108.5		

Age:	58 Years	Date of Birth:	27-03-1946
Height:	181,0 cm	Weight:	102,0 kg
Sex:	male	Operator:	ROLIEN

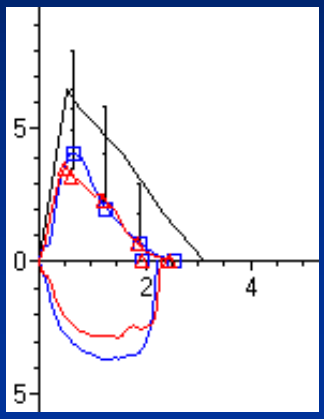


Casus 2

Patiënt met longfibrose (kan ook na pneumonectomie)

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		09-08-2004		09-08-2004		
Time		10:04:00		10:08:50		
VC IN .....[l]	3.17	2.19	69.1	2.26	71.3	103.2
FVC.....[l]	3.11	2.52	81.1	2.45	78.6	97.0
FEV 1.....[l]	2.68	1.93	72.0	1.94	72.4	100.6
FEV 1 % VC MAX.....[%]	81.5	76.5	93.8	79.3	97.3	103.7
MEF 75.....[l/s]	5.72	4.06	70.9	3.19	55.8	78.6
MEF 50.....[l/s]	4.06	1.93	47.7	2.26	55.8	116.8
MEF 25.....[l/s]	1.78	0.61	34.2	0.65	36.6	106.9
PEF.....[l/s]	6.44	4.06	63.0	3.47	54.0	85.6

Age:	40 Years	Date of Birth:	04-03-1964
Height:	159,0 cm	Weight:	105,0 kg
Sex:	female	Operator:	CORRY

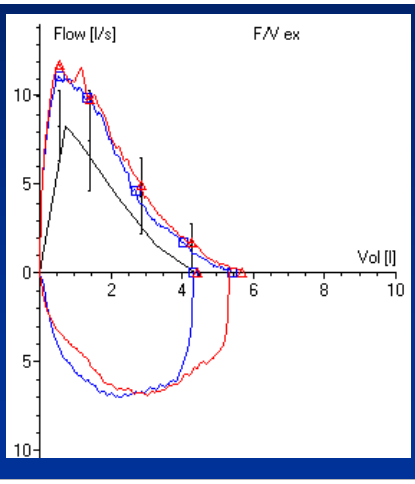


Casus 3

Mevrouw J.: overgewicht met restrictie

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		03-01-1992		03-01-1992		
Time		14:52:59		15:01:57		
VC IN .....[l]	4.54	4.40	96.9	5.34	117.7	121.5
FVC.....[l]	4.37	5.39	123.4	5.67	129.7	105.2
FEV 1.....[l]	3.28	4.33	132.1	4.43	135.2	102.4
FEV 1 % VC MAX.....[%]	73.4	80.2	109.4	77.6	105.8	96.7
MEF 75.....[l/s]	7.45	9.85	132.2	9.82	131.8	99.7
MEF 50.....[l/s]	4.31	4.63	107.4	4.94	114.5	106.6
MEF 25.....[l/s]	1.51	1.67	110.6	1.66	109.7	99.2
PEF.....[l/s]	8.26	11.06	133.9	11.75	142.3	106.2

Age:	64 Years	Date of Birth:	30-06-1927
Height:	190,0 cm	Weight:	97,0 kg
Sex:	male	Operator:	INGRID

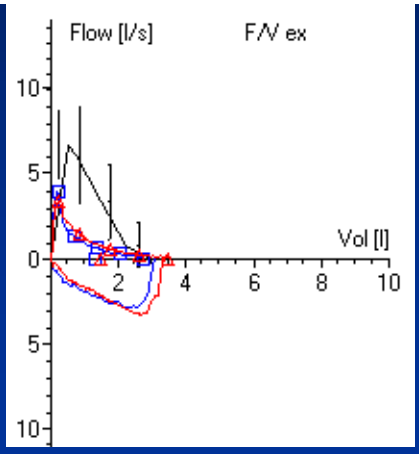


Casus 4

Normale lf; waarden meer dan 100% ook mogelijk

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		06-10-1994		06-10-1994		
Time		12:05:15		12:24:06		
VC IN .....[l]	3.03	3.02	99.7	3.48	114.7	115.0
FVC.....[l]	2.95	2.72	92.2	3.46	117.5	127.5
FEV 1.....[l]	2.16	1.29	59.7	1.46	67.9	113.8
FEV 1 % VC MAX.....[%]	72.3	42.6	58.9	42.1	58.3	98.9
MEF 75.....[l/s]	6.08	1.32	21.8	1.39	22.9	105.1
MEF 50.....[l/s]	3.29	0.58	17.7	0.54	16.4	92.9
MEF 25.....[l/s]	0.78	0.23	29.5	0.19	24.4	82.7
PEF.....[l/s]	6.65	3.91	58.9	3.34	50.3	85.4

Age:	73 Years	Date of Birth:	12-01-1921
Height:	164,0 cm	Weight:	60,0 kg
Sex:	male	Operator:	JANET

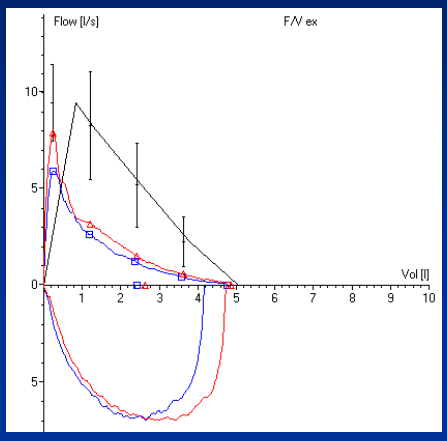


Casus 5

Hr K. Ernstige obstructie

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		10-04-2000		10-04-2000		
Time		09:02:17		09:19:42		
VC IN .....[l]	5.29	4.74	89.7	4.68	88.5	98.7
FVC.....[l]	5.07	4.76	93.8	4.86	95.8	102.1
FEV 1.....[l]	4.07	2.41	59.2	2.65	65.0	109.8
FEV 1 % VC MAX.....[%]	78.6	50.7	64.5	54.4	69.2	107.2
MEF 75.....[l/s]	8.24	2.60	31.5	3.13	38.0	120.5
MEF 50.....[l/s]	5.17	1.20	23.2	1.46	28.1	121.3
MEF 25.....[l/s]	2.24	0.41	18.3	0.54	24.1	131.1
PEF.....[l/s]	9.45	5.88	62.3	7.89	83.6	134.1

Age:	46 Years	Date of Birth:	29-09-1956
Height:	185,0 cm	Weight:	97,0 kg
Sex:	male	Operator:	PETRA

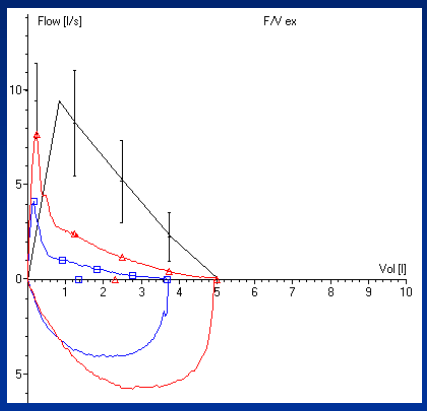


Casus 6

Pat. L. Astma bij controle apr 2000

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		07-01-2003		07-01-2003		
Time		09:43:26		10:02:46		
VC IN .....[l]	5.29	3.68	69.6	4.91	92.8	133.4
FVC.....[l]	5.07	3.68	72.5	4.99	98.5	135.8
FEV 1.....[l]	4.07	1.36	33.3	2.33	57.1	171.3
FEV 1 % VC MAX.....[%]	78.6	36.6	46.6	46.6	59.3	127.2
MEF 75.....[l/s]	8.24	1.01	12.3	2.38	28.9	235.0
MEF 50.....[l/s]	5.17	0.51	9.9	1.14	22.0	223.3
MEF 25.....[l/s]	2.24	0.20	8.9	0.39	17.4	196.0
PEF.....[l/s]	9.45	4.10	43.4	7.66	81.1	187.0

Age:	49 Years	Date of Birth:	29-09-1956
Height:	185,0 cm	Weight:	97,0 kg
Sex:	male	Operator:	PETRA

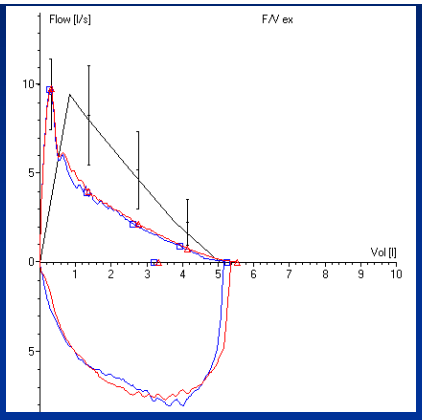


Casus 6, 3 jaar later

Opnieuw pat L.; heeft zich ontrokken aan controle en behandeling; komt weer met ernstige klachten.

	Pred	Pre	%(1/P)	Post	%(A2/P)
Date		27-02-2003		27-02-2003	
Time		15:52:10		15:56:24	
VC IN .....[l]	5.29	5.13	97.0	5.35	101.2
FVC.....[l]	5.07	5.23	103.2	5.53	109.1
FEV 1.....[l]	4.07	3.21	78.8	3.34	82.0
FEV 1 % VC MAX.....[%]	78.6	61.4	78.1	60.4	76.8
MEF 75.....[l/s]	8.24	3.88	47.1	3.96	48.1
MEF 50.....[l/s]	5.17	2.13	41.2	2.11	40.7
MEF 25.....[l/s]	2.24	0.89	39.9	0.75	33.3
PEF.....[l/s]	9.45	9.72	102.9	9.75	103.2

Age:	49 Years	Date of Birth:	29-09-1956
Height:	185,0 cm	Weight:	97,0 kg
Sex:	male	Operator:	PETRA

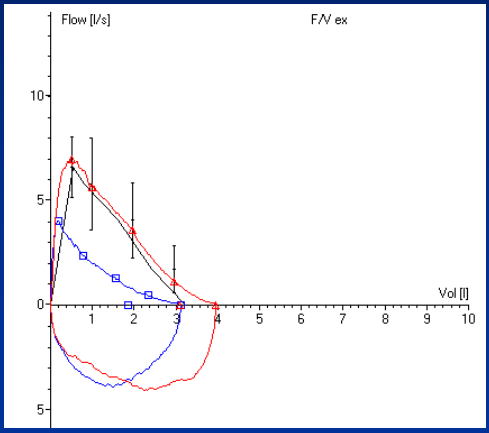


Casus 6, 6 weken later

Pat L. 6 weken na therapie met oa prednison

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		22-01-1996		22-01-1996		
Time		10:02:45		10:30:53		
VC IN .....[l]	3.31	3.11	94.1	3.94	119.1	126.6
FVC.....[l]	3.22	3.11	96.4	3.95	122.6	127.2
FEV 1.....[l]	2.77	1.87	67.5	3.09	111.8	165.7
FEV 1 % VC MAX.....[%]	80.4	60.1	74.7	78.3	97.4	130.4
MEF 75.....[l/s]	5.76	2.35	40.8	5.62	97.6	239.4
MEF 50.....[l/s]	4.05	1.24	30.6	3.56	87.8	287.0
MEF 25.....[l/s]	1.69	0.44	26.0	1.11	65.8	253.4
PEF.....[l/s]	6.59	4.01	60.9	6.95	105.5	173.2

Age:	37 Years	Date of Birth:	16-05-1958
Height:	165,0 cm	Weight:	70,0 kg
Sex:	female	Operator:	CORRY

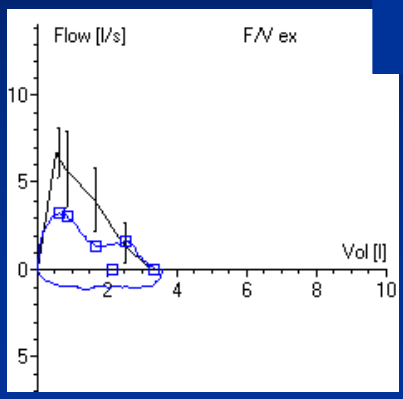


Casus 7

Patiënt met onbehandeld astma

	Pred	Pre	%(1/P)
Date		29-03-1999	
Time		10:57:33	
VC IN .....[l]	3.37	3.54	105.1
FVC.....[l]	3.24	3.36	103.5
FEV 1.....[l]	2.76	2.14	77.4
FEV 1 % VC MAX.....[%]	78.1	60.5	77.4
MEF 75.....[l/s]	5.70	3.03	53.1
MEF 50.....[l/s]	3.94	1.33	33.8
MEF 25.....[l/s]	1.47	1.53	104.3
PEF.....[l/s]	6.64	3.24	48.8

Age:	52 Years	Date of Birth:	12-06-1946
Height:	174,0 cm	Weight:	81,0 kg
Sex:	female	Operator:	LEONIE

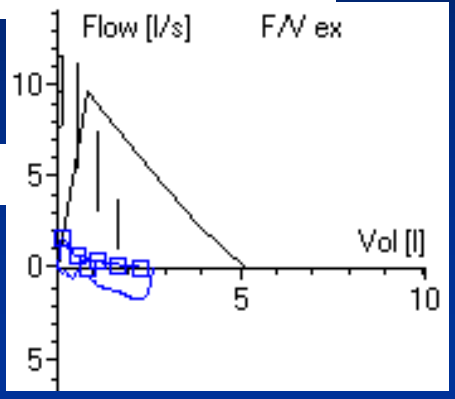


Casus 8

Stembandstenose na struma-operatie

	Pred	Pre	%(1/P)
Date		14-08-1998	
Time		11:39:30	
VC IN .....[l]	5.34	2.56	48.0
FVC.....[l]	5.11	2.23	43.7
FEV 1.....[l]	4.16	0.82	19.7
FEV 1 % VC MAX.....[%]	79.7	32.0	40.1
MEF 75.....[l/s]	8.30	0.57	6.9
MEF 50.....[l/s]	5.28	0.31	5.9
MEF 25.....[l/s]	2.34	0.12	5.1
PEF.....[l/s]	9.58	1.64	17.1

Age:	36 Years	Date of Birth:	01-01-1962
Height:	183,0 cm	Weight:	85,0 kg
Sex:	male	Operator:	LEONIE

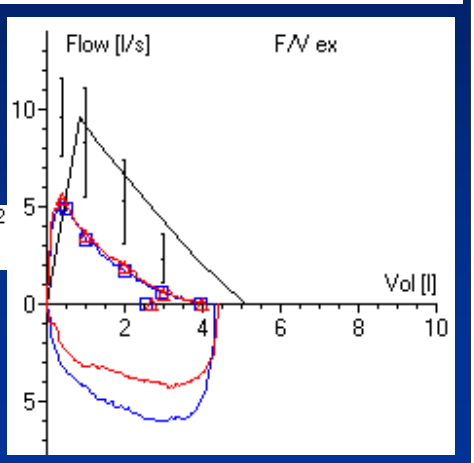


Casus 9

Pat N. Met ernstige dyspnoe; zie vervolg

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		20-08-1998		20-08-1998		
Time		11:35:18		11:36:52		
VC IN .....[l]	5.34	4.28	80.2	4.58	85.9	107.0
FVC.....[l]	5.11	3.97	77.6	4.02	78.6	101.3
FEV 1.....[l]	4.16	2.55	61.2	2.68	64.4	105.1
FEV 1 % VC MAX.....[%]	79.7	59.5	74.7	58.4	73.4	98.2
MEF 75.....[l/s]	8.30	3.30	39.7	3.49	42.1	106.0
MEF 50.....[l/s]	5.28	1.72	32.6	1.93	36.5	112.1
MEF 25.....[l/s]	2.34	0.65	27.7	0.54	22.9	82.8
PEF.....[l/s]	9.58	4.94	51.5	5.39	56.2	109.1

Age:	36 Years	Date of Birth:	01-01-1962
Height:	183,0 cm	Weight:	85,0 kg
Sex:	male	Operator:	LEONIE

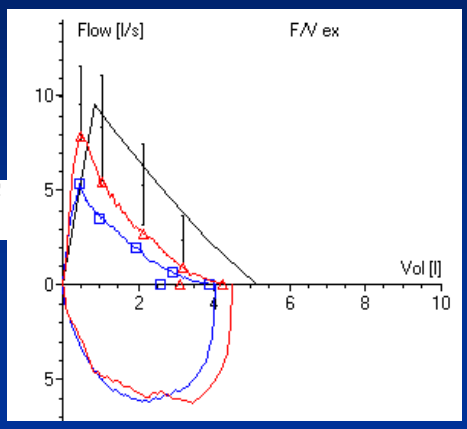


Casus 9, 1 week later

Pat N. Na therapie 1 week later

	Pred	Pre	%(1/P)	Post	%(A2/P)	2/1%
Date		11-09-1998		11-09-1998		
Time		11:31:52		11:35:49		
VC IN .....[l]	5.34	4.04	75.7	4.45	83.4	110.2
FVC.....[l]	5.11	3.87	75.8	4.24	83.1	109.7
FEV 1.....[l]	4.16	2.58	62.0	3.12	75.0	121.0
FEV 1 % VC MAX.....[%]	79.7	63.9	80.2	70.1	88.1	109.8
MEF 75.....[l/s]	8.30	3.52	42.4	5.39	64.8	153.0
MEF 50.....[l/s]	5.28	1.92	36.4	2.68	50.7	139.4
MEF 25.....[l/s]	2.34	0.66	28.2	0.91	39.0	138.5
PEF.....[l/s]	9.58	5.35	55.9	7.81	81.5	145.9

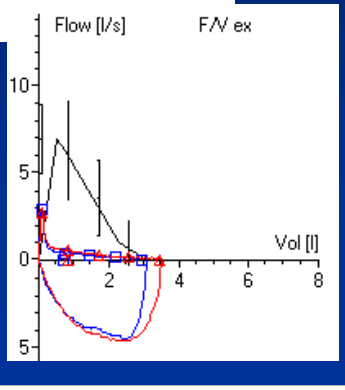
Age:	36 Years	Date of Birth:	01-01-1962
Height:	183,0 cm	Weight:	85,0 kg
Sex:	male	Operator:	LEONIE



Casus 9, weer 3 weken later. Zie FEV_1 na ß-mim.; was 820 ml en nu 3120 ml!

	Pred	Pre	%(1/P)	Post	%(2/P)
Date		20-02-2004		20-02-2004	
Time		15:41:01		15:51:19	
VC IN .....[l]	3.16	3.05	96.6	3.51	111.0
FVC.....[l]	3.07	2.93	95.3	3.45	112.5
FEV 1.....[l]	2.32	0.71	30.7	0.83	35.8
FEV 1 % VC MAX.....[%]	73.7	23.3	31.6	23.7	32.1
MEF 75.....[l/s]	6.23	0.36	5.8	0.50	8.0
MEF 50.....[l/s]	3.48	0.24	6.8	0.23	6.7
MEF 25.....[l/s]	0.95	0.13	13.9	0.17	17.9
PEF.....[l/s]	6.90	2.81	40.8	2.67	38.6
TLC-He.....[l]	5.90	5.85	99.1		
RV-He.....[l]	2.55	2.75	107.8		
VIN.....[l]	3.16	3.11	98.2		
TLCO SB....[mmol/min/kPa]	7.07	2.12	30.0		
TLCO/VA..[mmol/min/kPa/l]	1.20	0.37	30.9		

Age:	75 Years	Date of Birth:	21-01-1929
Height:	162,5 cm	Weight:	58,0 kg
Sex:	male	Operator:	MARGOT



Casus 10

Ernstige obstructie: emfyseem Zie DLCO