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Lung Research Antwerp



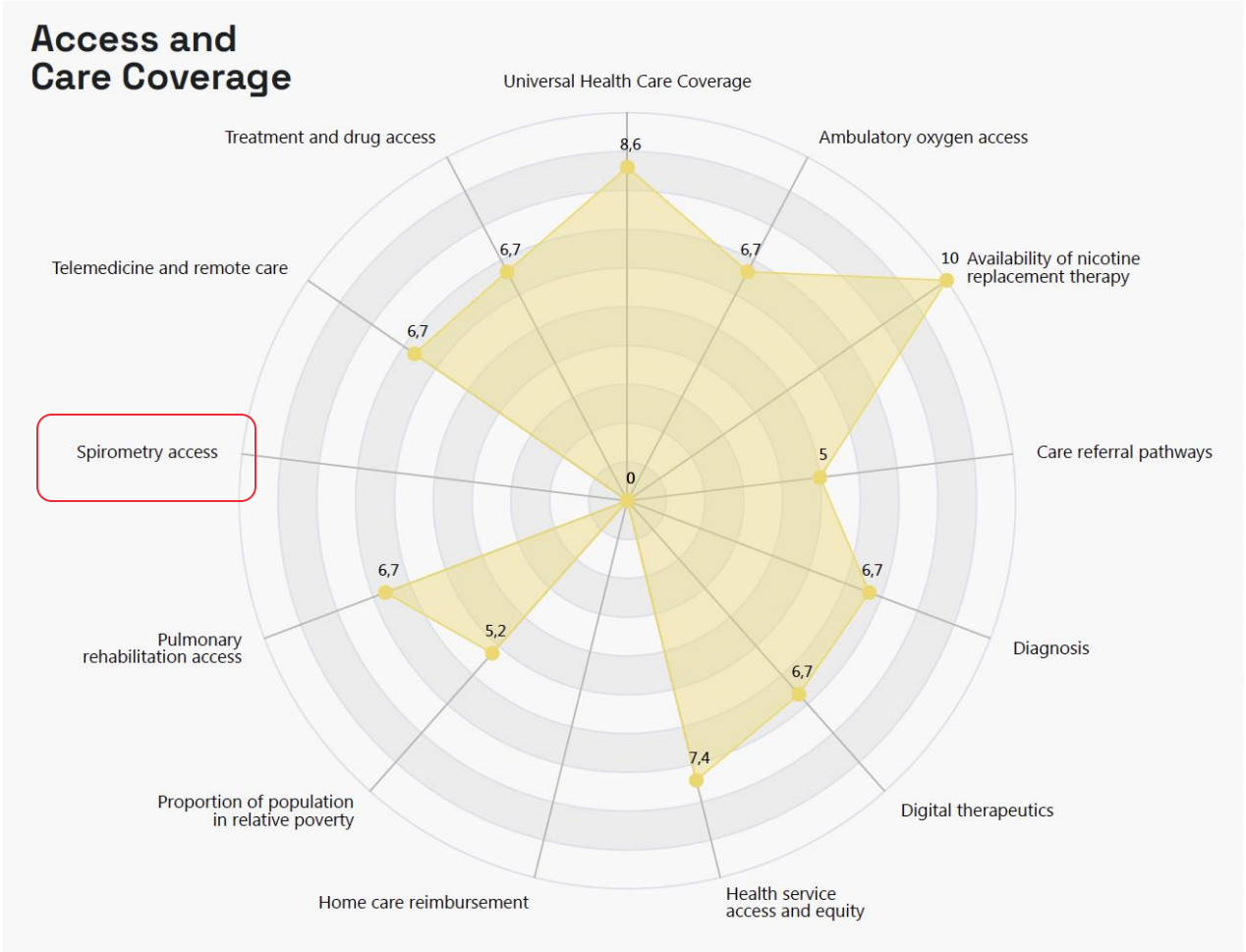
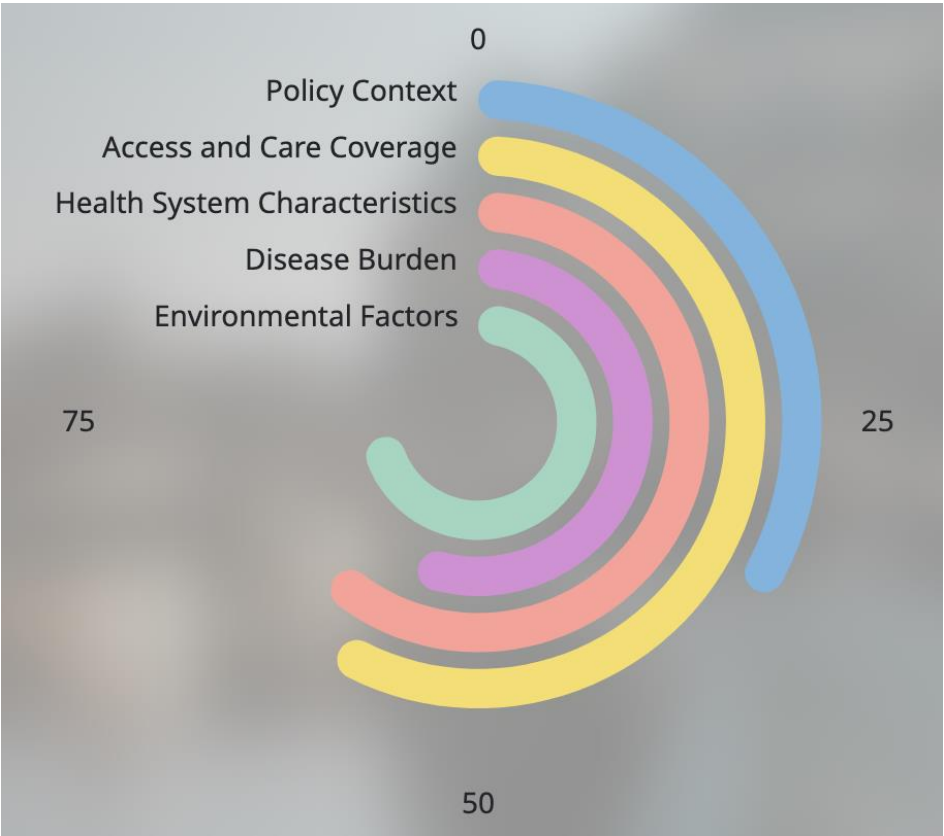
Rol van longfunctie bij de respiratoire patient: Aanpak in de huisartsenpraktijk

12-09-2025

Prof. Thérèse Lapperre

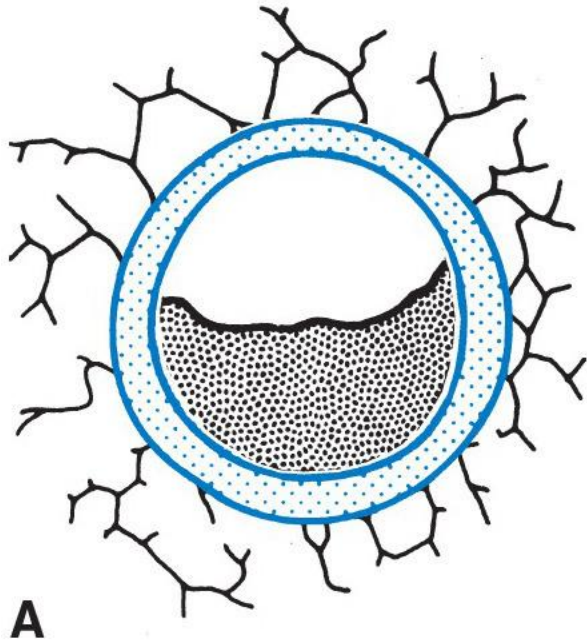
Head of Dept. Respiratory Medicine UZA

COPD Index: Belgian data



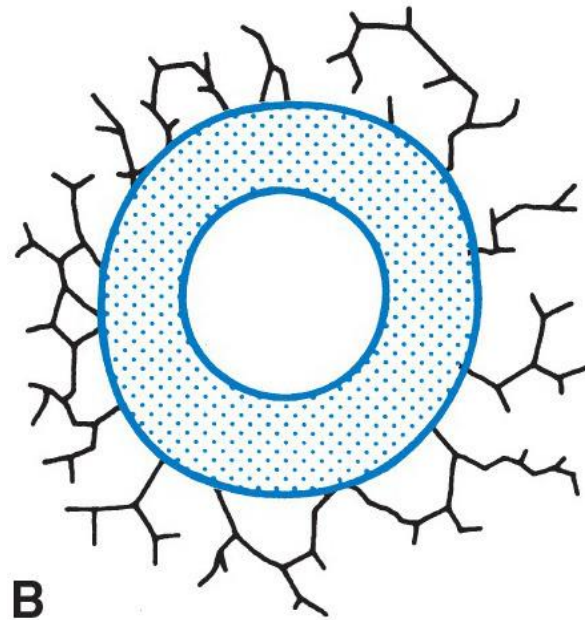
Ranking: 32/34

Luchtwegobstructie



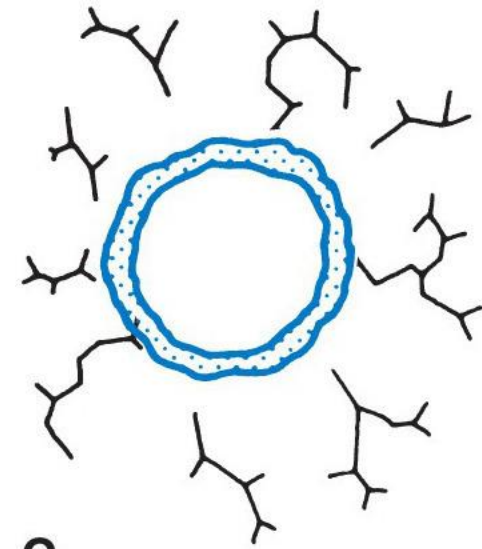
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Chronische bronchitis



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Astma



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Emfyseem

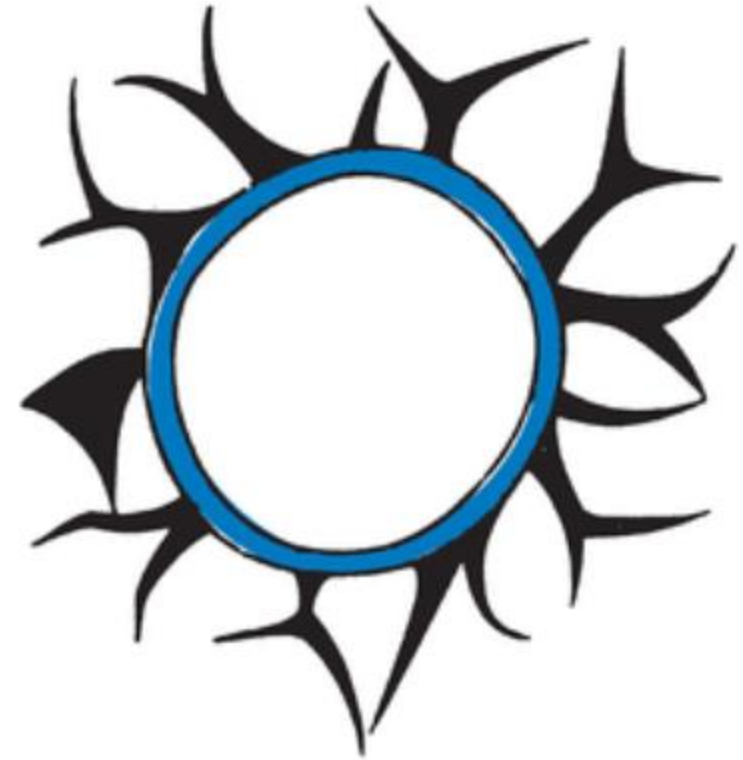
Longemfyseem versus fibrose



Normal



Emphysema



Fibrosis

Diverse longfunctiemetingen in het lab

- **Spirometrie**
 - **FeNO uitgeademde lucht**
 - **Peakflow**
 - **Forced oscillation technique (FOT)**
-
- **Bodyplethysmografie**
 - **Diffusiecapaciteit**
 - **Provocatietesten (methacholine, inspanning, ...)**
 - **Ergospirometrie**

Mogelijk in
de eerste lijn



Spirometrie in de huisartspraktijk

Doel spirometrie

Doel van de spirometrie

Diagnostiek:	Pre- en post-meting Zonder medicatie vooraf
Follow-up COPD	Meting na gebruik van eigen medicatie
Follow-up Astma	Meting na gebruik van eigen medicatie

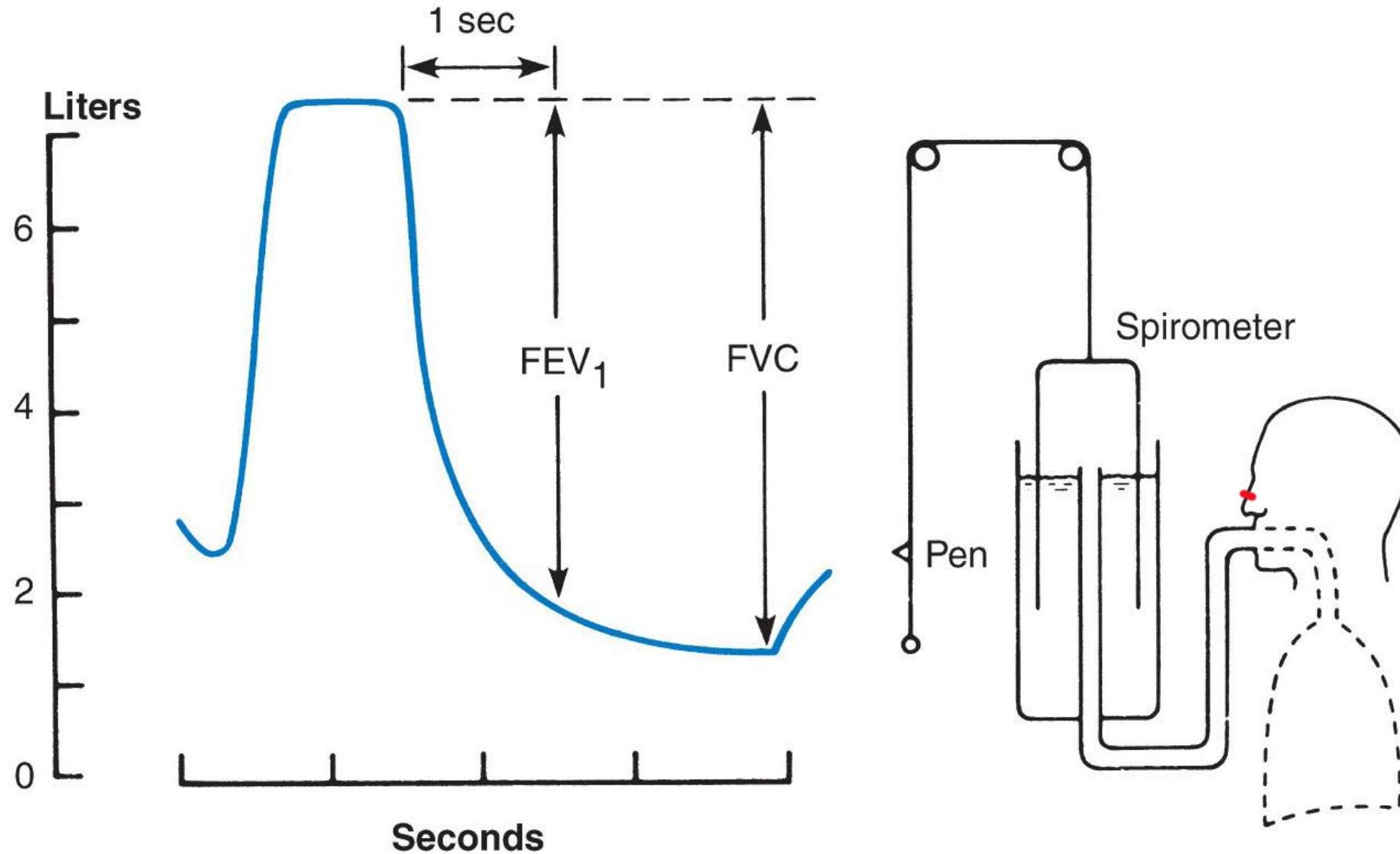
Eventueel gevolgd door een reversibiliteitsmeting

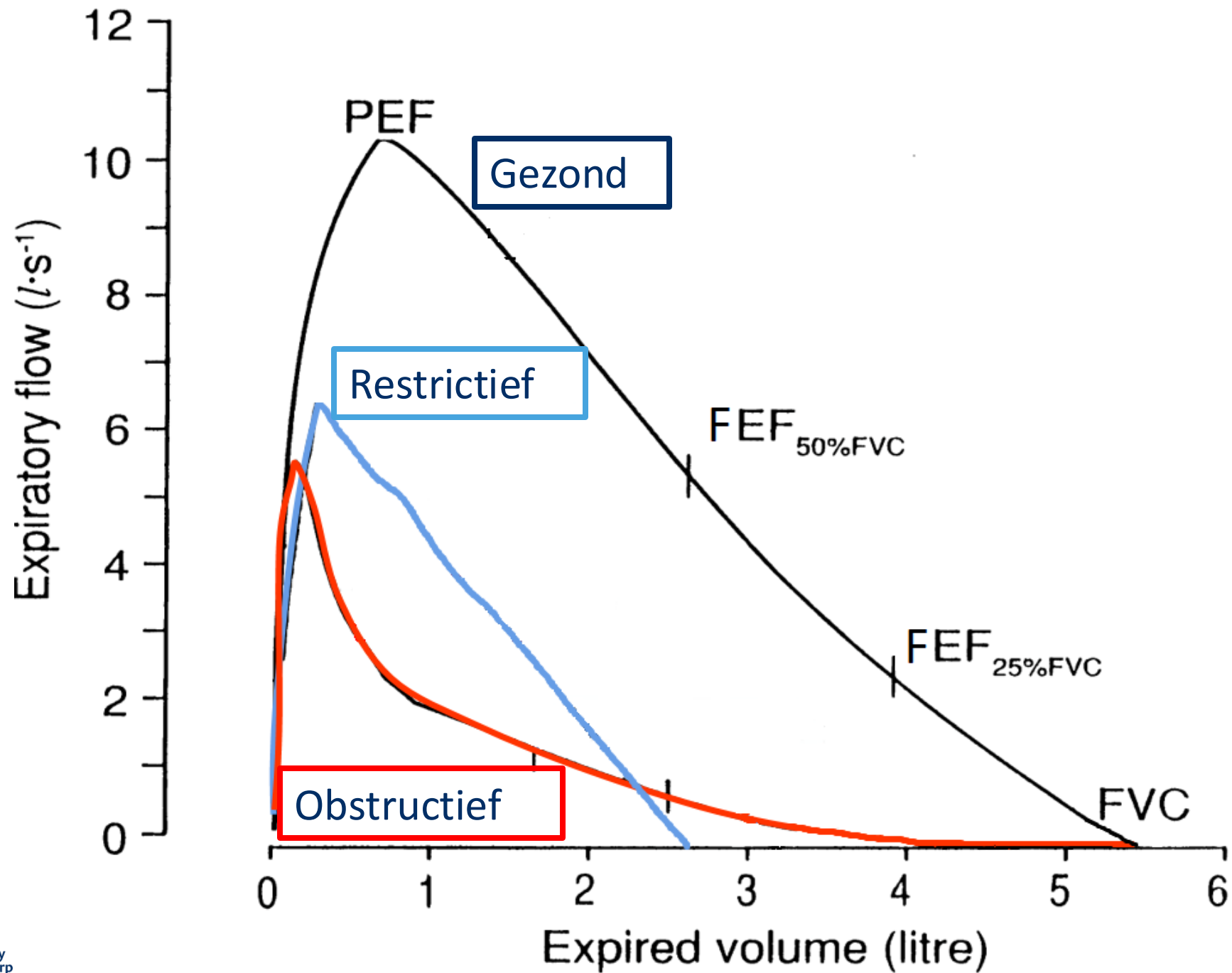
- indien er bij gebruik van eigen medicatie sprake is van een mogelijk (deels-)reversibele obstructie
- als er veel klachten zijn.



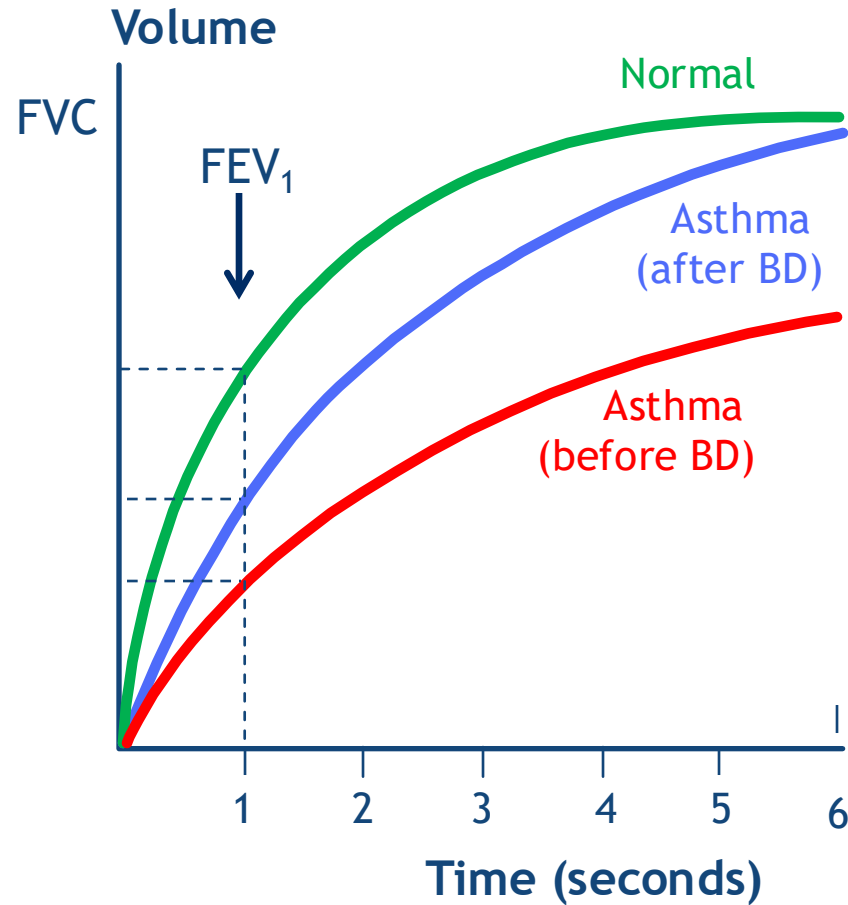
Uitleg uitvoeren spirometrie
<https://www.cahag.nl/spirometrie>

Spirometrie: meten van volumeverandering

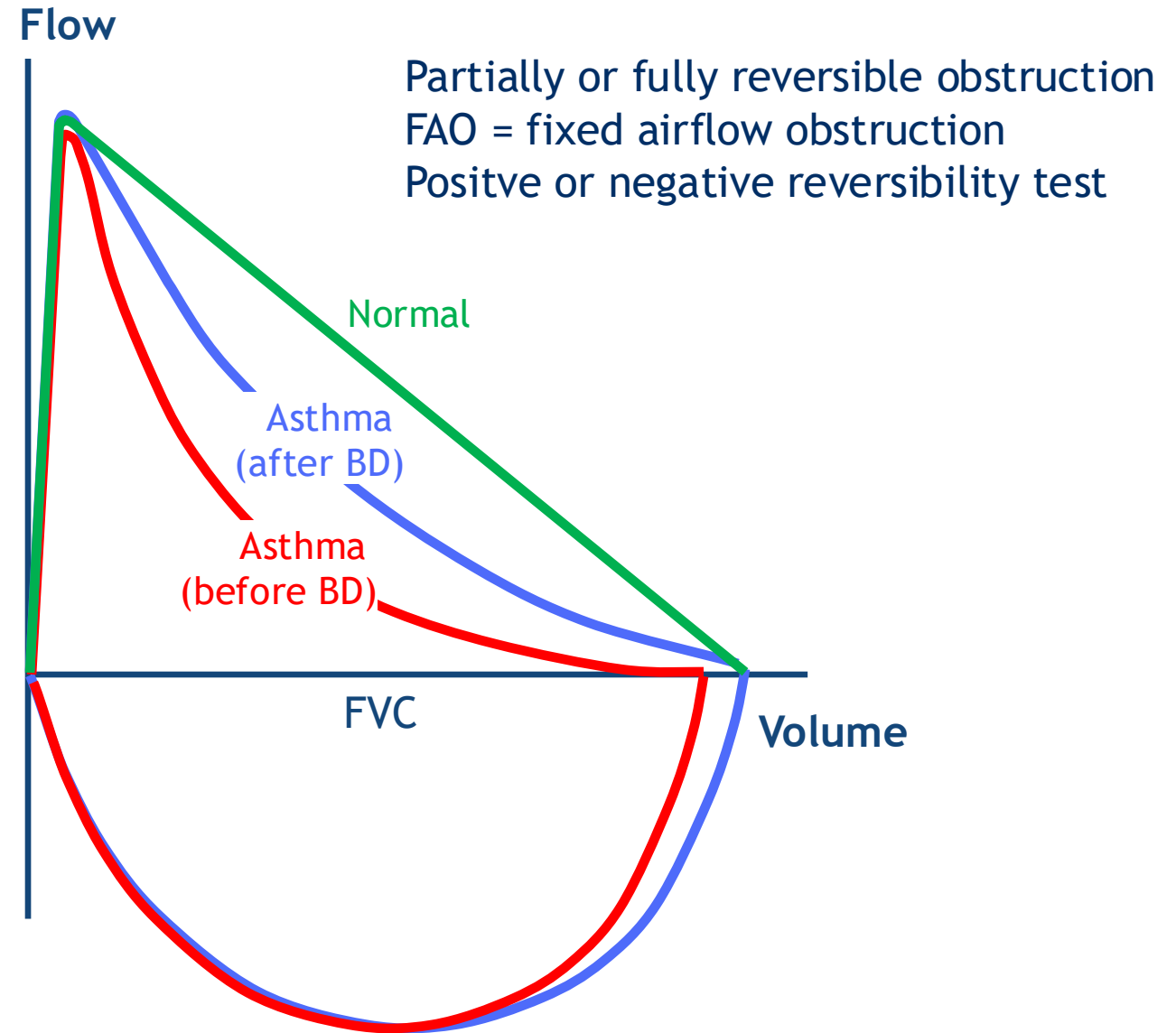




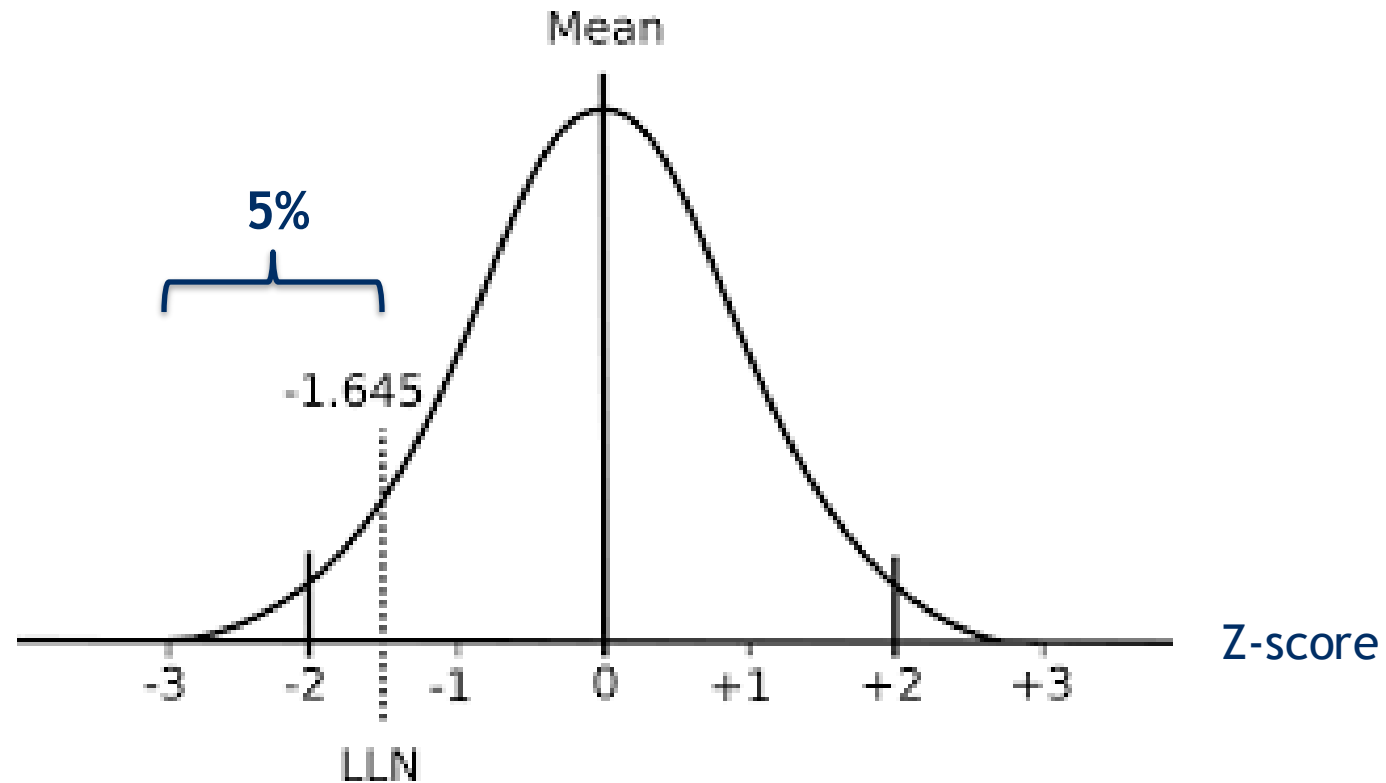
Spirometry: (reversible) airflow limitation



Note: Each FEV₁ represents the highest of three reproducible measurements



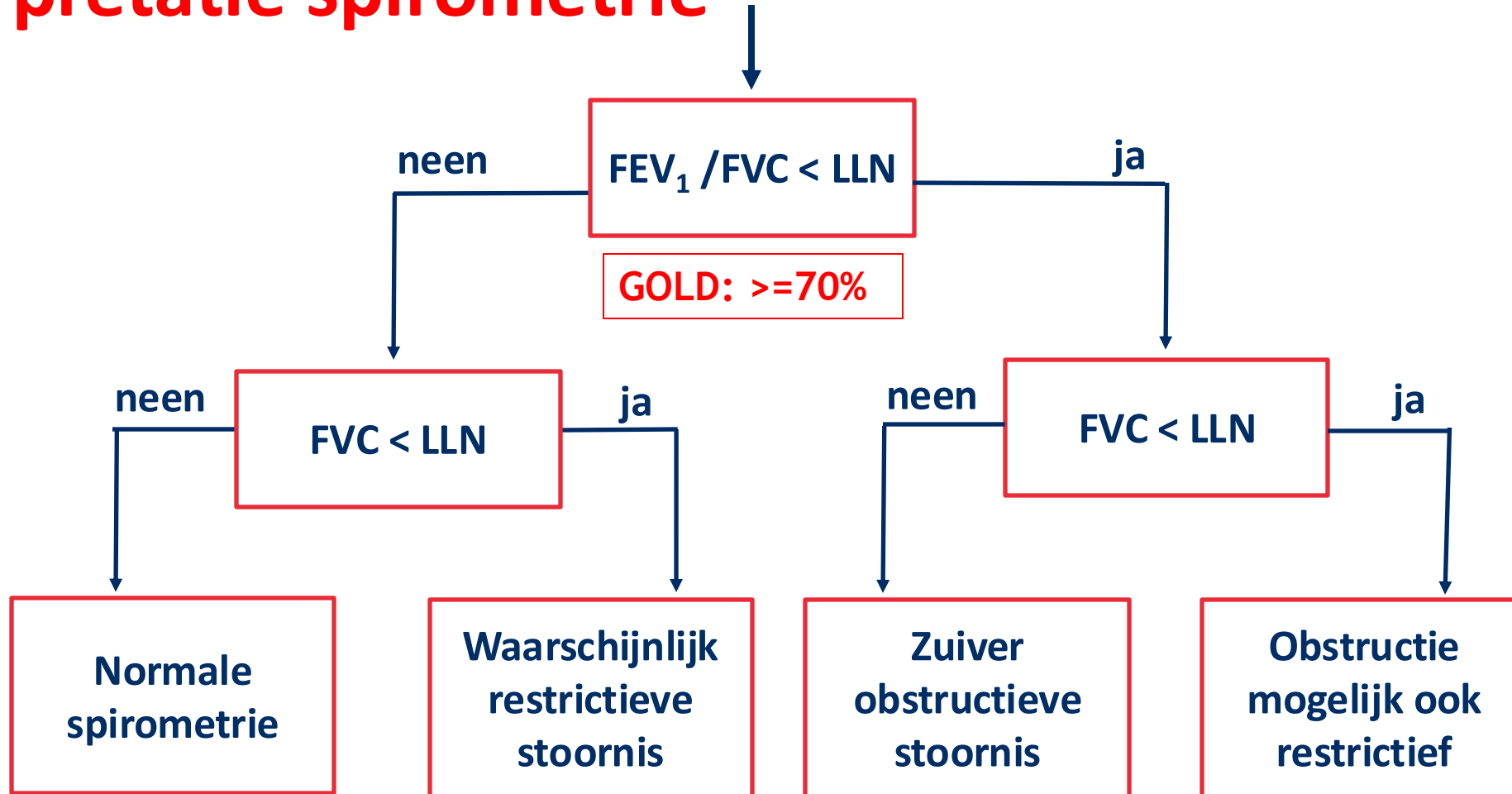
LLN and z-scores



LLN = lower limit of normal => 5th percentile of a normal healthy non-smoking population

Z-score = number of standard deviations away from mean

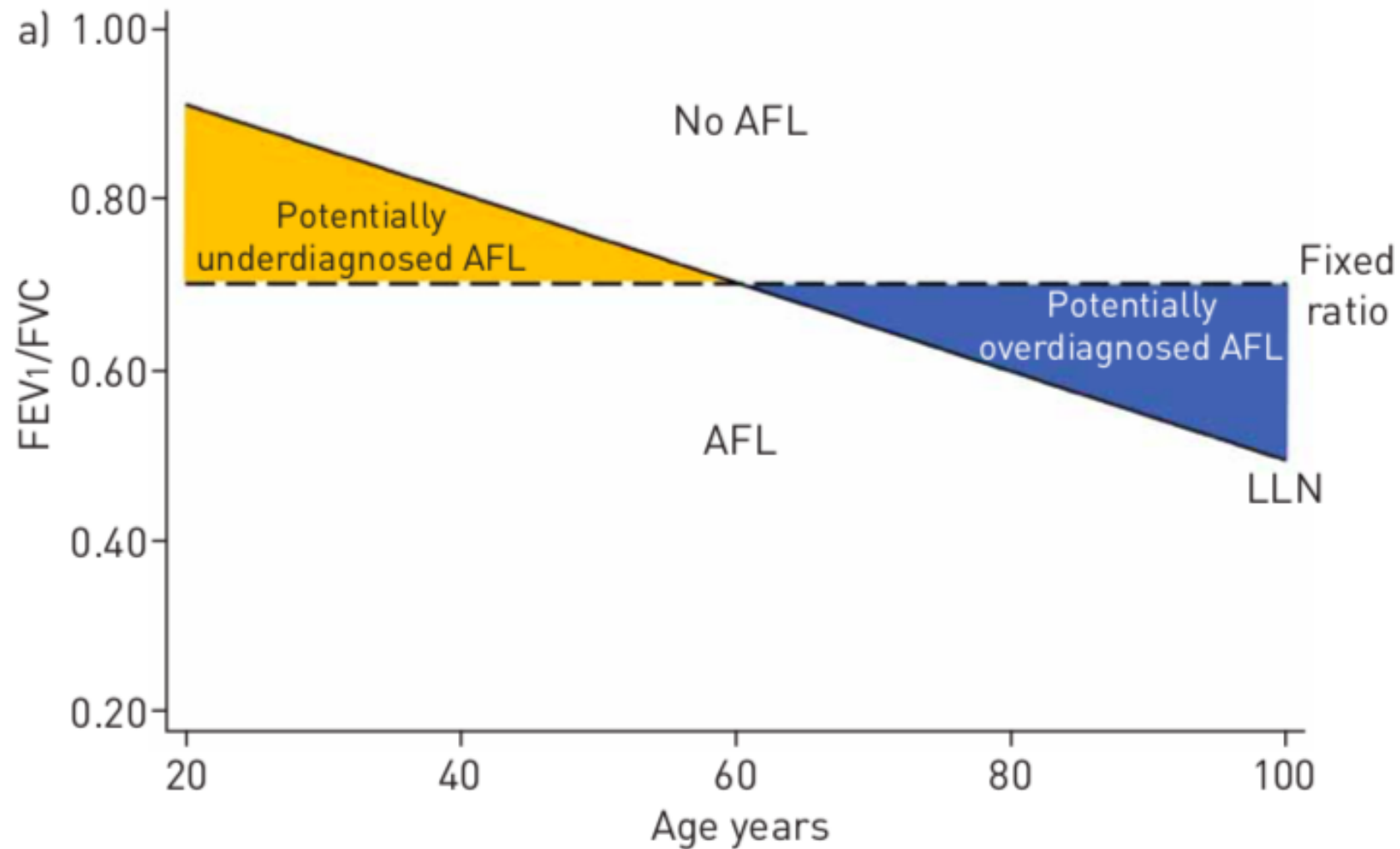
Interpretatie spirometrie



LLN = lower limit of normal = ondergrens van normaal (Z-score < -1.64)

Opmerking: om restrictie te duiden $\rightarrow$ gemeten TLC $<$ LLN

FEV1/FVC ratio: 0.70 (fixed ratio) vs LLN



Interpretatie longfunctie door longarts

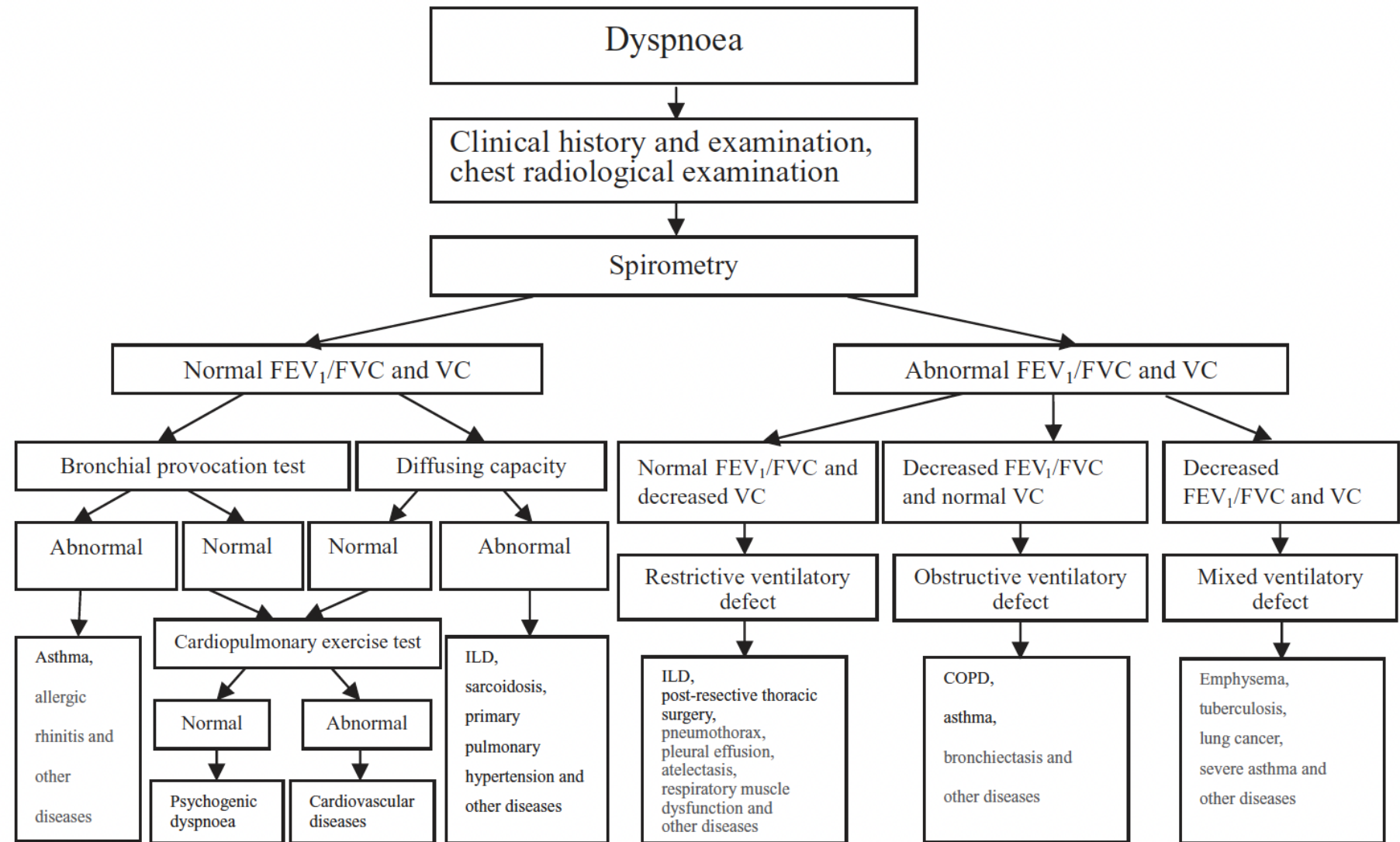


Figure 2 Interpretative strategy for lung function tests for the clinical evaluation of subjects with dyspnoea. COPD, chronic obstructive pulmonary disease; FEV₁, forced expiratory volume in 1 s; FVC, forced vital capacity; ILD, interstitial lung disease; VC, vital capacity.

Oorzaken obstructief en restrictief gestoorde longfunctie

Oorzaken obstructief gestoorde longfunctie:

Chronische of wisselende bronchusobstructie

- Ziektebeelden:
 - chronische obstructieve bronchitis
 - Emfyseem
 - bronchiaal astma

Oorzaken restrictief gestoorde longfunctie:

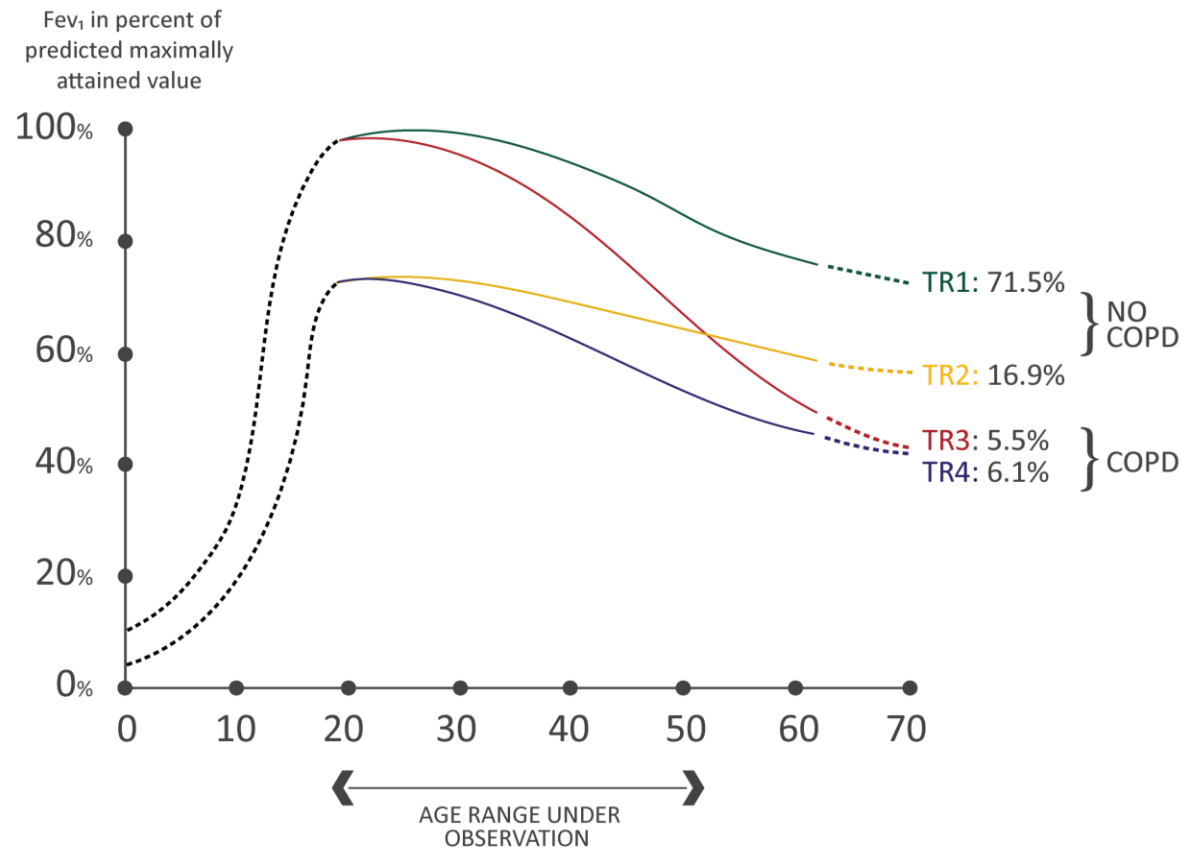
Aantasting van het longparenchym

- Ziektebeelden:
 - longfibrose
 - pneumectomie / lobectomie
 - atelectase

Aantasting respiratoire spieren of thoraxwand

- Ziektebeelden:
 - (beperkte coöperatie)
 - Diafragmaparalyse
 - kyfoscoliose

Lung function (FEV₁) progression over time in COPD

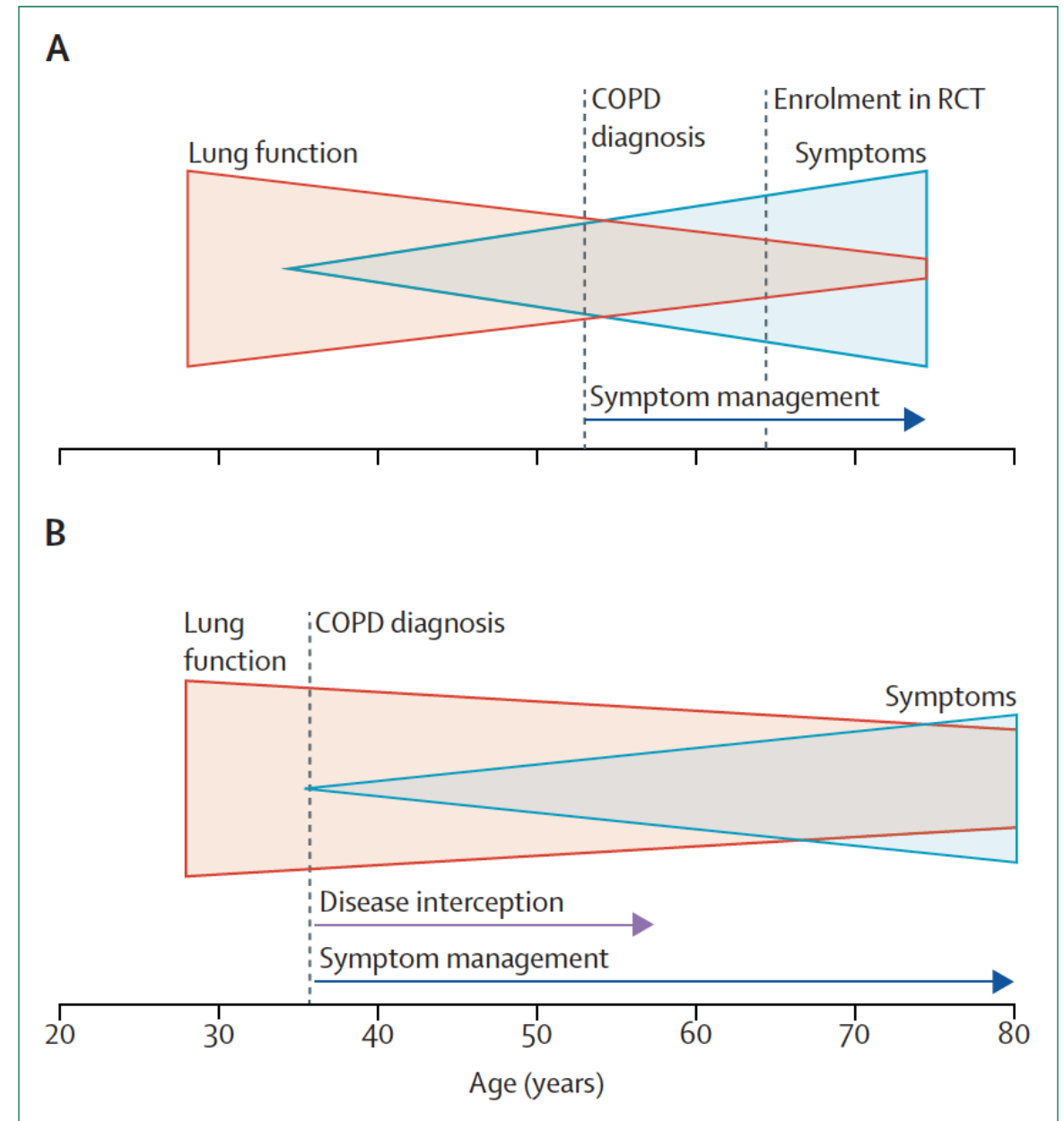


Two main biologic mechanisms can lead to chronic obstructive pulmonary disease (COPD) in adulthood:

- abnormal lung development
- an increased rate of lung-function decline with age

Lancet Commision on COPD: The importance of early diagnosis to eliminate COPD

- **Objective: To set the course to eliminate COPD by challenging accepted dogma and generating debate.**



Screening for COPD: CAPTURE Tool

Please answer each question	No	Yes
1. Have you ever lived or worked in a place with dirty or polluted air, smoke, second-hand smoke, or dust?	☐	☐
2. Does your breathing change with seasons, weather, or air quality?	☐	☐
3. Does your breathing make it difficult to do things such as carry heavy loads, shovel dirt or snow, jog, play tennis, or swim?	☐	☐
4. Compared to others your age, do you tire easily?	☐	☐
	0	1
		2 or more
5. In the past 12 months, how many times did you miss work, school, or other activities due to a cold, bronchitis, or pneumonia?	☐	☐

***C**OPD **A**ssessment in **P**rimary Care to Identify **U**ndiagnosed **R**espiratory Disease & **E**xacerbation Risk

Figure 1. The CAPTURE questionnaire (Chronic Obstructive Pulmonary Disease Assessment in Primary Care to Identify Undiagnosed Respiratory Disease and Exacerbation Risk).

- Positive screening:
 - Score 5-6
 - Score 2-4 + PEF <250L/min (female) / <350 L/min (male)
- Primary care study
- N=4325
- Clinically significant COPD:
 - Post-BD FEV1/FVC <70% OR Pre-BD FEV1/FVC <65%
 - FEV1 <60%pred OR self-reported acute respiratory illness < 12 months

Screening for COPD: CAPTURE Tool

Figure 2. Receiver Operating Characteristic Curve for Detecting Clinically Significant Chronic Obstructive Pulmonary Disease (COPD) Under Alternative Definitions of a Positive Screening Result

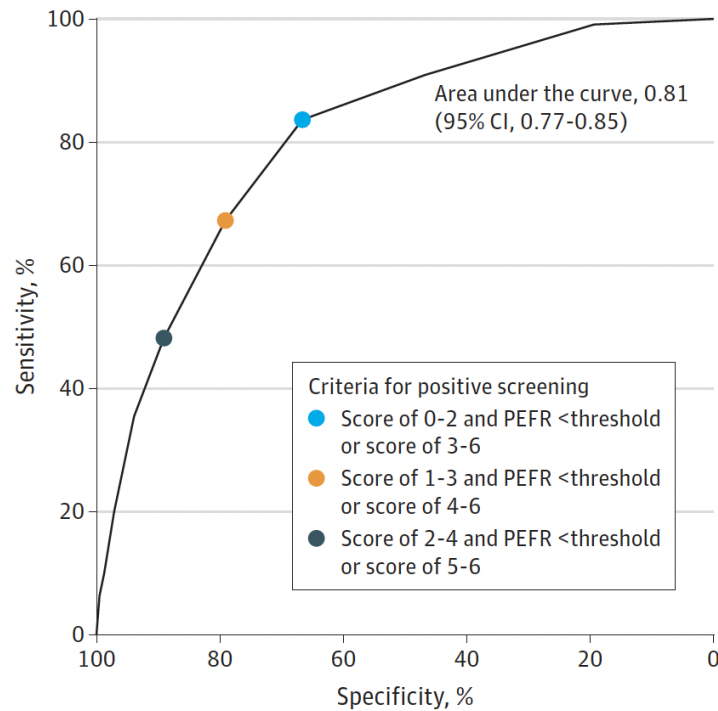
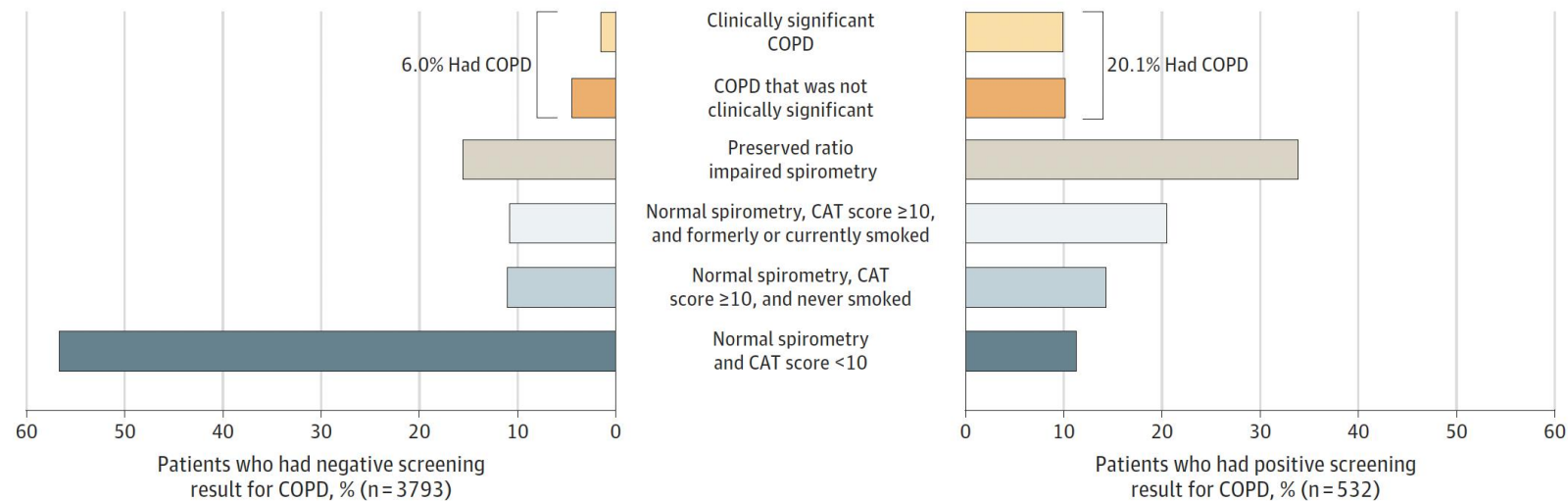


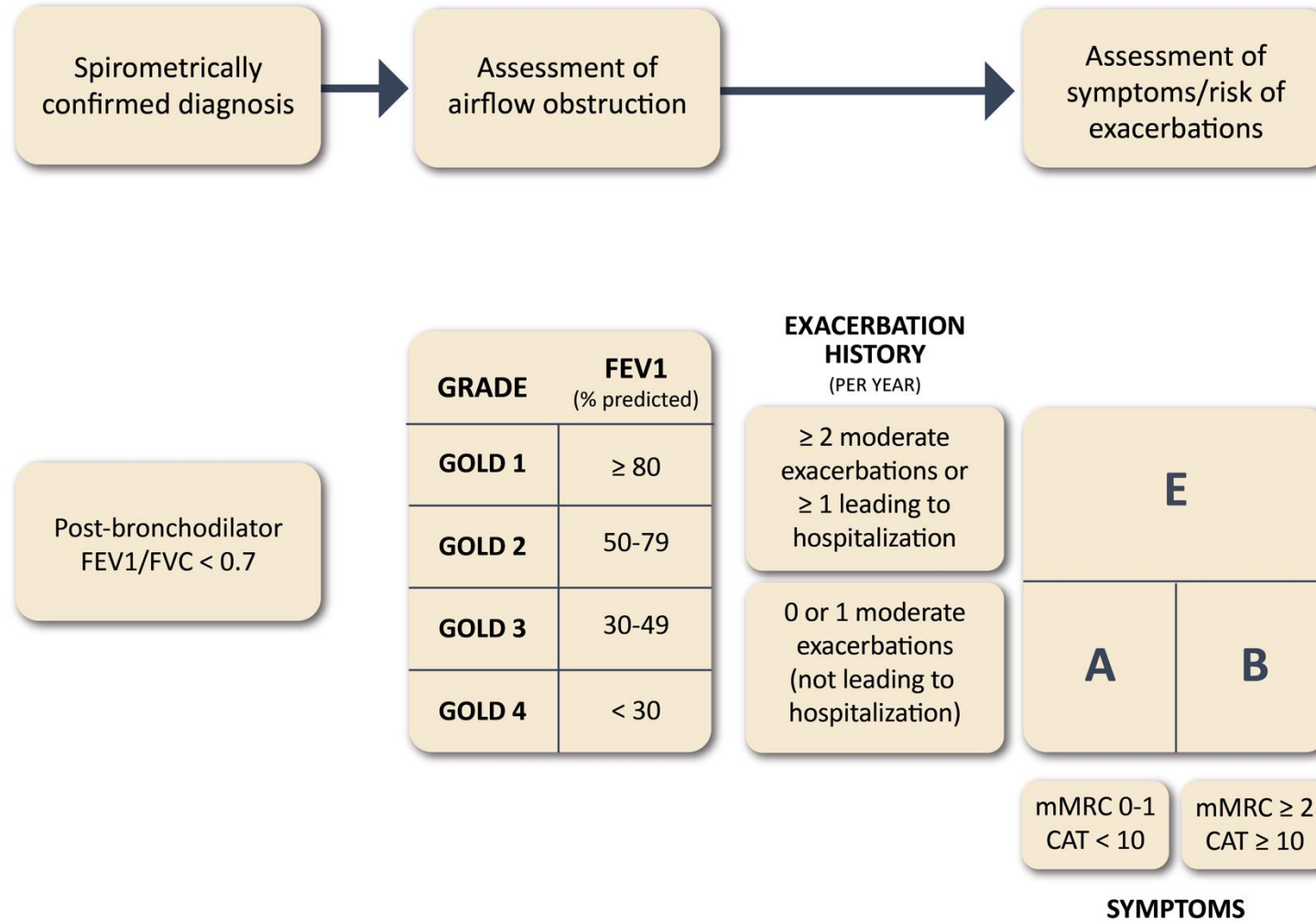
Figure 3. Spirometry- and Symptom-Based Classification of Patients With a Positive or Negative Screening Result for Detecting Clinically Significant Chronic Obstructive Pulmonary Disease (COPD)



- Sens 48.2%
- Spec 88.6%
- AUC 0.81

GOLD ABE Assessment Tool

Figure 2.3



GOLD: Pharmacological initial treatment



*single inhaler therapy may be more convenient and effective than multiple inhalers

RETHINC trial: Redefining therapy in COPD GOLD 0

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

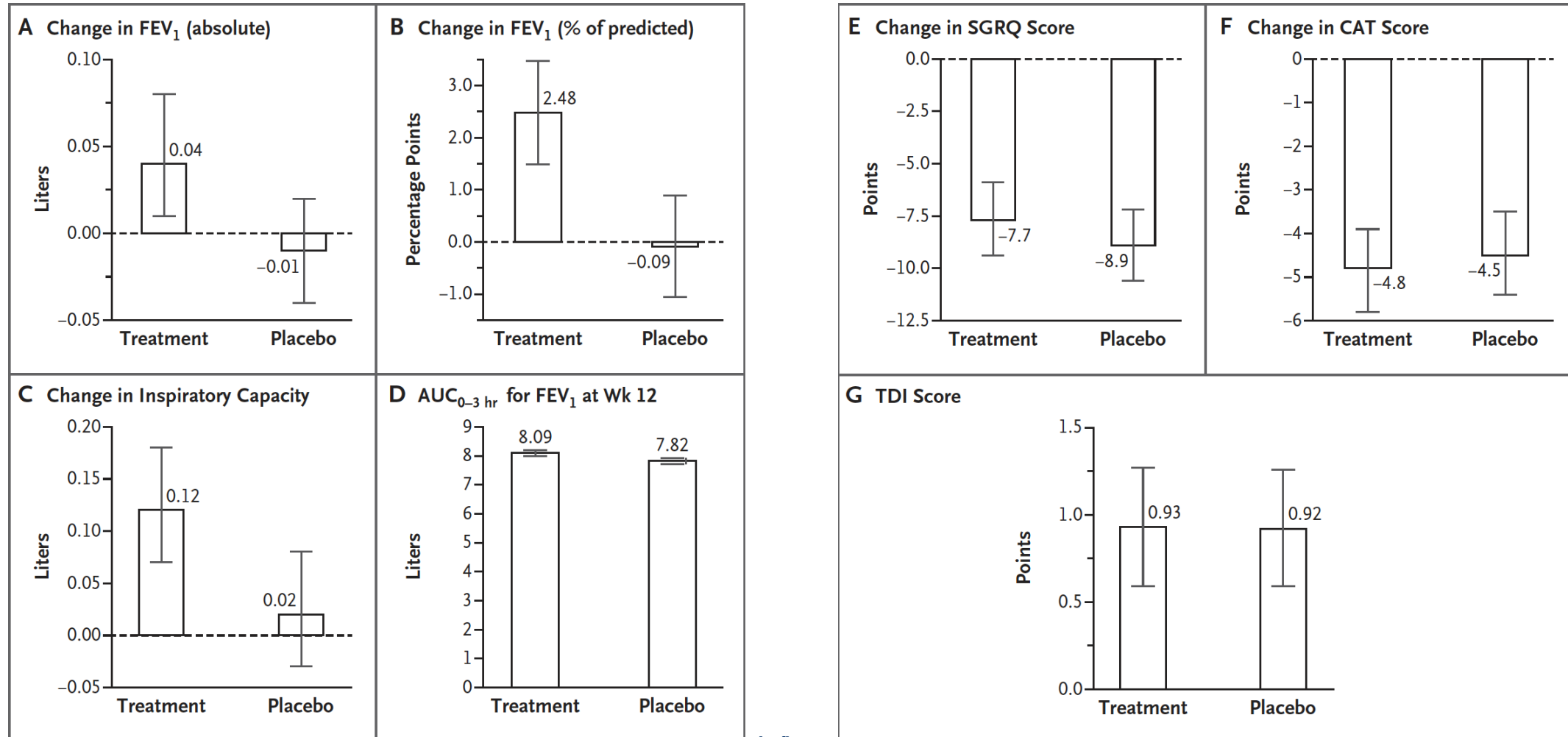
Bronchodilators in Tobacco-Exposed Persons with Symptoms and Preserved Lung Function

M.K. Han, W. Ye, D. Wang, E. White, M. Arjomandi, I.Z. Barjaktarevic, S.-A. Brown, R.G. Buhr, A.P. Comellas, C.B. Cooper, G.J. Criner, M.T. Dransfield, F. Drescher, R.J. Folz, N.N. Hansel, R. Kalhan, R.J. Kaner, R.E. Kanner, J.A. Krishnan, S.C. Lazarus, V. Maddipati, F.J. Martinez, A. Mathews, C. Meldrum, C. McEvoy, T. Nyunoya, L. Rogers, W.W. Stringer, C.H. Wendt, R.A. Wise, S.R. Wisniewski, F.C. Sciurba, and P.G. Woodruff, for the RETHINC Study Group*

- Phase III, double-blind, placebo-controlled, parallel-design multi-site study
- 12 weeks intervention:
 - indacaterol/glycopyrrolate 27.5/15.6 mcg inhaled twice daily vs placebo
- Subjects:
 - ≥ 10 pack-years smoking history
 - post-BD FEV1/FVC ≥ 0.70 and CAT ≥ 10
- Outcomes: SGRQ, CAT, BDI/TDI and spirometry
- Phone call at 4 weeks to assess AEs

RETHINC trial: no effect LABA/LABA therapy in COPD GOLD 0

Prim endpoint: ≥ 4 points decrease of SGRQ



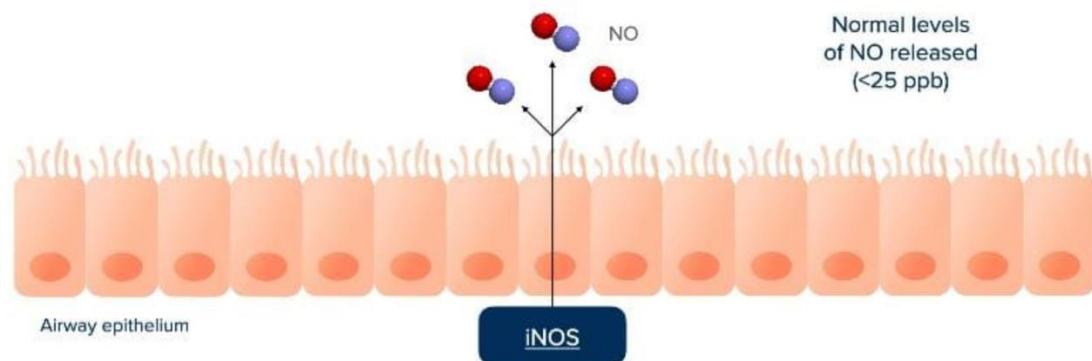
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FeNO = Uitgeademde NO meting

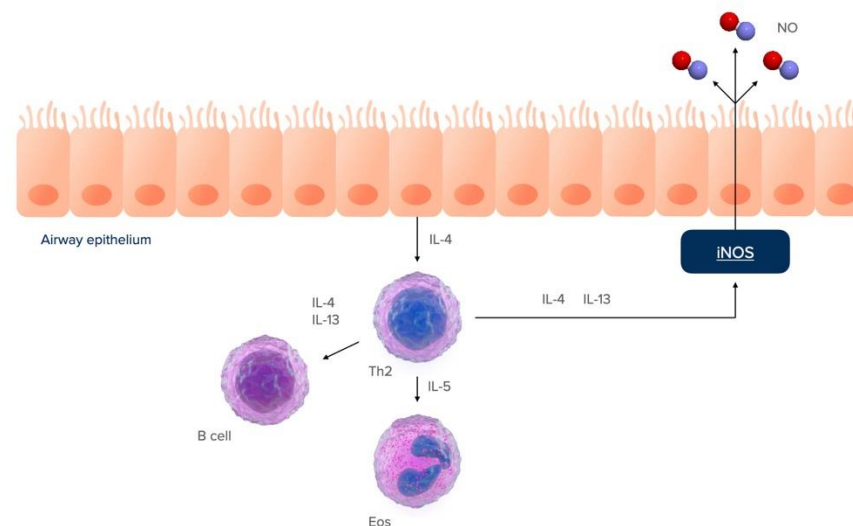


Vorming NO door epitheelcellen in de luchtwegen

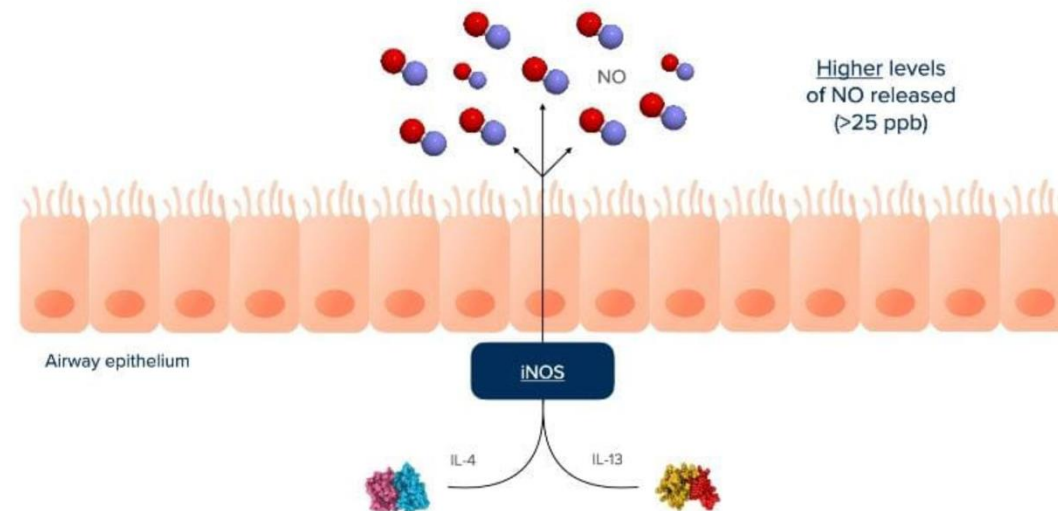
Normal Epithelial Cells



iNOS = inducible nitric oxide synthase



Activated Epithelial Cells



[ref]

FeNO

Meet fractionele uitgeademde NO

Biomarker voor T2 luchtweginflammatie

Gebruikt voor fenotypering van astma patiënten

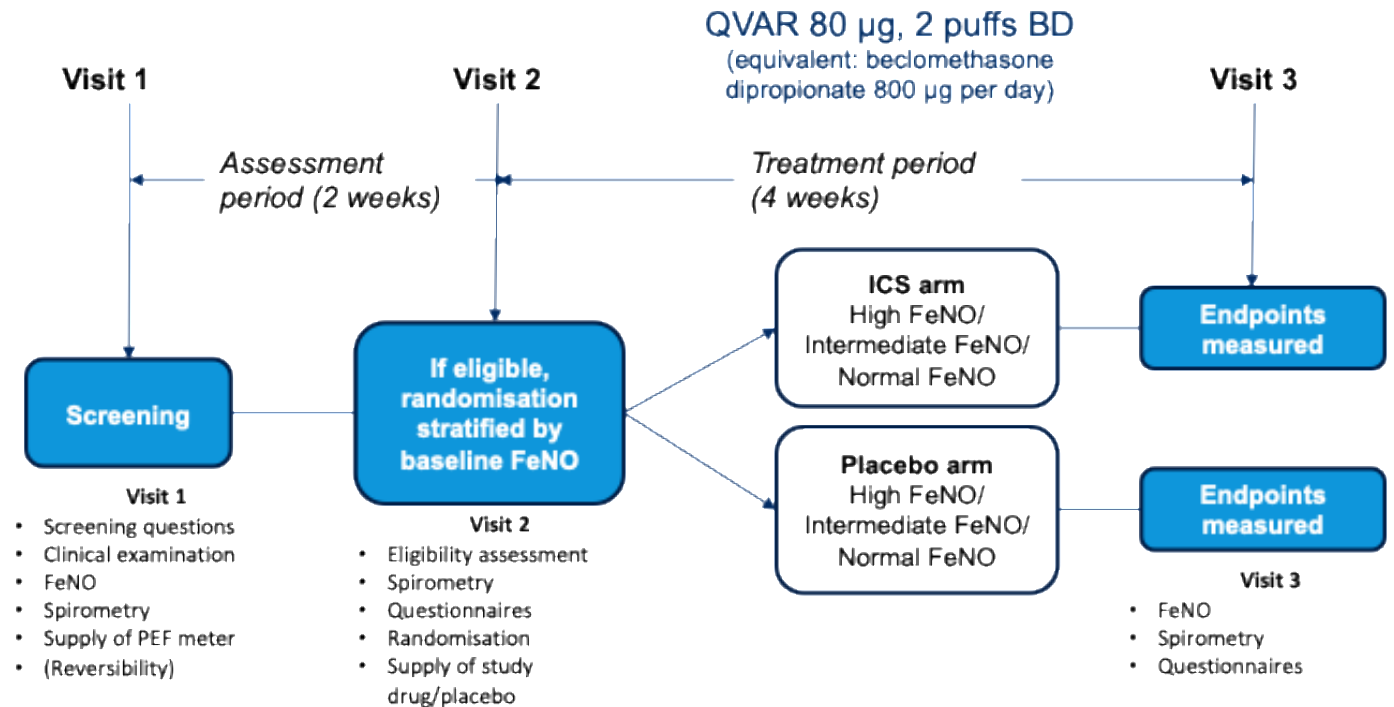
Voorspeller voor respons op anti-inflammatoire therapie (corticosteroiden, biologicals)



FeNO levels and assessment of airway inflammation, from the ATS guidelines ¹			
FeNO (ppb)	LOW	INTERMEDIATE	HIGH
Adults	< 25	25-50	> 50
Type 2 inflammation	Unlikely	Possible	Likely

Fractional exhaled nitric oxide as a predictor of response to inhaled corticosteroids in patients with non-specific respiratory symptoms and insignificant bronchodilator reversibility: a randomised controlled trial

David B Price, Roland Buhl, Adrian Chan, Daryl Freeman, Elizabeth Gardener, Clifford Godley, Kevin Gruffydd-Jones, Lorcan McGarvey, Ken Ohta, Dermot Ryan, Jörgen Syk, Ngiap Chuan Tan, TzeLee Tan, Mike Thomas, Sen Yang, Priyanka Raju Konduru, Marcus Ngantcha, Martina Stagno d'Alcontres, Therese S Lapperre



FeNO cut-offs: Normal ≤ 25 ppb; Intermediate > 25 & < 40 ppb; High ≥ 40 ppb

	Extrafine inhaled corticosteroids (n=114)	Placebo (n=100)
Age, years	50.0 (15.5)	47.7 (17.0)
Body-mass index (kg/m ²)	27.6 (5.2)	27.6 (6.0)
Sex		
Female	60 (53%)	63 (63%)
Male	54 (47%)	37 (37%)
Smoking status		
Current smoker	11 (10%)	1 (1%)
Ex-smoker	30 (26%)	26 (26%)
Never-smoker	73 (64 %)	73 (73%)
Country		
UK	80 (70%)	78 (78%)
Singapore	34 (30%)	22 (22%)
FeNO, ppb	36.1 (27.2)	39.6 (31.5)
ACQ7*	1.61 (0.57)	1.71 (0.6)
FEV ₁ , L	2.78 (0.92)	2.81 (0.82)
FEV ₁ percent predicted	90.8% (16.5)	92.9% (14.9)
FVC, L	3.59 (1.17)	3.61 (1.11)
FVC percent predicted	95.4% (18.8)	97.7% (16.3)
FEV ₁ :FVC	0.78% (0.09)	0.79% (0.09)
Peak expiratory flow, L/min	222.5 (233.4)	261.11 (209.4)
EQ-5D-3L score	0.85 (0.17)	0.87 (0.13)
VAS cough, mm	42.0 (29.1)	41.1 (26.6)
VAS symptom, mm	46.5 (25.6)	46.7 (26.3)
Eosinophil count, ×10 ⁹ /L	0.2 (0.27)	0.2 (0.15)
Reversibility score†	2.37% (0.84)	2.47% (0.74)
Clinical judgment‡		
Patient is asthmatic	62/113 (55%)	60/99 (61%)
Treatment is clinically justified	113/113 (100%)	99/99 (100%)
Probable COPD§	2 (2%)	2 (2%)

ef]

	Extrafine inhaled corticosteroids (n=114)	Placebo (n=100)	Adjusted treatment effect (intervention minus placebo)* or interaction effect with FeNO
Change in ACQ7 by FeNO category (follow-up minus baseline)			
All	0.82 (0.70)	0.56 (0.78)	0.29 (0.08 to 0.49)
Normal	0.80 (0.59)	0.73 (0.62)	0.10 (−0.24 to 0.44)
Intermediate	0.70 (0.75)	0.47 (0.89)	0.25 (−0.10 to 0.61)
High	0.97 (0.77)	0.49 (0.78)	<u>0.49 (0.14 to 0.84)</u>
Interaction effect			
Difference in treatment effect†	..	..	<u>0.071 (0.002 to 0.139); p=0.044</u>
Difference in gradients‡	..	..	<u>0.045 (0.006 to 0.084); p=0.024</u>

Data are mean (SD) or difference (95% CI). Differences in treatment effect or gradient are intervention minus placebo. FeNO=fractional exhaled nitric oxide. ACQ7=Asthma control questionnaire, six questions and FEV₁. *All models are adjusted by baseline FeNO and smoking status. †Difference in treatment effect is interpreted as the additional change in continuous outcome (intervention minus placebo) for every 10 ppb increase in baseline FeNO. ‡Sensitivity analysis.

Table 2: Primary analysis: change in ACQ7 by treatment group and baseline FeNO

Hoe praktisch aan de slag met longfunctie in de 1e lijn?

■ Zelf spirometrie uitvoeren in de huisartsenpraktijk

- Spirometriecursus volgen
- Regelmatig uitvoeren om routine te onderhouden



■ Direct verwijzen naar een longfunctie Labo

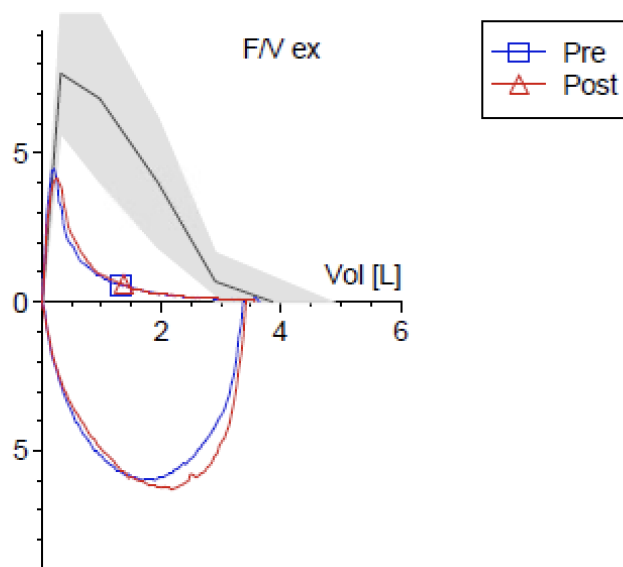
We raden je aan je afspraak via pneumologie@uza.be te maken, te wijzigen of te annuleren. Dit kan op elk moment. Geef hierbij door wanneer je zeker beschikbaar bent. Je ontvangt dan binnen de 3 werkdagen een nieuwe afspraak via e-mail.

- Ben je door je huisarts verwezen voor een **longfunctieonderzoek**, contacteer +32 3 821 30 39.

- Uitslag longfunctie rapport in CoZo



Longfunctie onderzoek in CoZo + rapport

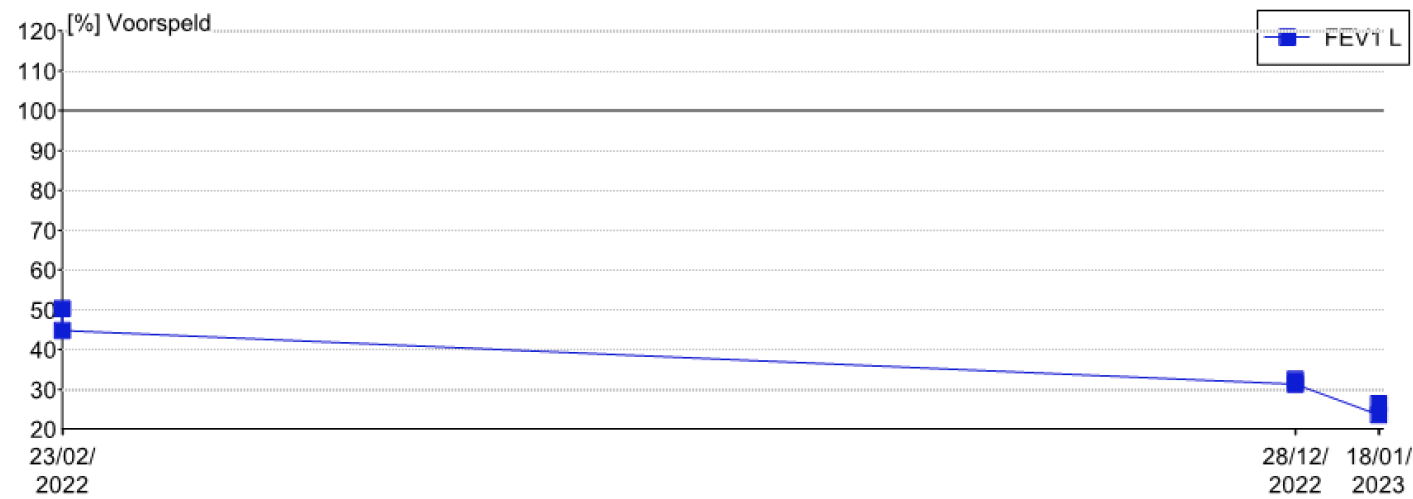


Datum onderzoek	31.05.18	Pred.	Gemeten	%Pred	Z-score	Gemeten	%Pred	% Verschil
Medicatie						NA VENTOLIN		
SPIROMETRIE/FLOW-VOLUME								
FVC	L	3.86	3.60	93	-0.43	3.56	92	-1
FEV 1	L	2.97	1.30	44	-3.28	1.35	46	4
FEV 1 % VC MAX	%	77	36	47	-4.32	38	49	6
PEF	L/s	7.65	4.93	64	-2.25	4.56	60	-7
MFEF 75/25	L/s	2.38	0.25	11	-3.38	0.28	12	11
FEF 75	L/s	0.65	0.10	16	-3.05	0.12	18	15
LONGVOLUMES (Bodyplethysmografie)								
RV	L	2.46	5.39	219	7.14			
ITGV	L	3.47	6.72	194	5.41			
TLC	L	6.42	9.04	141	3.74			
RV % TLC	%	40	60	149	3.56			
LUCHTWEGWEERSTAND								
R tot	kPa/(L/s)	0.30	0.54	180				
SR tot	kPa*s	1.18	3.77	320				
DIFFUSIECAPACITEIT								
DLCO SB	mmol/(min*kPa)	7.93	4.87	61	-2.57			
VA-SB	L	5.69	4.78	84	-1.32			
DLCO/VA	mmol/(min*kPa*L)	1.40	1.02	73	-1.79			

Lung function decline in COPD: Case

Geboortedatum: 12/01/1969

Parameter Datum	FEV1 (L)	FEV1 %Voorsp	FVC (L)	FVC %Voorsp	Tiff (%)	RV %Voorsp	TLC (L)	TLC %Voorsp	DLC... %Voorsp	FENO
23/02/2022	1.19	44.8	3.36	100.4	36	153.5	5.81	113.0	36.0	
23/02/2022	1.34	50.4	3.41	102.0	39					
28/12/2022	0.83	31.4	2.63	79.3	32	223.7	6.18	120.5	35.9	
28/12/2022	0.86	32.5	2.92	88.0	29					
18/01/2023	0.62	23.6	2.21	66.6	28	259.6	6.23	121.5		
18/01/2023	0.70	26.5	2.10	63.3	33					



Stopped smoking cigarettes 8/2022.

Started vaping 8/2022: AURA, green apples, nicotinezoutoplossing 10 mg in 10ml.

Toekomst van longfunctie in de huisartspraktijk?



Prof. Janwillem Kocks - Groningen

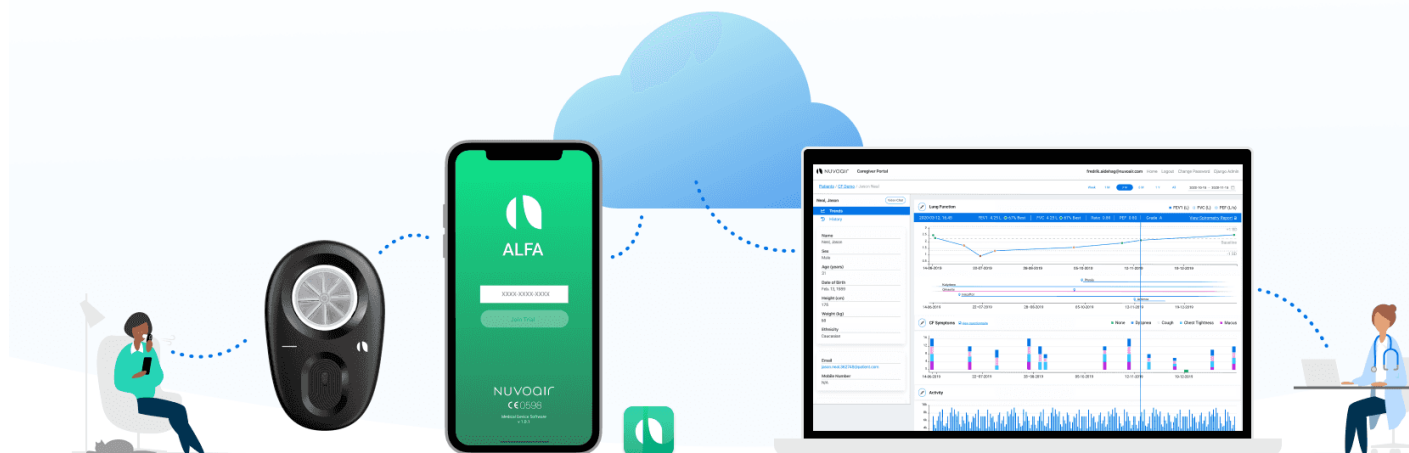
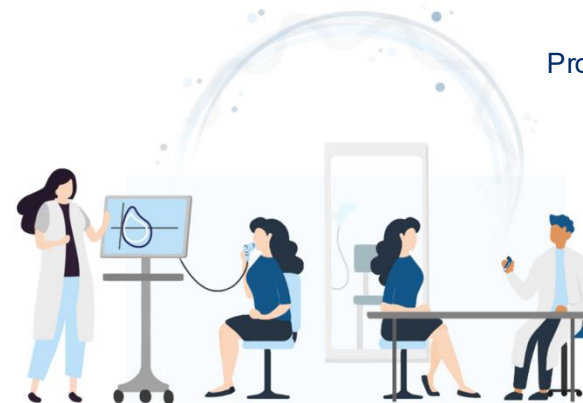


Portable FeNO + Spirometrie +
Forced Oscillation Technique (FOT) in 1

Bringing the Power of Artificial Intelligence to Clinical Research and Healthcare

ArtiQ provides cutting-edge AI-first software to optimize clinical trials, enhance diagnostic processes, and contribute to improving patients' lives worldwide

Prof. Janssens – UZ Leuven



Mail: pneumologie@uza.be
Instagram: Longziekten_uza
Website: www.uza.be/longziekten



Q&A



3. Respiratory diseases are common but often overlooked

Lung diseases affect millions of people around the world but are often not diagnosed properly or are misunderstood. Many people underestimate early symptoms such as a chronic cough, shortness of breath, or fatigue, attributing them to other causes. This lack of attention can lead to delays in diagnosis, while lung diseases are often more treatable if detected early.

