COPD: What does it stand for?

Chronic Obstructive Pulmonary Disease

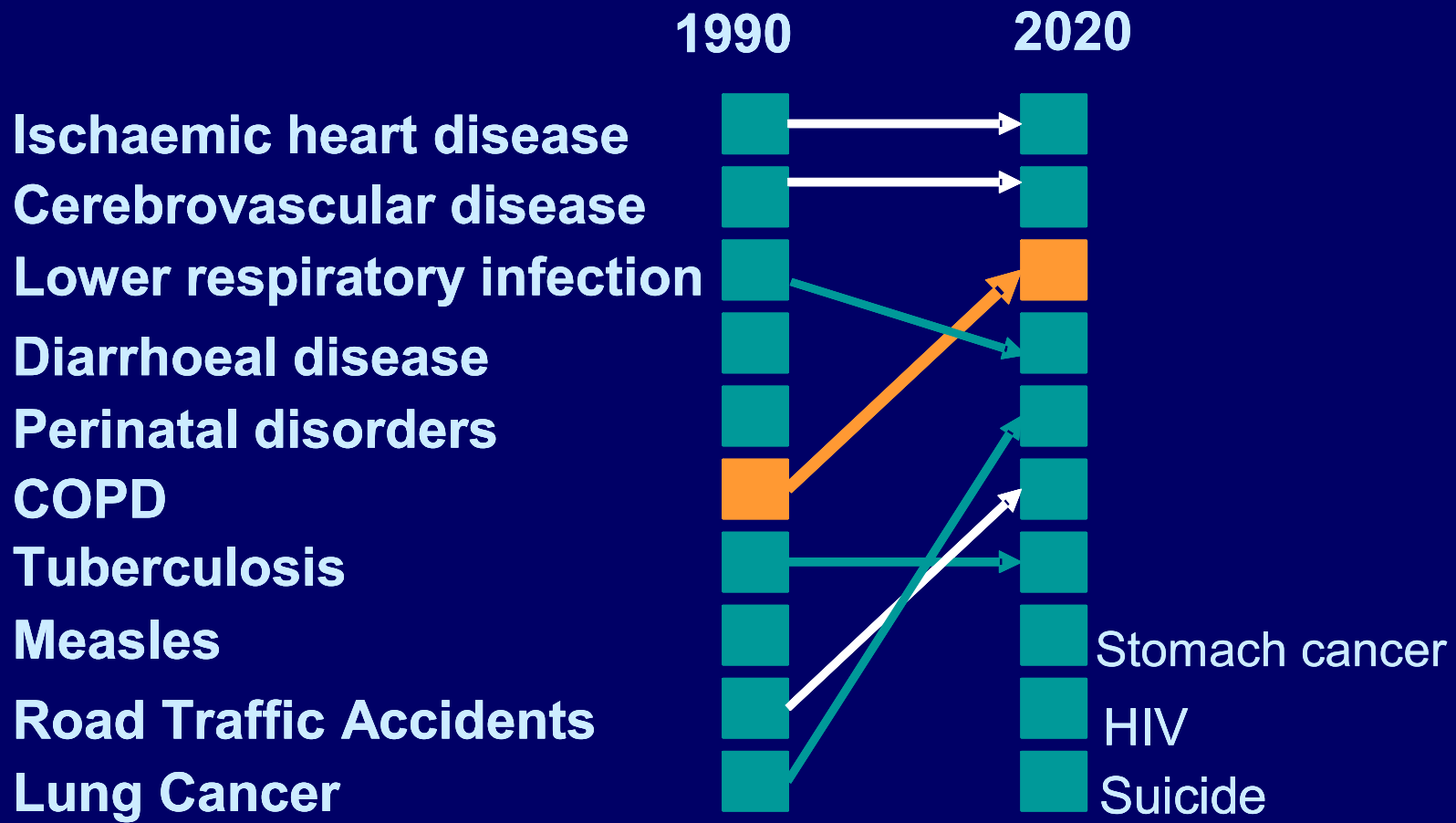
Professor William MacNee
Past President European Respiratory Society

Definition of COPD

- COPD is a preventable and treatable disease. In the lungs it is characterized by airflow limitation (or obstruction to the flow of air) that is not fully reversible.
- The airflow limitation is usually progressive and associated with an abnormal inflammation in the lungs in response to noxious particles or gases.
- COPD has significant effects out with the lungs that may contribute to the severity in individual patients.

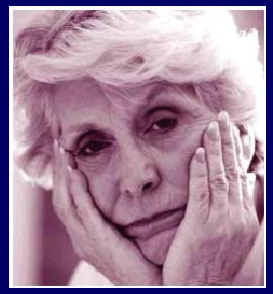
Global Burden Of Disease: Top 10 Causes Of Death In 1990 and 2020

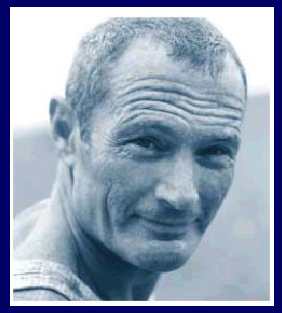
COPD as the only major disease to increase significantly in recent years



Murray et Lopez. Lancet 1997;349:1498-1504

The burden of COPD in Europe





- The frequency of COPD varies in European countries from 4-10% of the adult population, 50/100,000 males ; 20/100,000 females
- Many more are undiagnosed
- 2- 300,000 people die in Europe each year because of COPD
- Estimated direct cost in EU –

  Out - patient € 4.7 billion

  In-patient € 2.9 billion

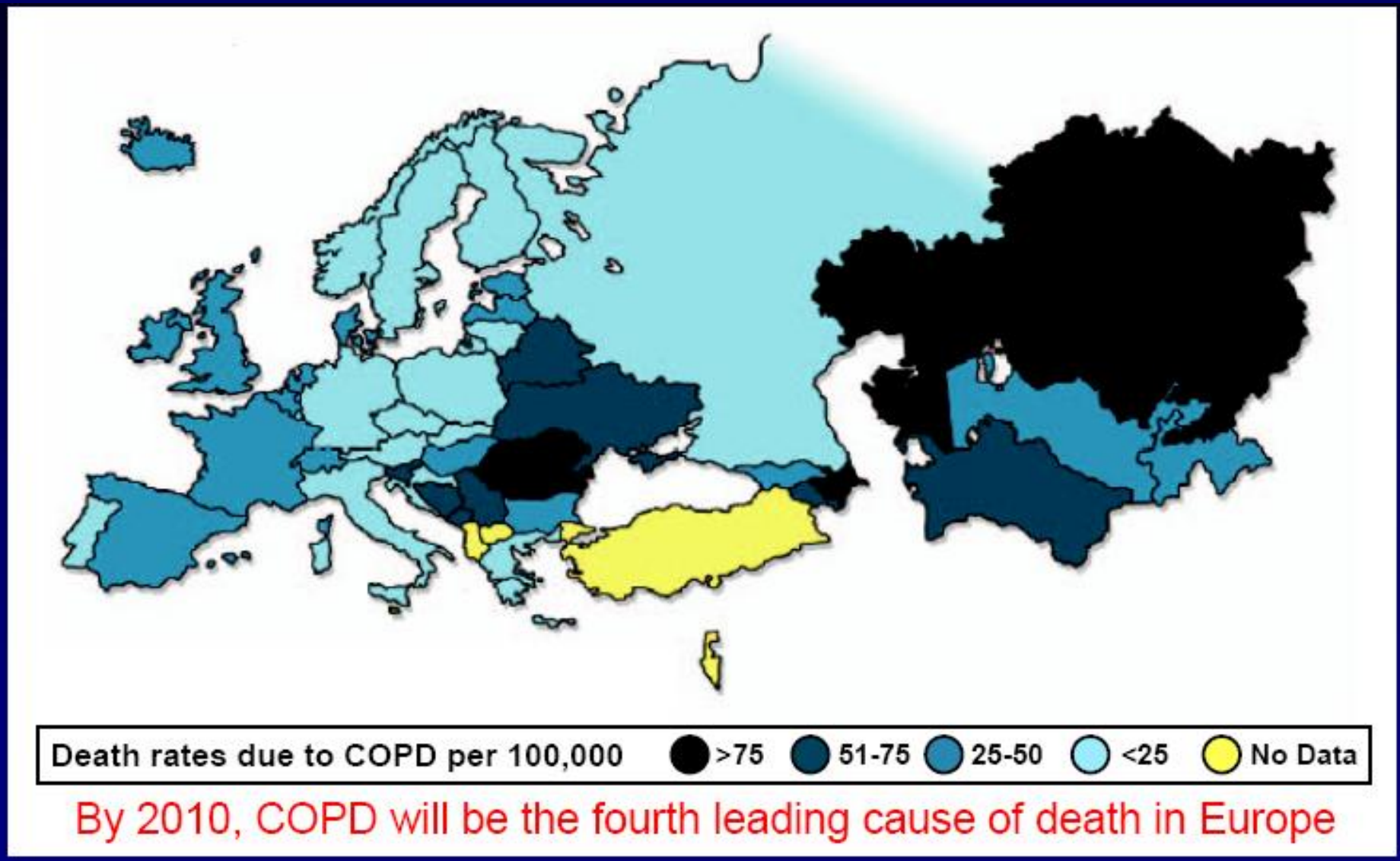
  Drugs € 2.9 billion

  41,300 Lost work days/ 100,000 pop^{n}

  Productivity losses € 28.5 billion

European Respiratory Society

Burden of mortality from COPD in Europe

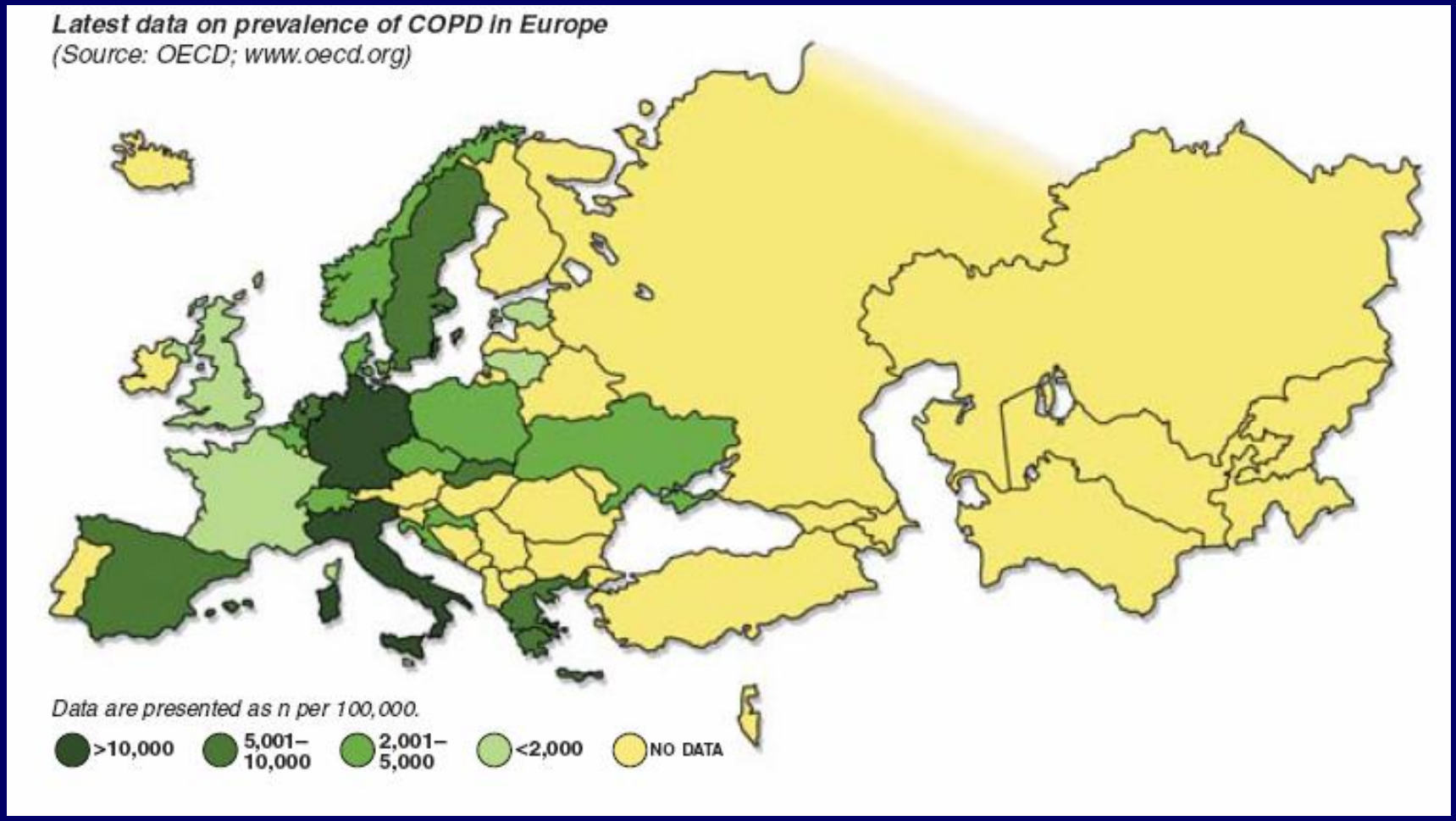


By 2010, COPD will be the fourth leading cause of death in Europe

ERS/ELF. European Lung White Book 2003

European Respiratory Society

Prevalence of COPD in Europe



Better data is urgently needed

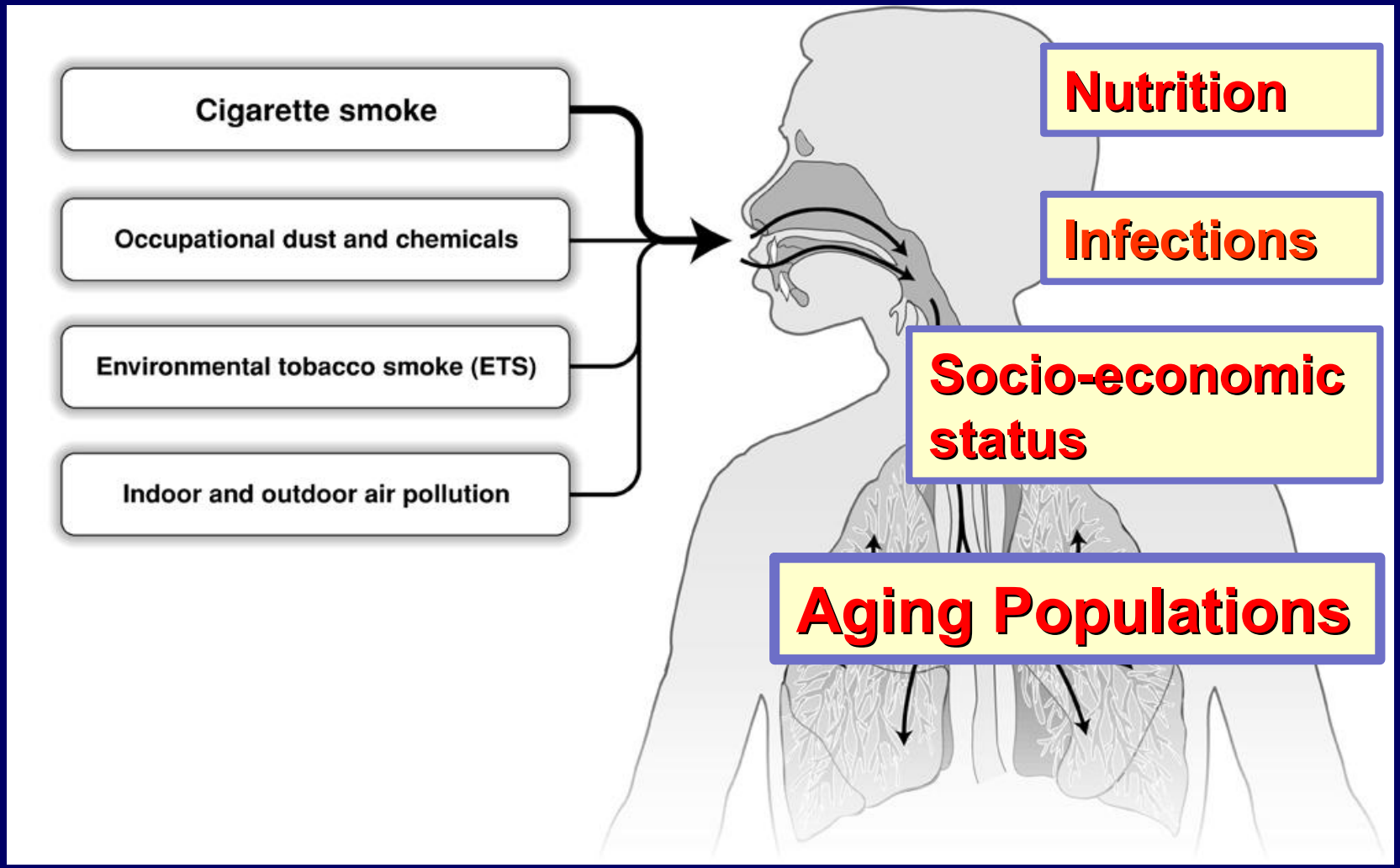
ERS/ELF European White Book 2003

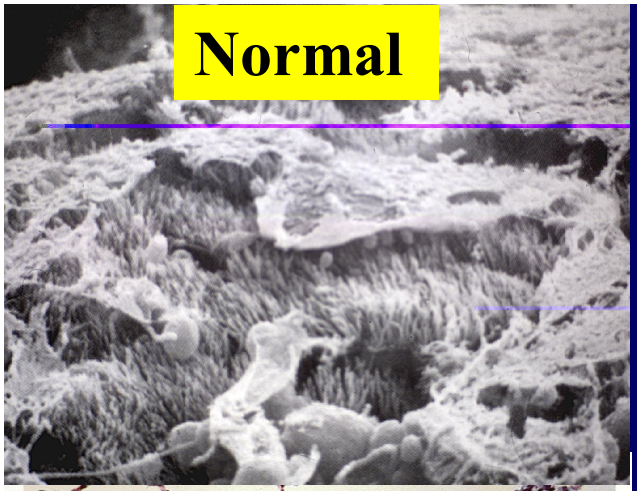
COPD is under-recognised and under- diagnosed

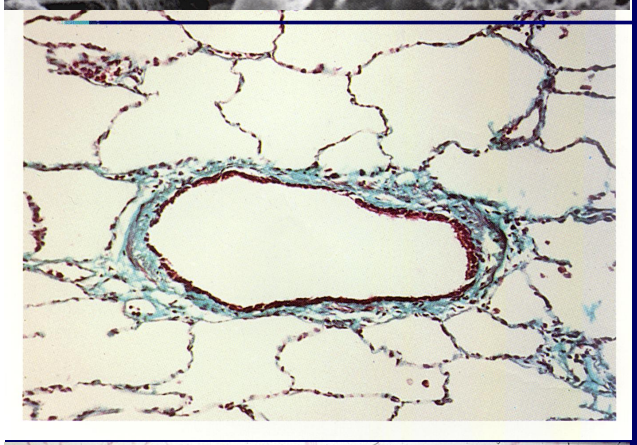
At least half of those affected with COPD may be undiagnosed

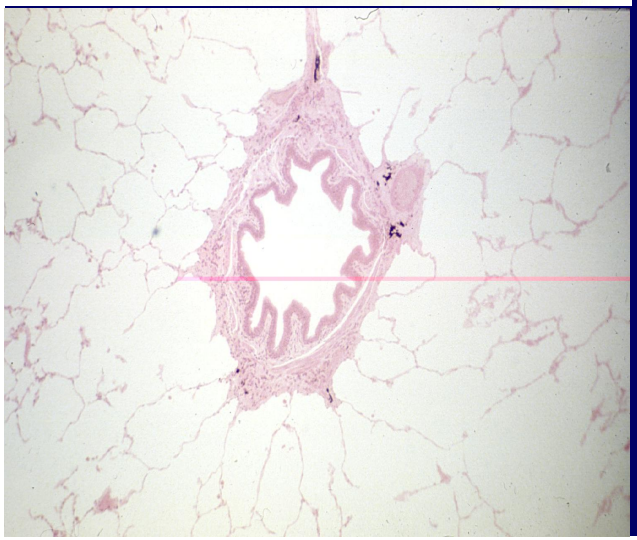
- Disease with insidious onset
- Often treated as asthma
- Smokers don't seek treatment
- Can present late with more advanced disease

Risk Factors for COPD



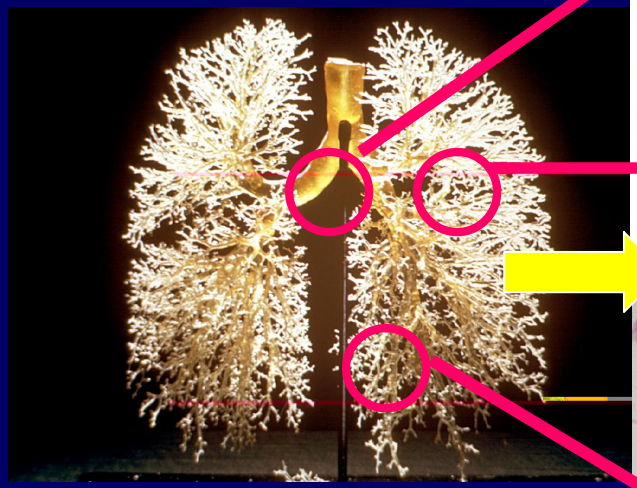




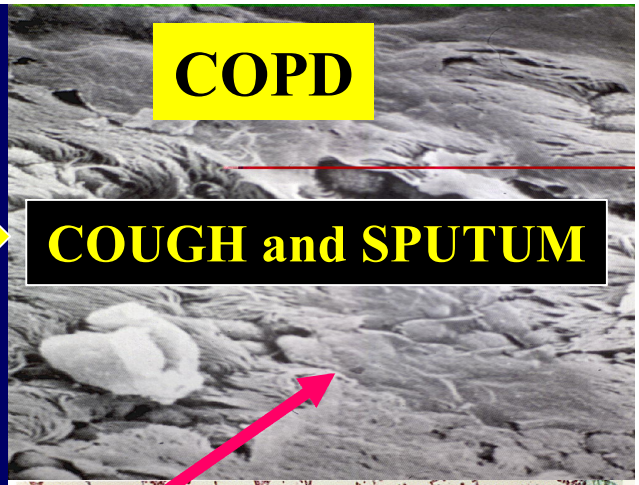


Chronic Bronchitis

Bronchiolitis
Small airways disease



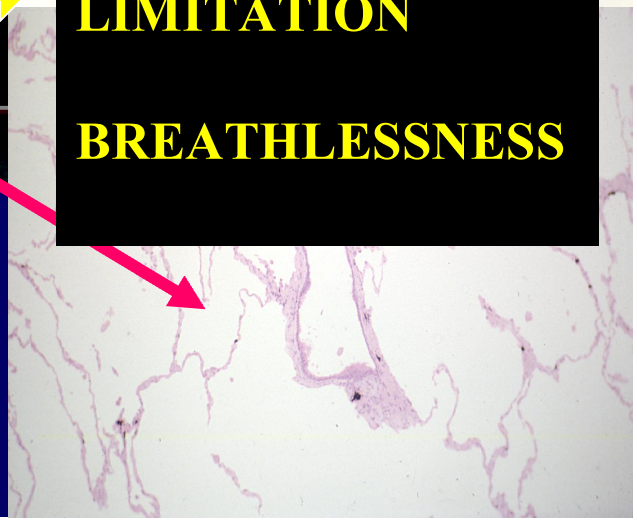
Emphysema



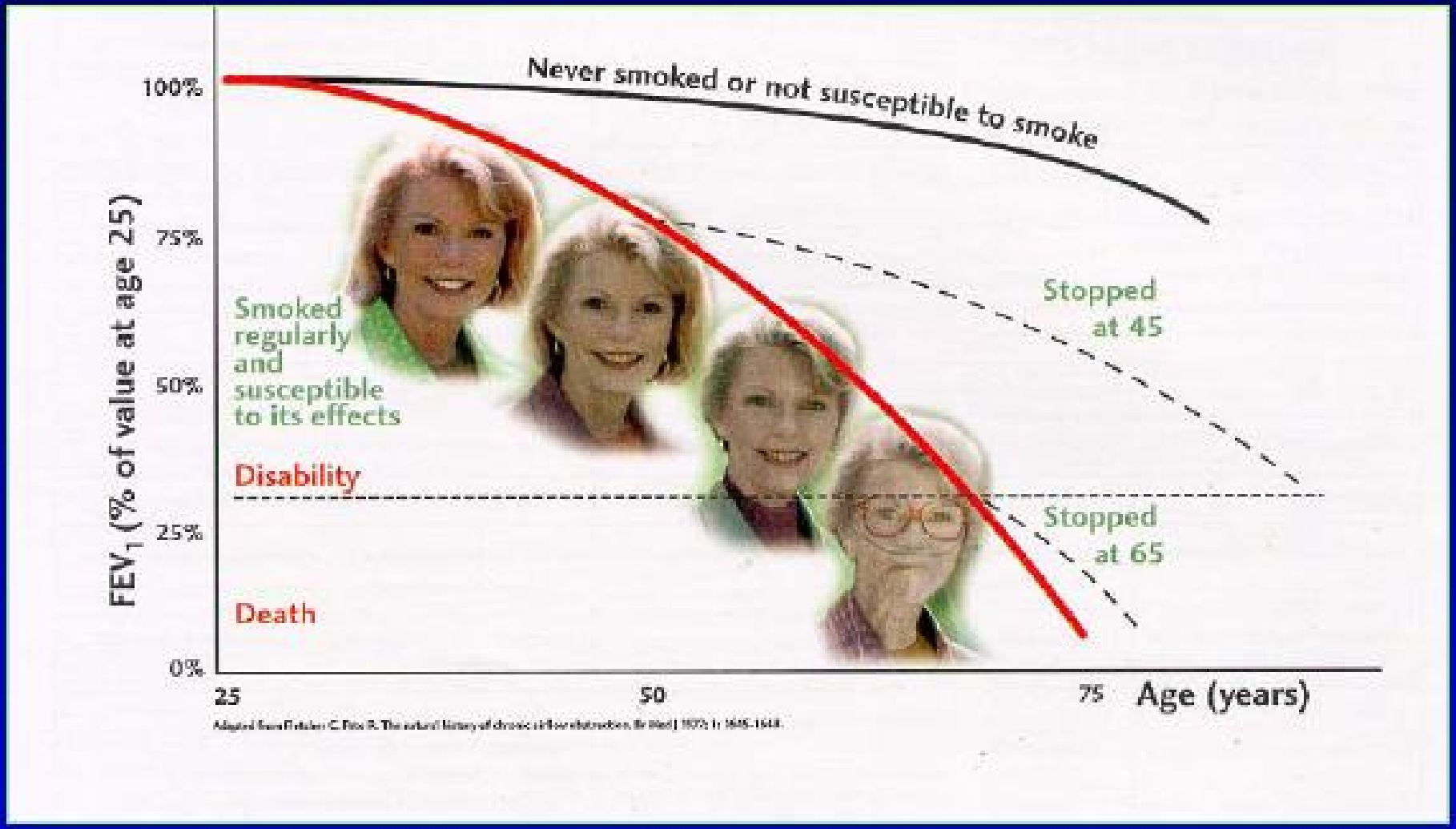
COUGH and SPUTUM

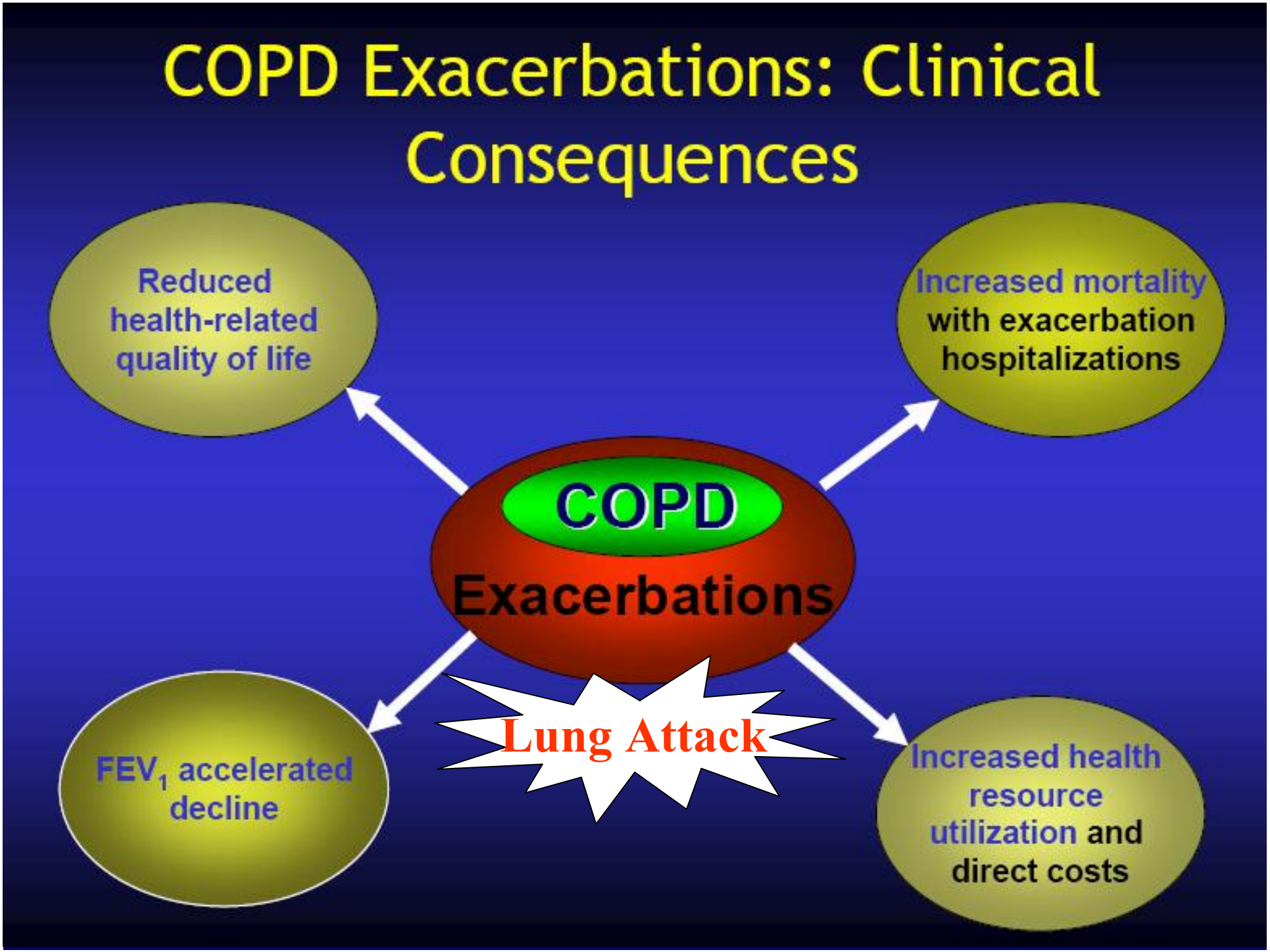
AIRFLOW LIMITATION

BREATHLESSNESS



COPD Progression




COPD Exacerbations: Clinical Consequences
Reduced health-related quality of life
Increased mortality with exacerbation hospitalizations
COPD
Exacerbations
Lung Attack
FEV1 accelerated decline
Increased health resource utilization and direct costs

SYSTEMIC EFFECTS OF COPD - COMORBIDITIES

Target organs

Respiratory system

Lung infections

Lung Cancer

Muscle weakness

Weight loss

Osteoporosis

(thin bones)

Systemic inflammation

Other co-morbidities

- Depression
- Diabetes
- Peptic Ulcer

Angina

Heart attacks

Diagnosis of COPD

SYMPTOMS

cough

sputum

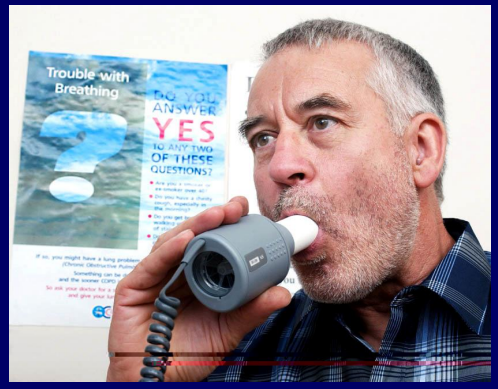
shortness of breath

EXPOSURE TO RISK FACTORS

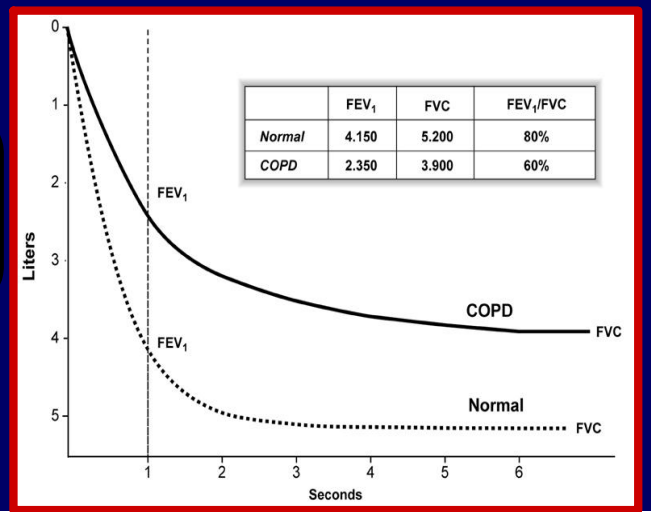
tobacco

occupation

indoor/outdoor pollution



SPIROMETRY



Preventive treatment in COPD

- Avoidance of risk factors
  - smoking cessation
  - reduction of indoor pollution
  - reduction of occupational exposure
- Influenza vaccination

GOALS of COPD MANAGEMENT

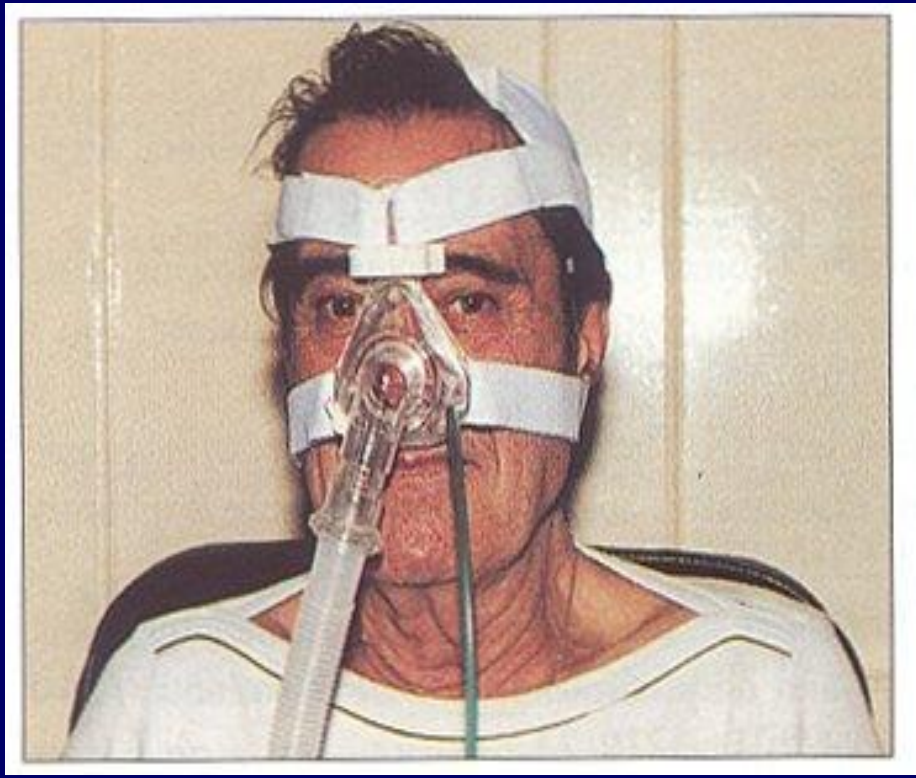
- Relieve symptoms
- Prevent disease progression
- Improve exercise tolerance
- Improve health status
- Prevent and treat complications
- Prevent and treat exacerbations
- Reduce mortality

Management of Stable COPD

Non-Drug Treatments

- Rehabilitation: All COPD patients benefit from exercise training programs, improving with respect to both exercise tolerance and symptoms of dyspnea and fatigue (Evidence A).
- Provision of Pulmonary rehabilitation services is inadequate.

Management of Exacerbations
(Lung Attack)



- Noninvasive ventilation (NIV):-

  improves blood gases , reduces in-hospital mortality, decreases the need for invasive mechanical ventilation and decreases the length of hospital stay (Evidence A).

WORLD COPD DAY
November 14, 2007

Raising COPD Awareness Worldwide

COPD: What do we need?

Health care provision

- Recognition of COPD as a health care priority.
- Spirometry available for screening and diagnosis.
- Vaccination programe specifically targeting COPD patients.
- Smoking cessation services.
- Health care professionals with specific training in COPD and smoking cessation.
- Access to specialist respiratory services for diagnosis and assessment (oxygen therapy, surgical intervention,exacerbations).
- Pulmonary rehabilitation services.
- Access to non-invasive ventilation.
- Hospital at home services to manage non life-threatening exacerbations.
- palliative care services.

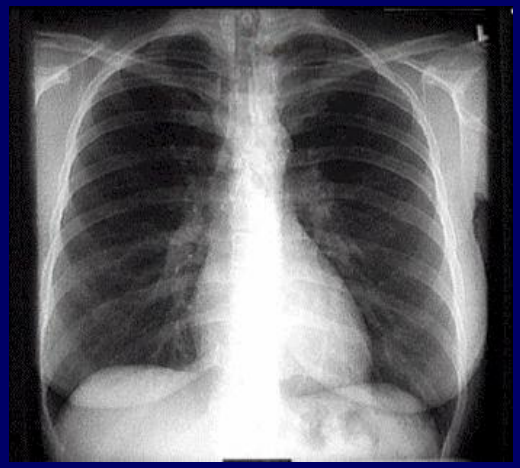
COPD: What do we need?

Research priorities

- To create a stronger foundation for fighting COPD by acquiring accurate data on illness, exacerbations, natural history, deaths and costs.
- To perform scientific surveys with spirometry in population samples of all European countries to improve knowledge of the distribution of COPD.
- To establish higher standards of care through studies on the effectiveness of current prevention, education, medication and rehabilitation.
- To develop new therapies to inhibit the progression of the disease.
- To study the most effective smoking cessation intervention techniques to prevent people from starting smoking.
- To guide caregivers and care payers in the most efficient and effective ways to manage this disease.

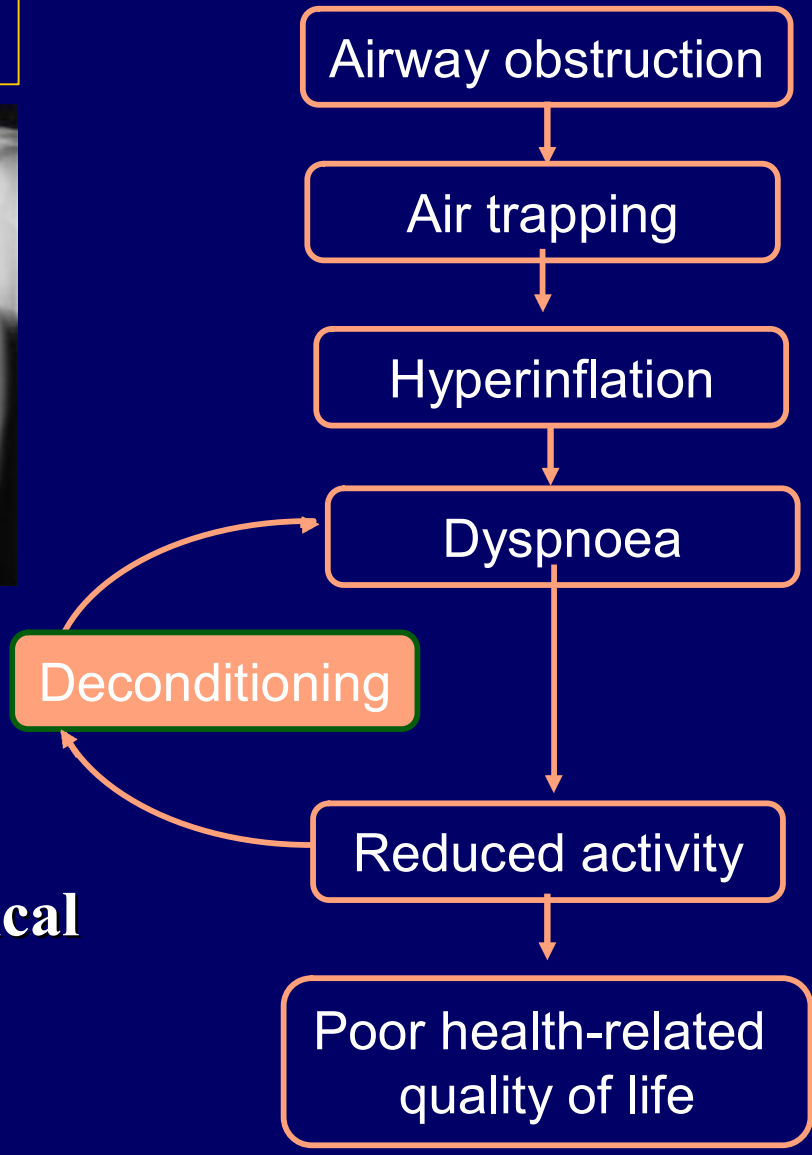
Impact of air trapping (hyperinflation)

Normal

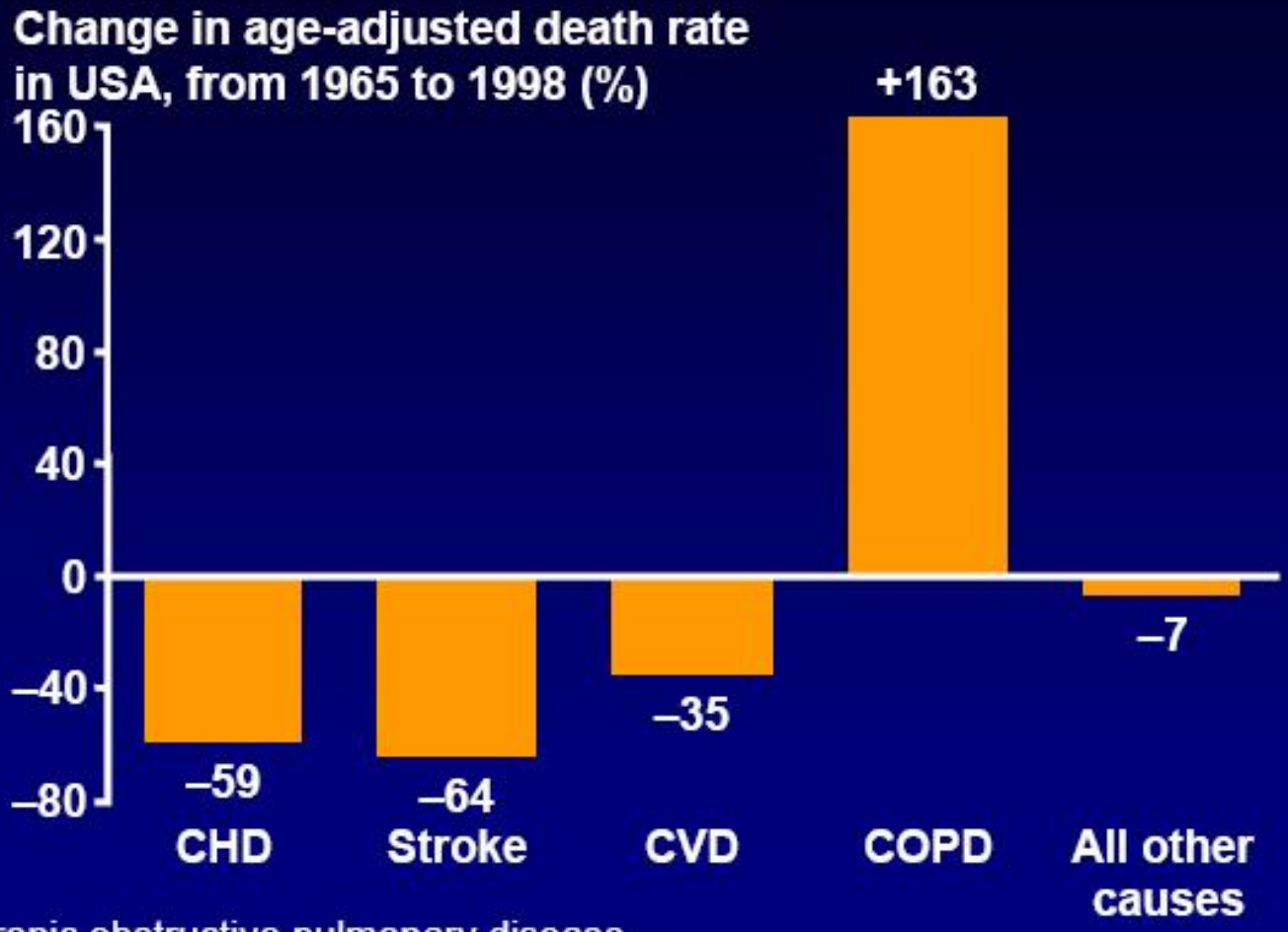


Hyperinflation

- Occurs in all patients with COPD
- Increases the work of breathing
- Respiratory muscles at a mechanical disadvantage
- Contributes to breathlessness



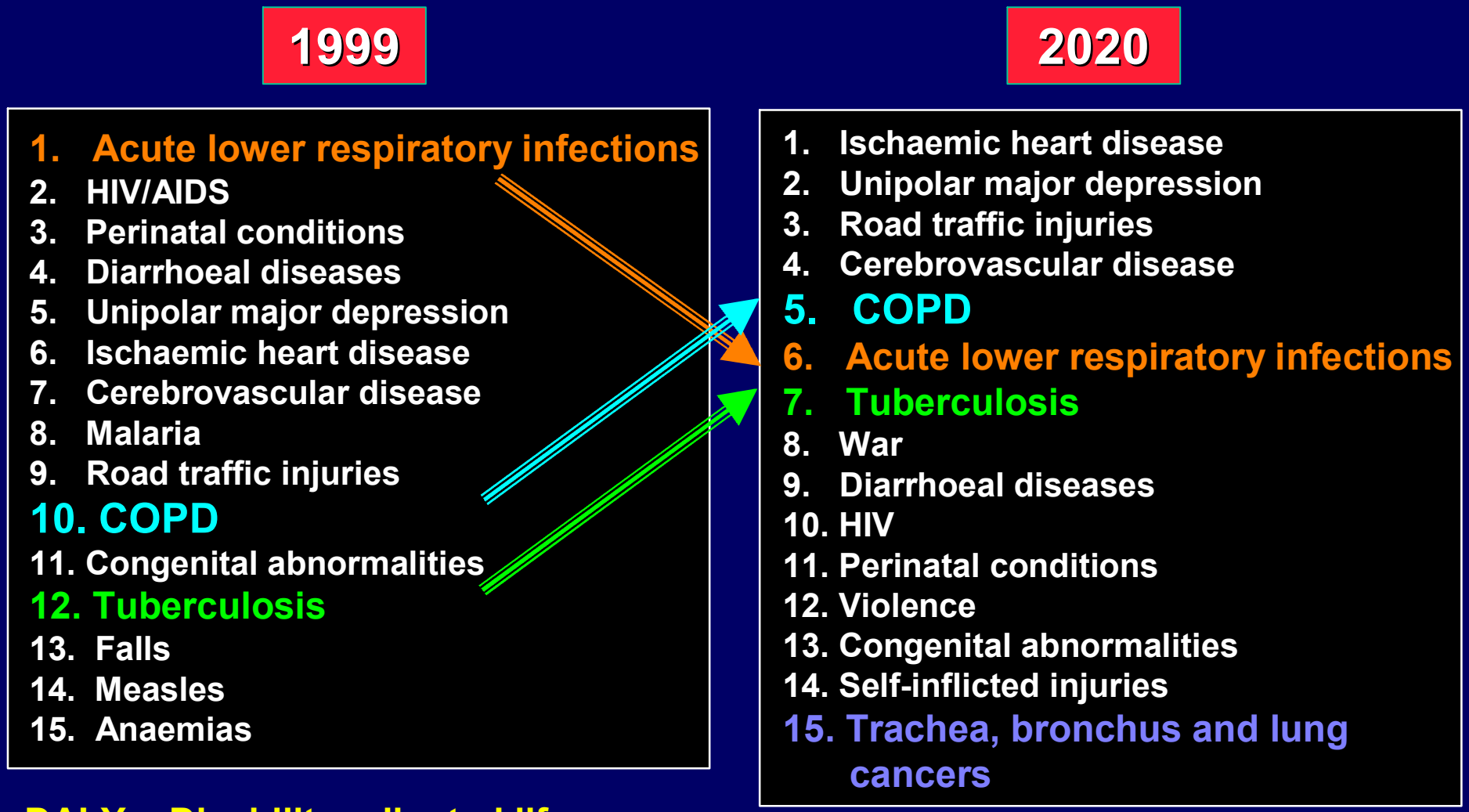
COPD is the only major cause of death to increase significantly in recent years



COPD = chronic obstructive pulmonary disease
CHD = coronary heart disease
CVD = cerebrovascular disease

Adapted from: www.copdgold.com

Increasing burden of diseases and Injuries: change in rank order of DALYs



DALY = Disability-adjusted life year

Source: WHO
Evidence, Information and Policy, 2000

COPD: What does it stand for?

Chronic Obstructive Pulmonary Disease

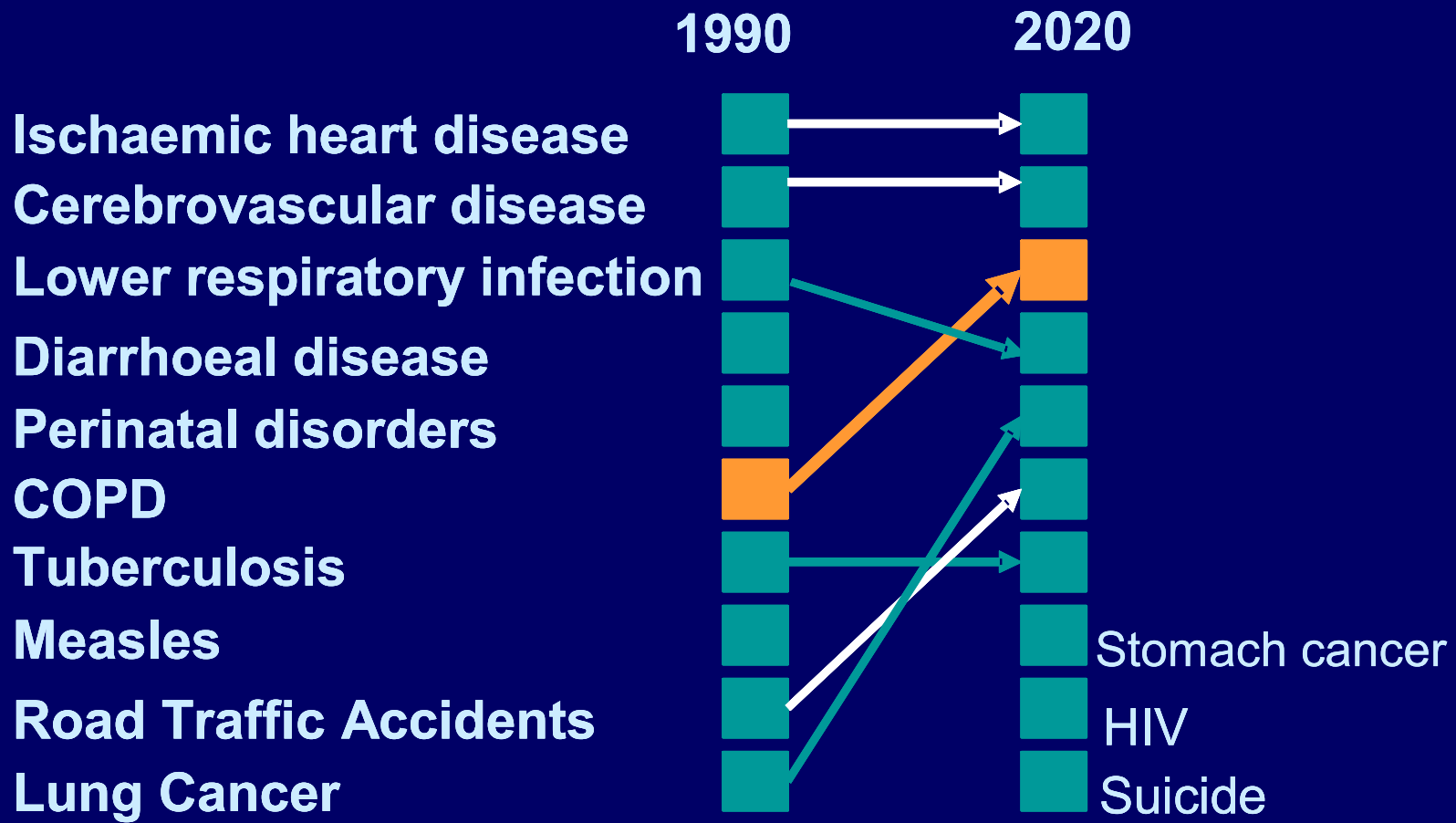
Professor William MacNee
Past President European Respiratory Society

Definition of COPD

- COPD is a preventable and treatable disease. Its lung component is characterized by airflow limitation (or obstruction to the flow of air) that is not fully reversible.
- The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases.
- COPD has significant extra-pulmonary effects that may contribute to the severity in individual patients.

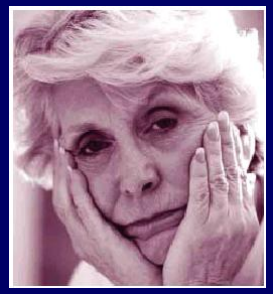
Global Burden Of Disease: Top 10 Causes Of Death In 1990 and 2020

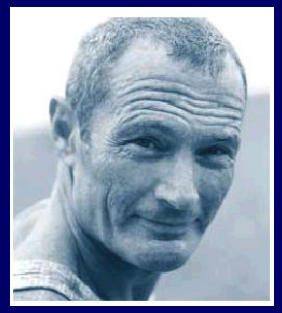
COPD as the only major disease to increase significantly in recent years



Murray et Lopez. Lancet 1997;349:1498-1504

The burden of COPD in Europe





- The frequency of COPD varies in European countries from 4-10% of the adult population, 50./100,000 males ; 20/100,000 females
- Many more are undiagnosed
- 2- 300,000 people die in Europe each year because of COPD
- Estimated direct cost in EU –

  Out - patient € 4.7 billion

  In-patient € 2.9 billion

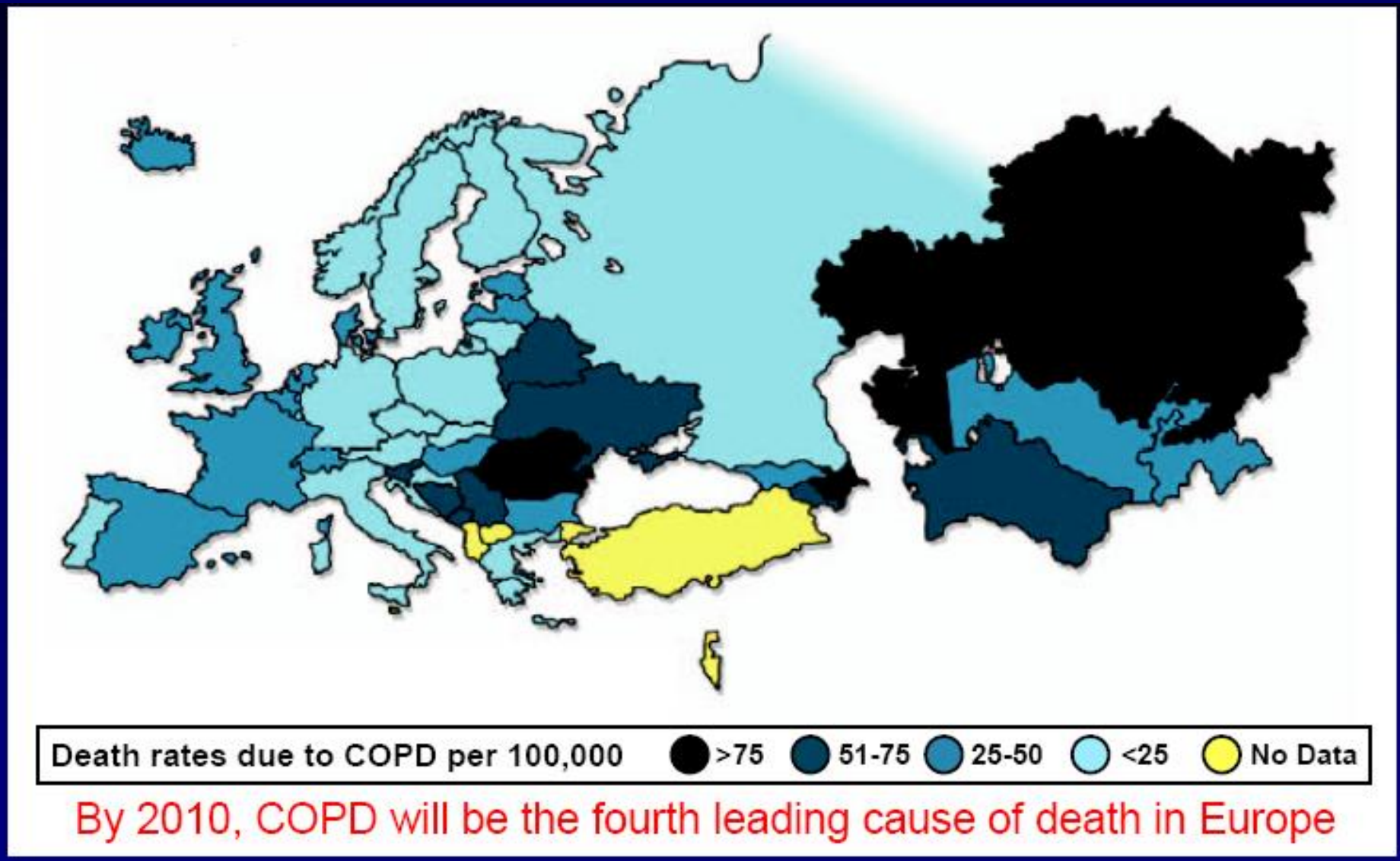
  Drugs € 2.9 billion

  41,300 Lost work days/ 100,000 pop^{n}

  Productivity losses € 28.5 billion

European Respiratory Society

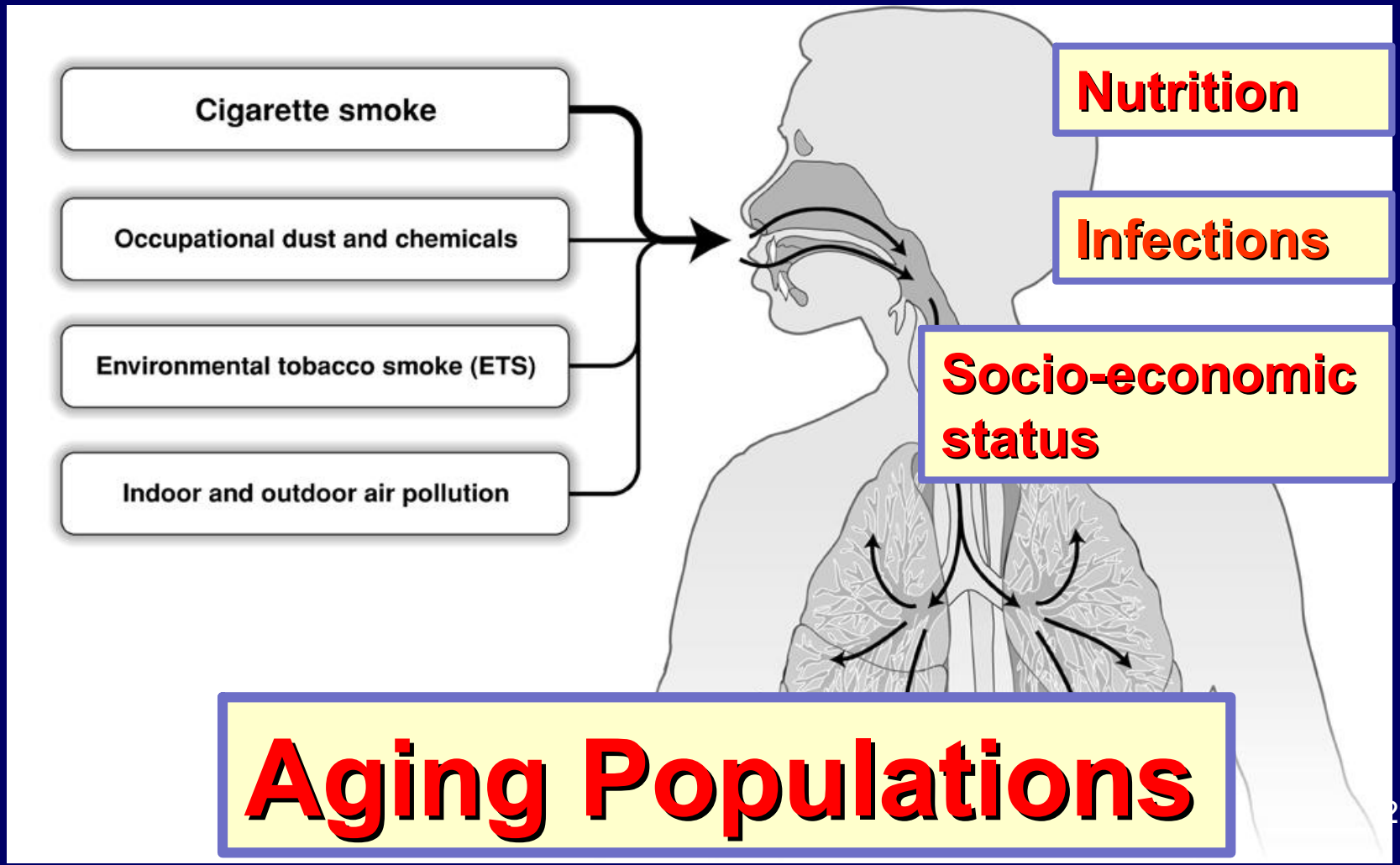
Burden of mortality from COPD in Europe



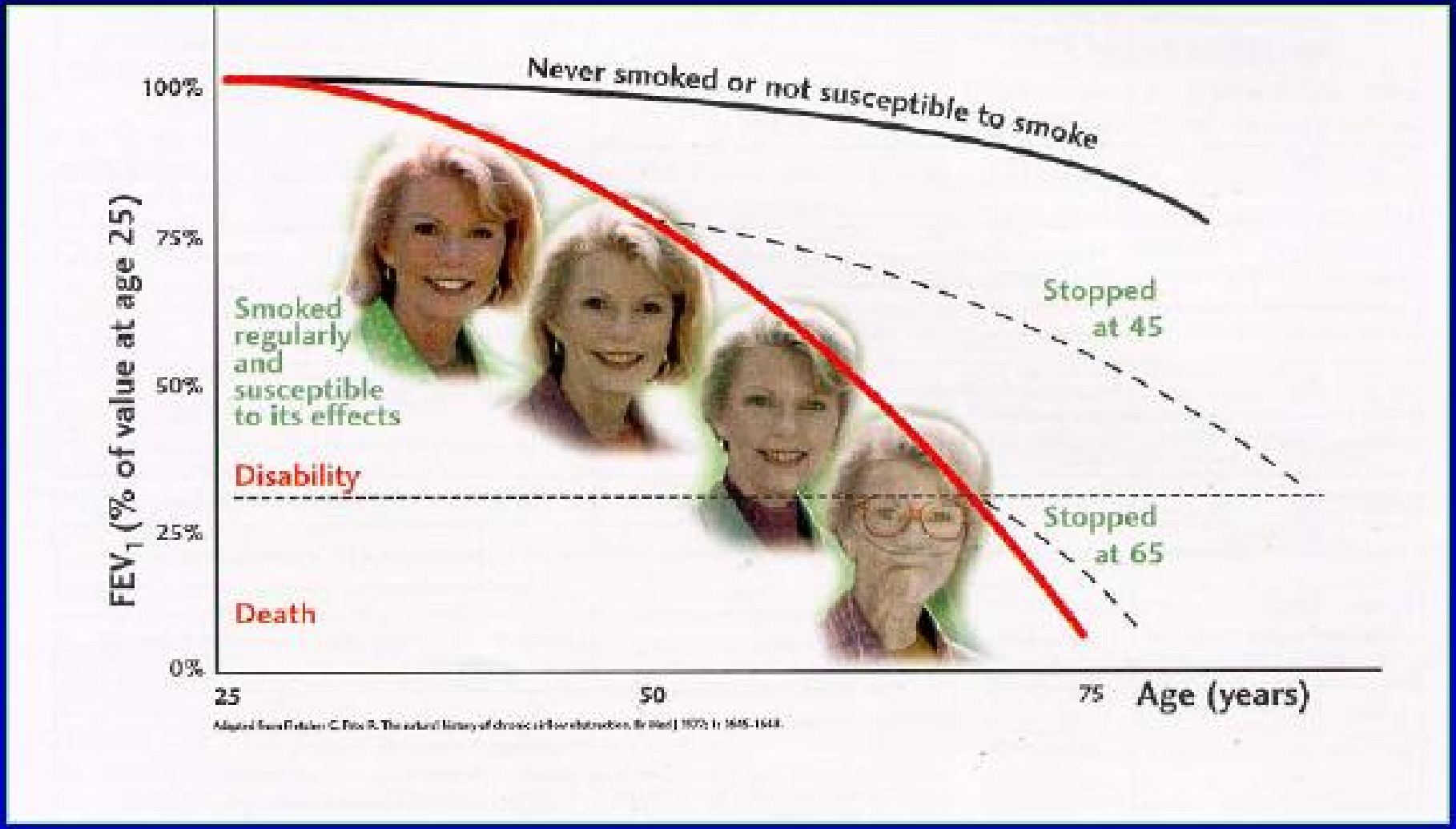
By 2010, COPD will be the fourth leading cause of death in Europe

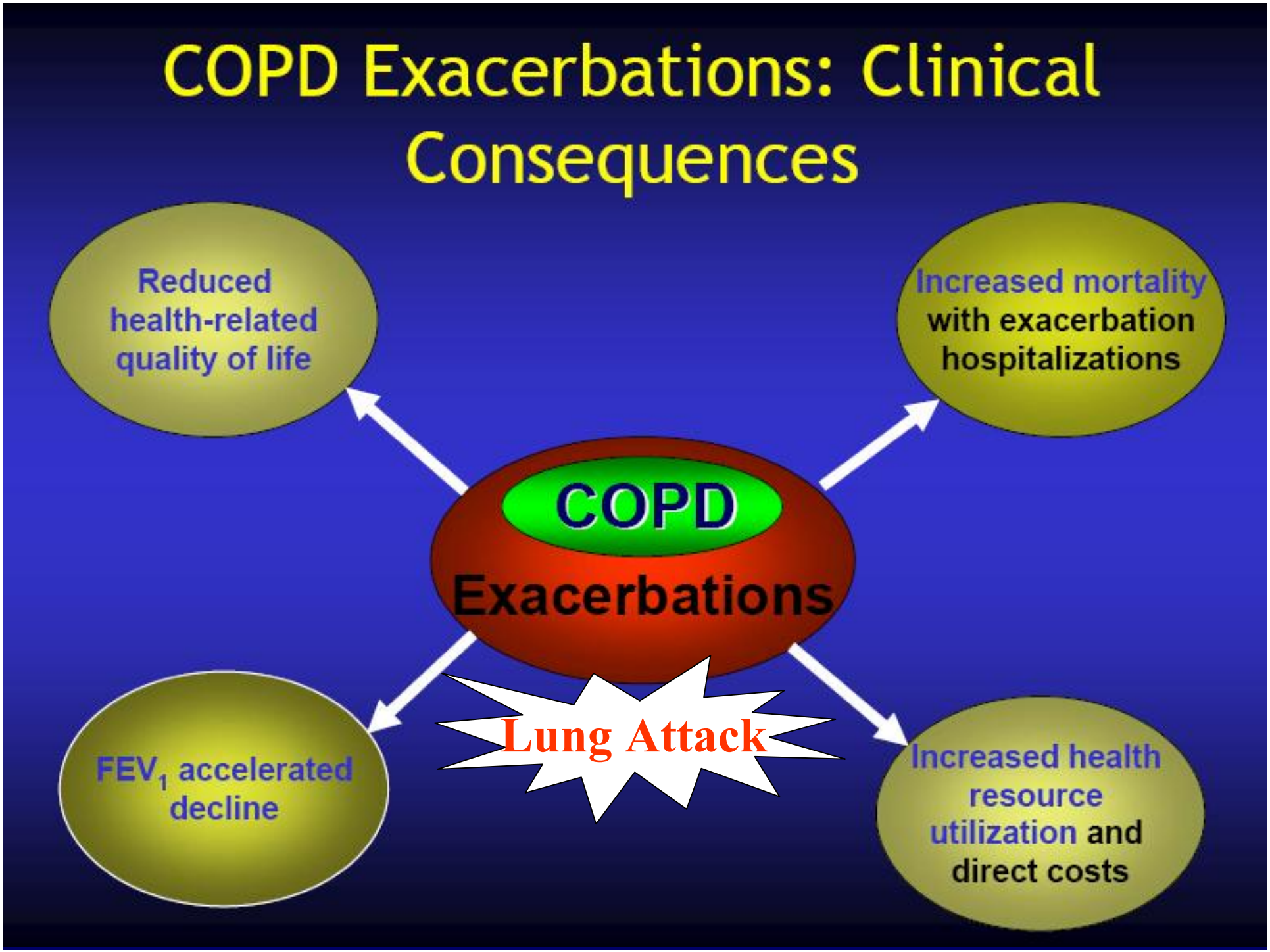
ERS/ELF. European Lung White Book 2003

Risk Factors for COPD



COPD Progression




COPD Exacerbations: Clinical Consequences
Reduced health-related quality of life
Increased mortality with exacerbation hospitalizations
COPD
Exacerbations
Lung Attack
FEV1 accelerated decline
Increased health resource utilization and direct costs

Diagnosis of COPD

SYMPTOMS

cough

sputum

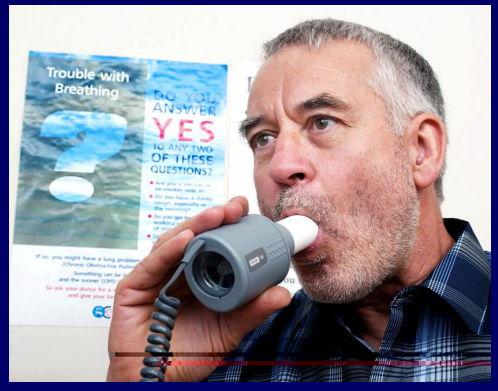
shortness of breath

EXPOSURE TO RISK FACTORS

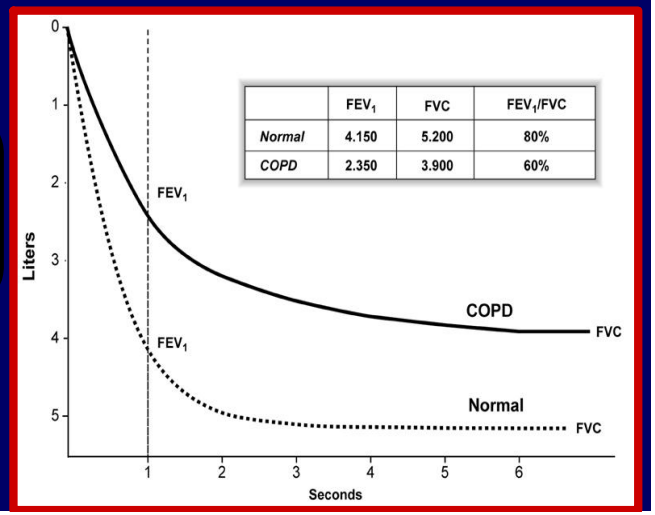
tobacco

occupation

indoor/outdoor pollution



SPIROMETRY



	FEV_1	FVC	FEV_1/FVC
Normal	4.150	5.200	80%
COPD	2.350	3.900	60%

GOALS of COPD MANAGEMENT

- Relieve symptoms
- Prevent disease progression
- Improve exercise tolerance
- Improve health status
- Prevent and treat complications
- Prevent and treat exacerbations
- Reduce mortality

WORLD COPD DAY
November 14, 2007

Raising COPD Awareness Worldwide

COPD: What do we need?

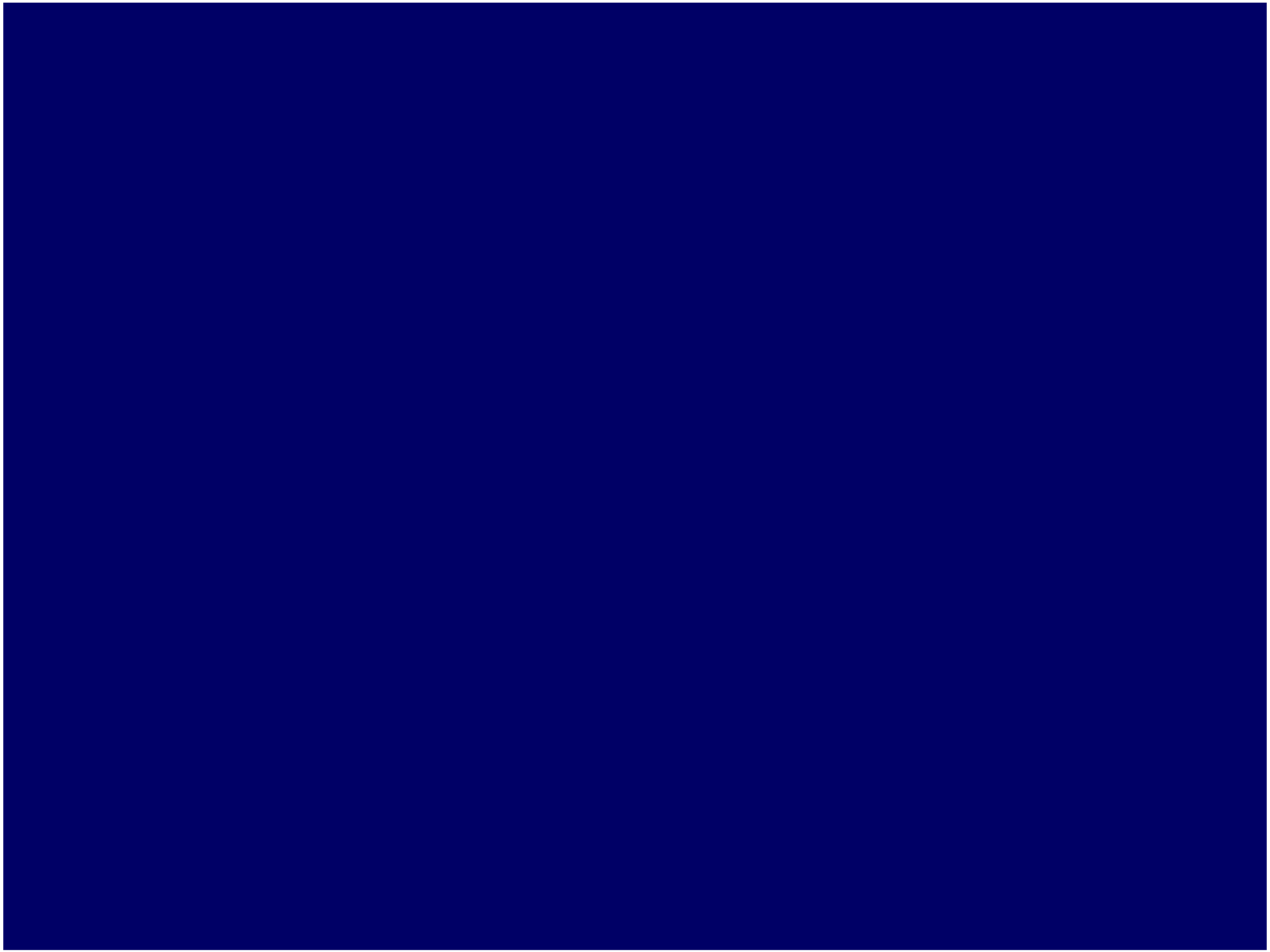
Health care provision

- Recognition of COPD as a health care priority
- Spirometry available for screening and diagnosis
- Vaccination programe specifically targeting COPD patients
- Smoking cessation services
- Health care professionals with specific training in COPD and smoking cessation
- Access to specialist respiratory services for diagnosis and assessment (oxygen therapy, surgical intervention,exacerbations)
- Pulmonary rehabilitation services
- Access to non-invasive ventilation
- Hospital at home services to manage non life threatening exacerbations
- palliative care services

COPD: What do we need?

Research priorities

- To create a stronger foundation for fighting COPD by acquiring accurate data on illness, exacerbations, natural history, deaths and costs
- To perform scientific surveys with spirometry in population sampl of all European countries to improve knowledge of the distribution o COPD
- To establish higher standards of care through studies on the effectiveness of current prevention, education, medication and rehabilitation
- To develop new therapeutic modalities to inhibit the progression o the disease
- To study the most effective smoking cessation cessation interventio and techniques to prevent people from starting smoking
- To guide caregivers and care payers in the most efficient and effective ways to manage this disease



In 2030

Plos Med (25 Nov 2006)

- COPD: 4th cause of death
- Tobacco > 8 million deaths
- Biomass fuel combustion > 10 million deaths (Ezzatti, Science 2005)

Management of Stable COPD

Reduce Risk Factors

- Reduction of total personal exposure to tobacco smoke, occupational dusts and chemicals, and indoor and outdoor air pollutants are important goals to prevent the onset and progression of COPD.

- Smoking cessation is the single most effective — and cost effective — intervention in most people to reduce the risk of developing COPD and stop its progression (Evidence A).

Translating COPD Guidelines into Primary Care

KEY POINTS

- Spirometric confirmation is a key component of the diagnosis of COPD and primary care practitioners should have access to high quality spirometry.
- Older patients frequently have multiple chronic health conditions. Comorbidities can magnify the impact of COPD on a patient's health status, and can complicate the management of COPD.

Management of Stable COPD

Non-Pharmacologic Treatments

- Rehabilitation: All COPD patients benefit from exercise training programs, improving with respect to both exercise tolerance and symptoms of dyspnea and fatigue (Evidence A).
- Oxygen Therapy: The long-term administration of oxygen (> 15 hours per day) to patients with chronic respiratory failure has been shown to increase survival (Evidence A).

New Advances in COPD

- Assessment
- Understanding disease processes
- Treatment

"COPD-PD: Lung function and Homogeneity"

Patient # 1
58 y
FEV1: 28 %

COPD Sub(Pheno)types Important for treatment ?

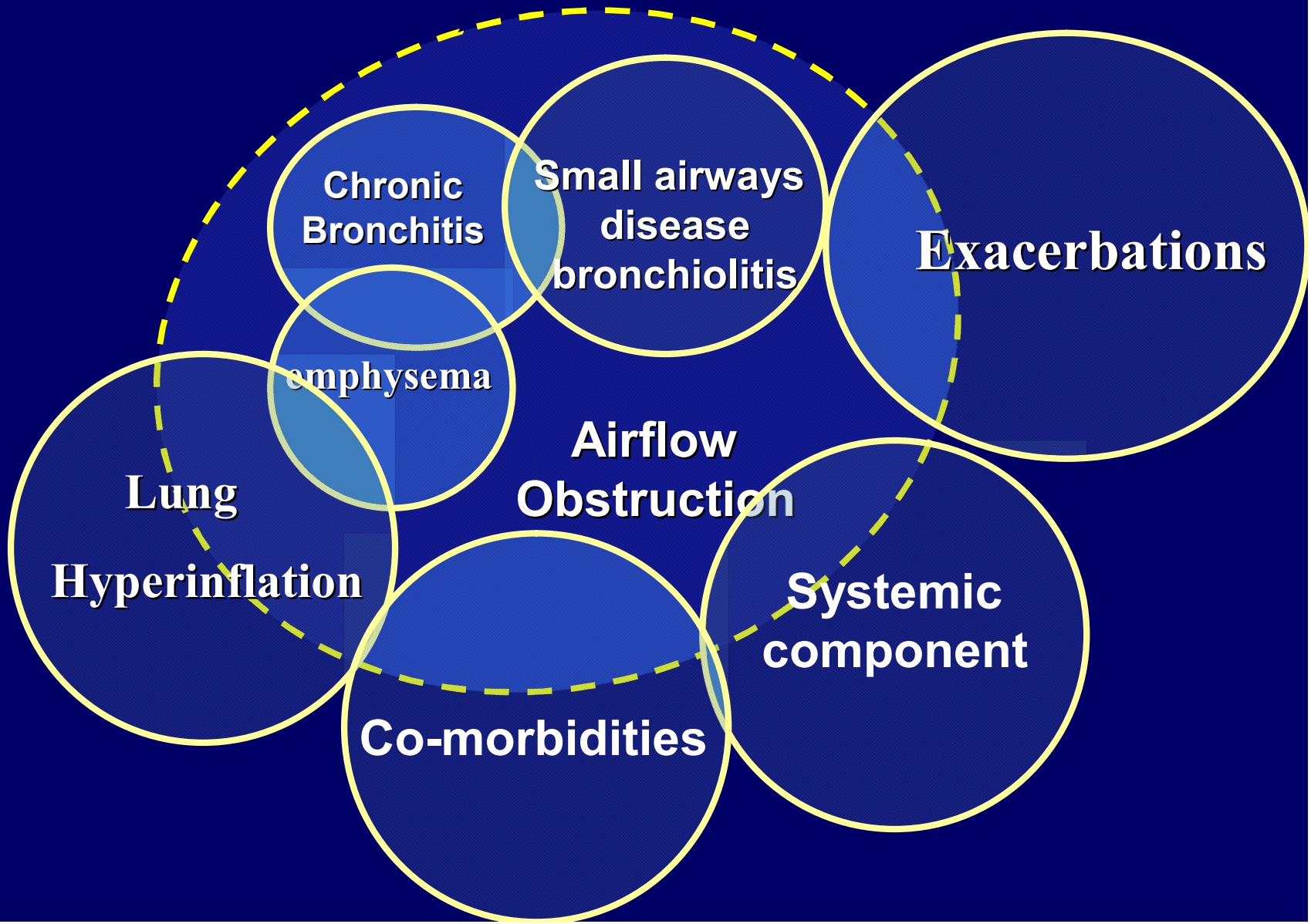
Patient # 4
72 y
FEV1: 34%
MRC: 4/4
6MWD: 154 m
BMI: 24
BODE: 9

FEV1 < 35% Predicted

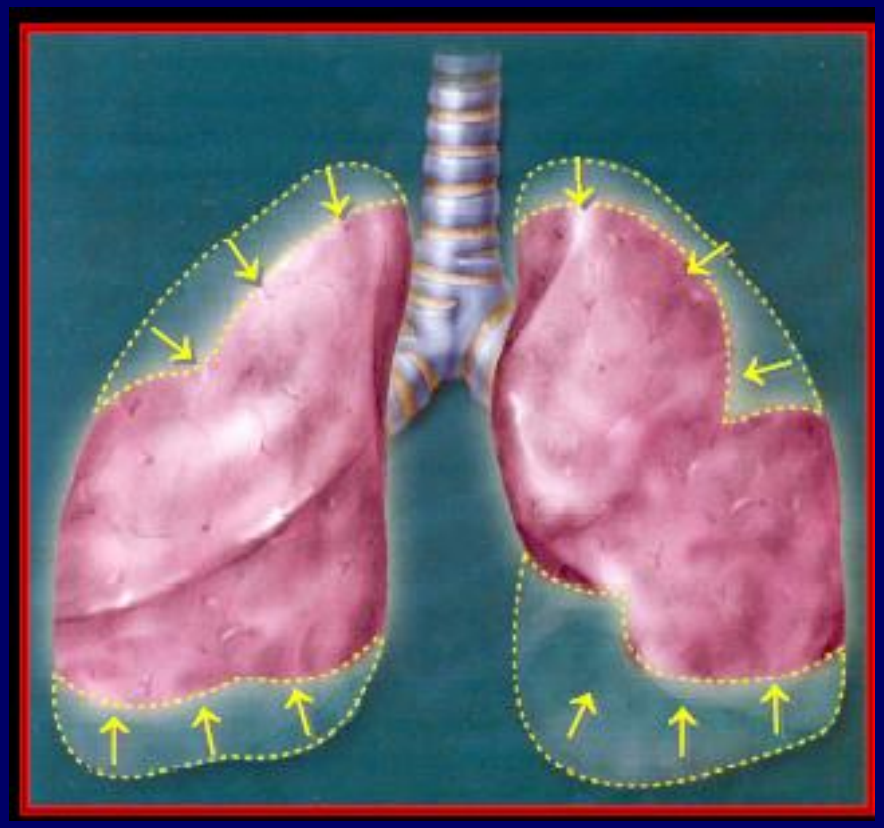
Severe disease

Cote et al

COPD: a multicomponent disease



Surgical volume reduction for emphysema

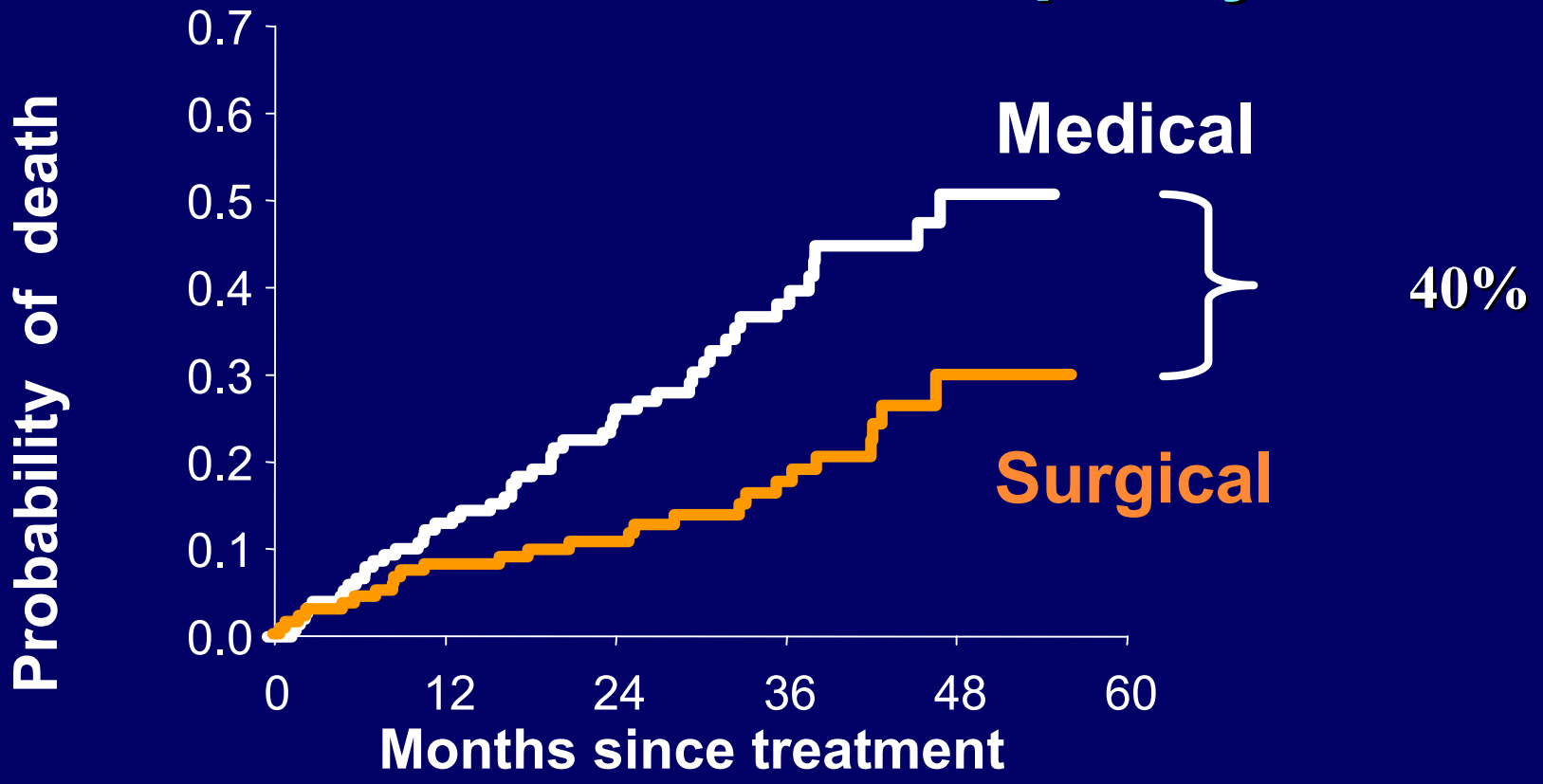


In selected patients:-

- Removes hyperinflated areas of lung
- Reduces air trapping
- Improves breathlessness
- Improves health status
- Improves survival

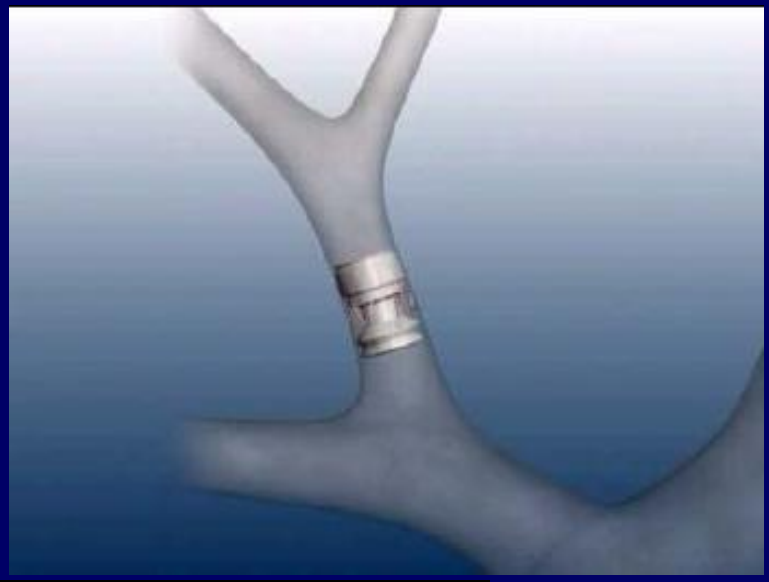
LVRS improves mortality:

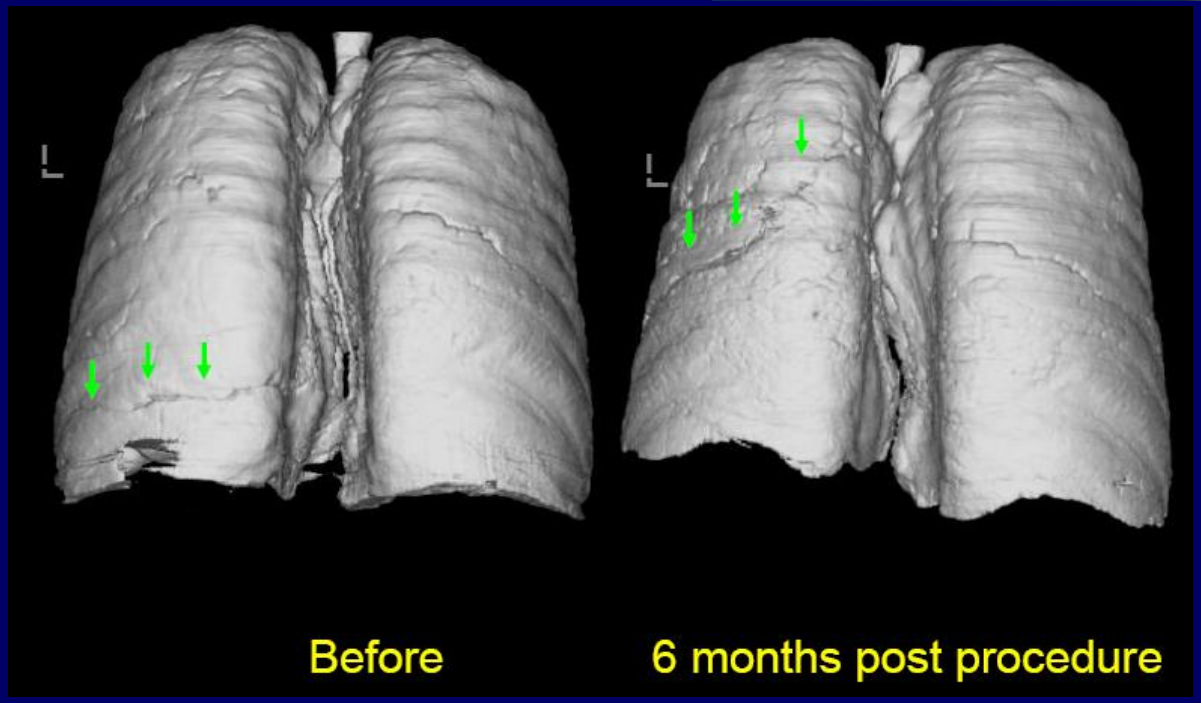
Patients Upper-lobe emphysema and low exercise capacity



High-risk patients excluded

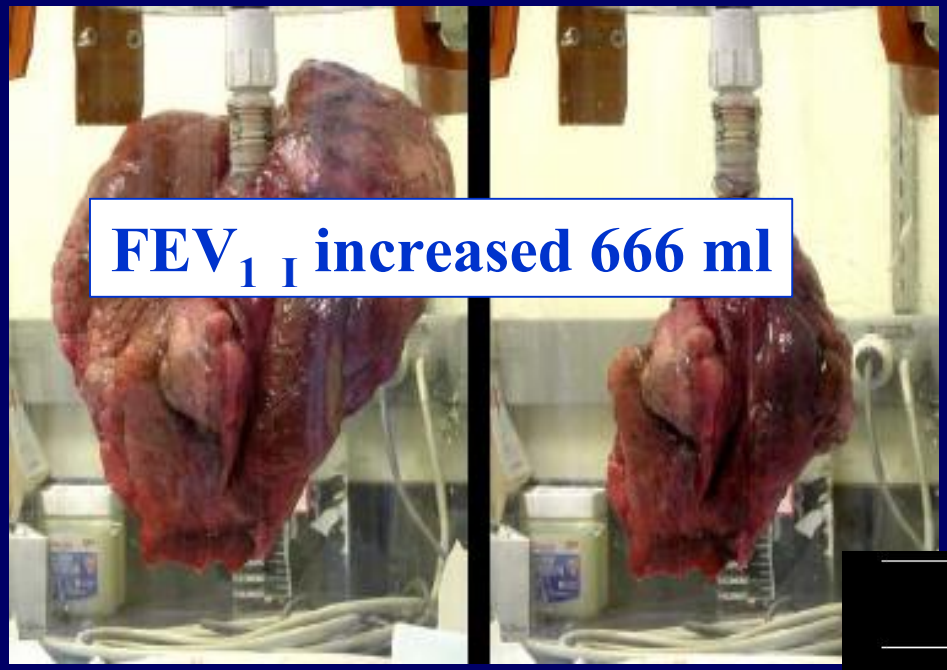
Bronchoscopic Lung Volume Reduction





Airway bypass for emphysema

Proof of concept



Designed for patients with diffuse severe emphysema :-

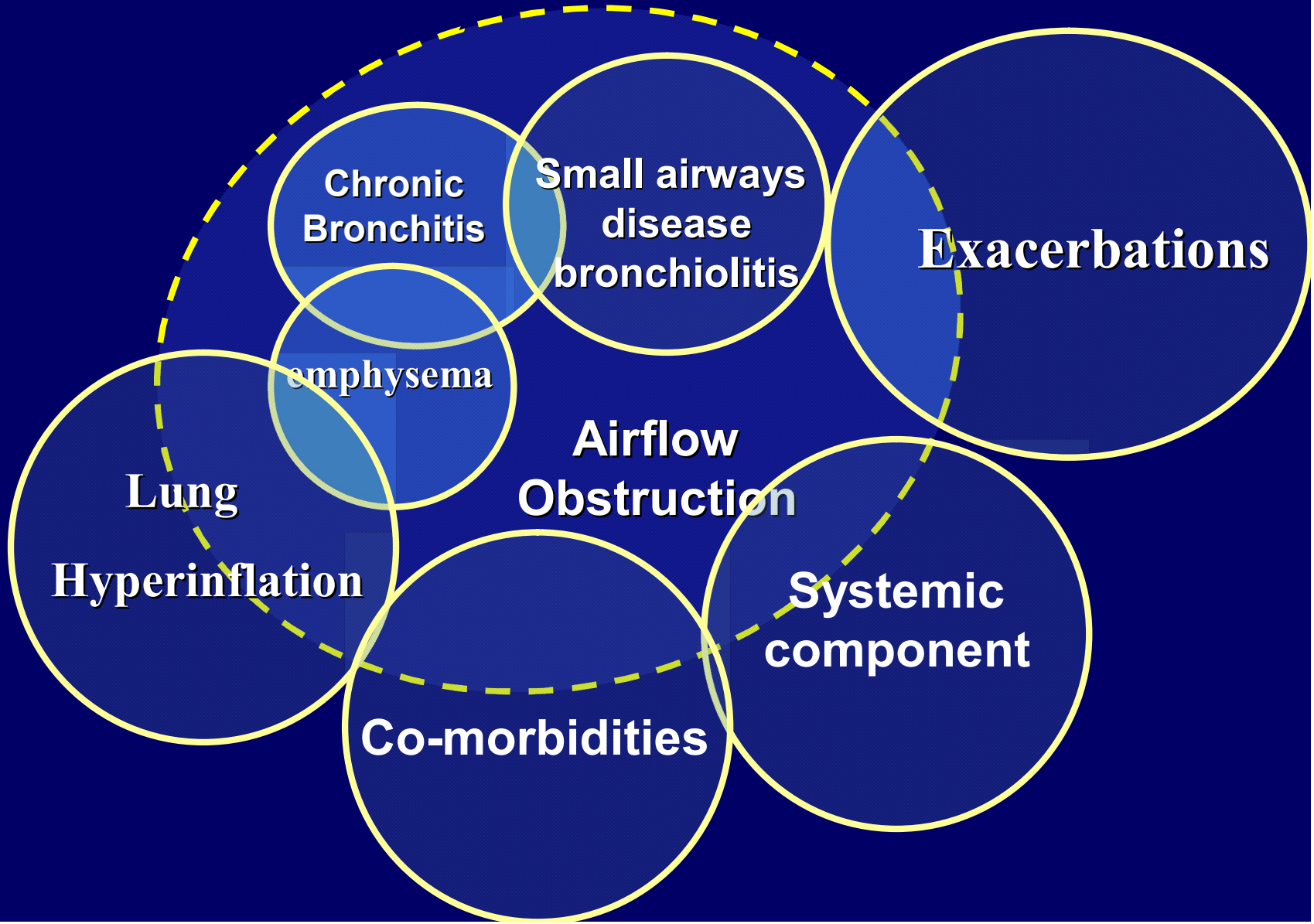
- **Creation of new pathways for trapped gas to escape from the lungs**
- **Reduces hyperinflation**
- **Improves breathlessness and quality of life**

Preliminary results in emphysema patients

	1 month	6 months
Change in SGRQ scores	-8.1 ± 9.6 (p,0.0001)	-6.8 ± 14.3 (p=0.05)
Proportion with ≥ -4 points	17 (63%)	12 (52%)
Proportion with ≥ -8 points	11 (41%)	9 (39%)
Proportion with FEV_1 change ≥ 15%	3 (10%)	2 (8%)
Proportion with 6MWD change ≥ 15%	8 (29%)	6 (24%)

Wood et al. J Thorac & Cardiovasc Surg 2007

COPD: a multicomponent disease



Small airways disease and emphysema

A

Age 53

44 Pack years

FEV_1 42.1%

FEV_1/FVC 0.39

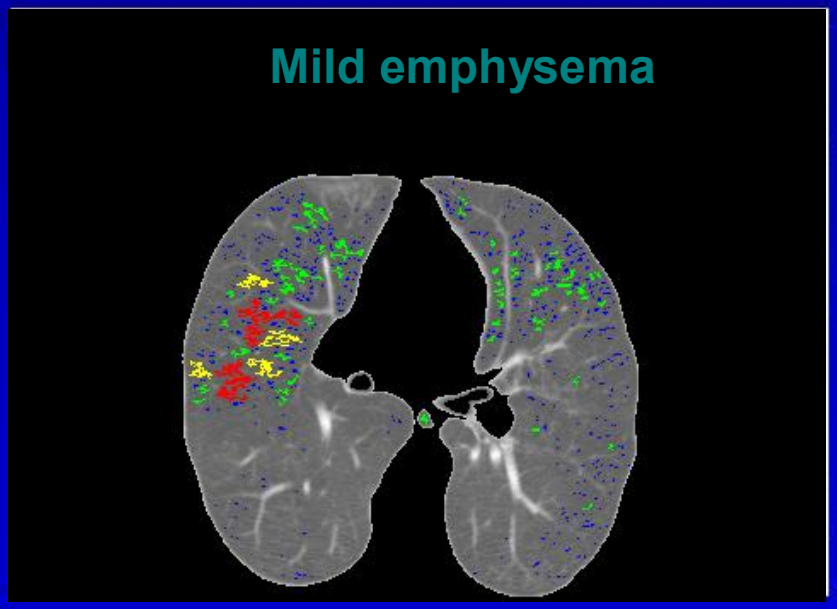
B

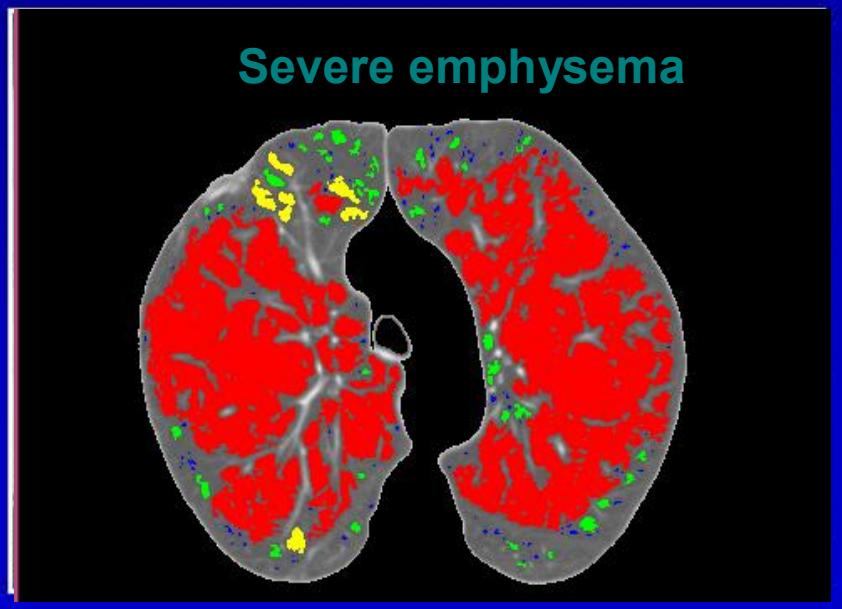
Age 59

48 pack years

FEV_1 44.2%

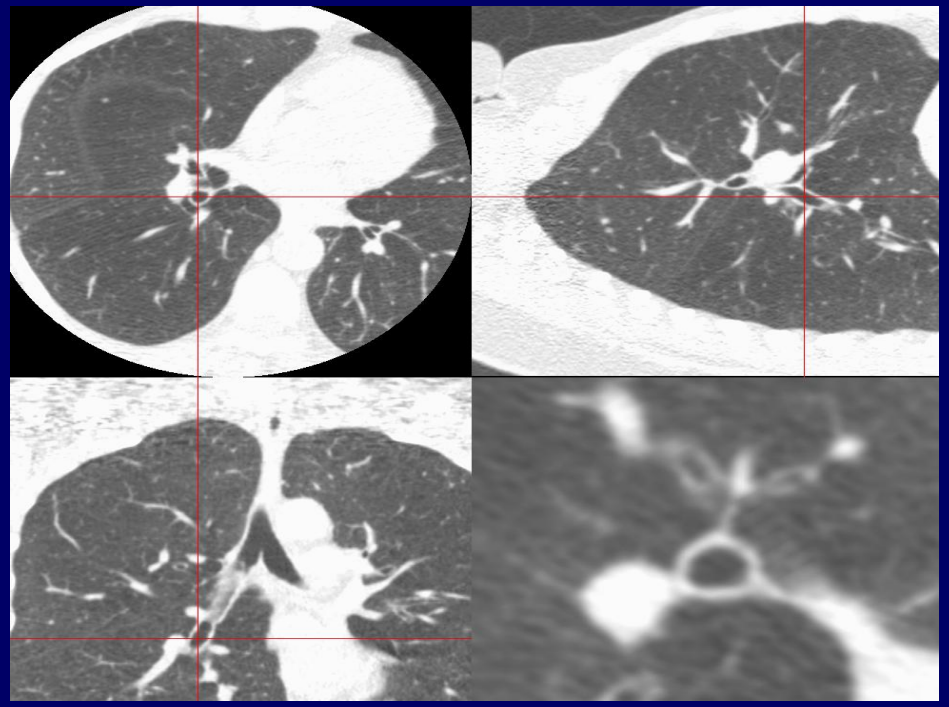
FEV_1/FVC 0.39

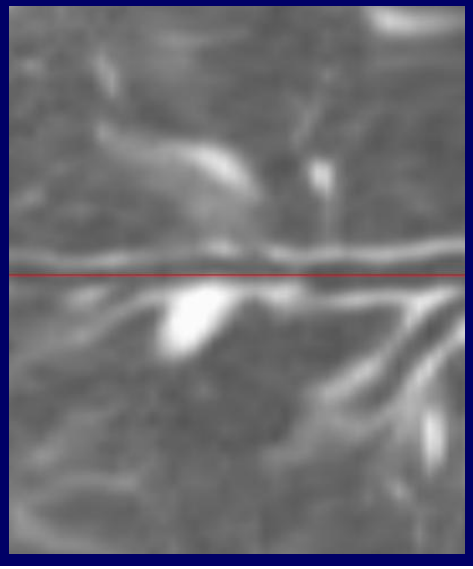


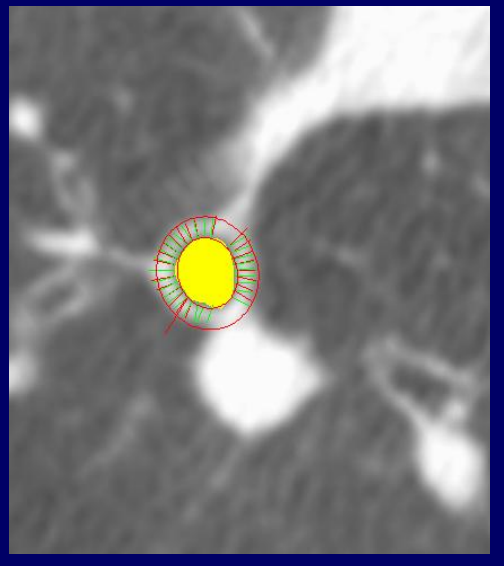


Airway wall dimensions

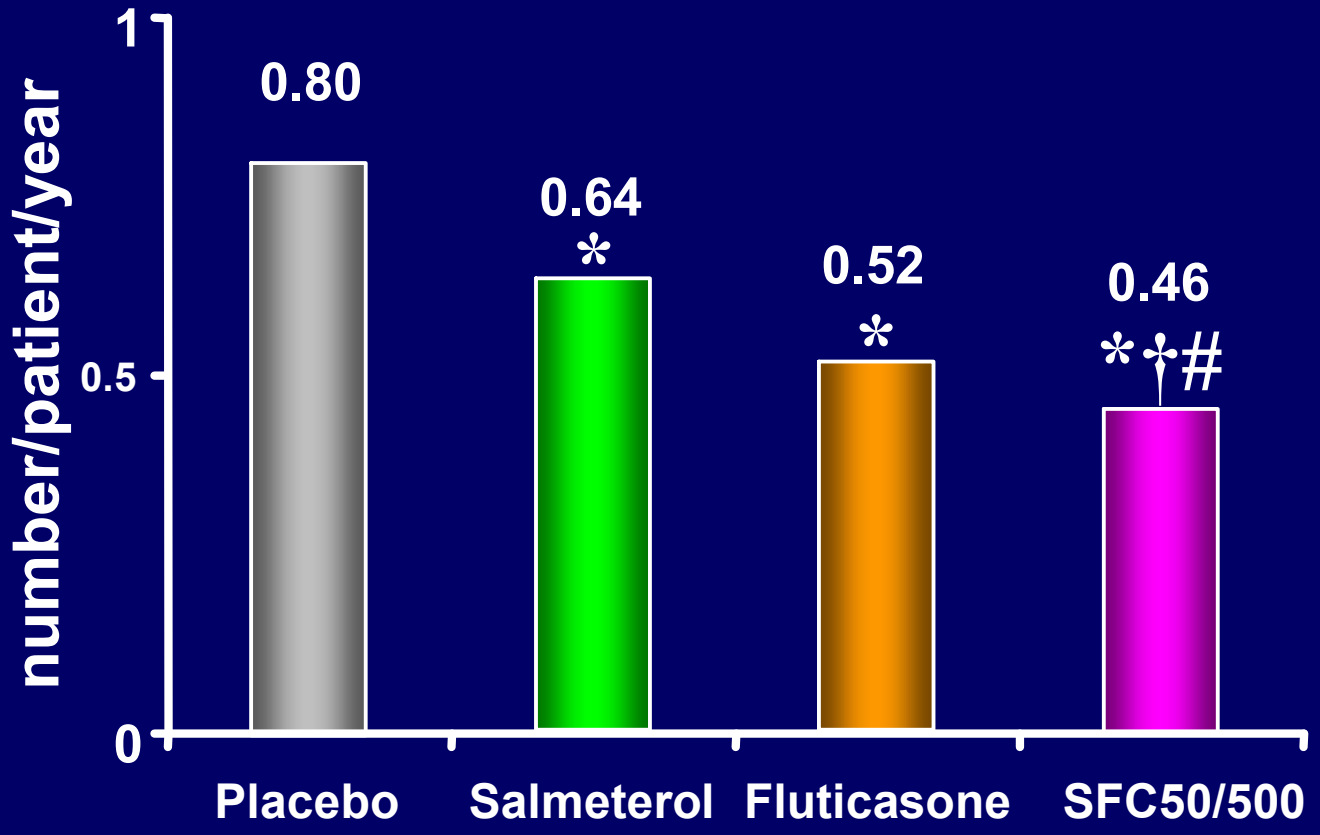
- Airway dimensions
  - Lumen diameter
  - Wall thickness
  - Wall area
  - Percentage wall area







Rate of Exacerbations Requiring Oral Corticosteroids



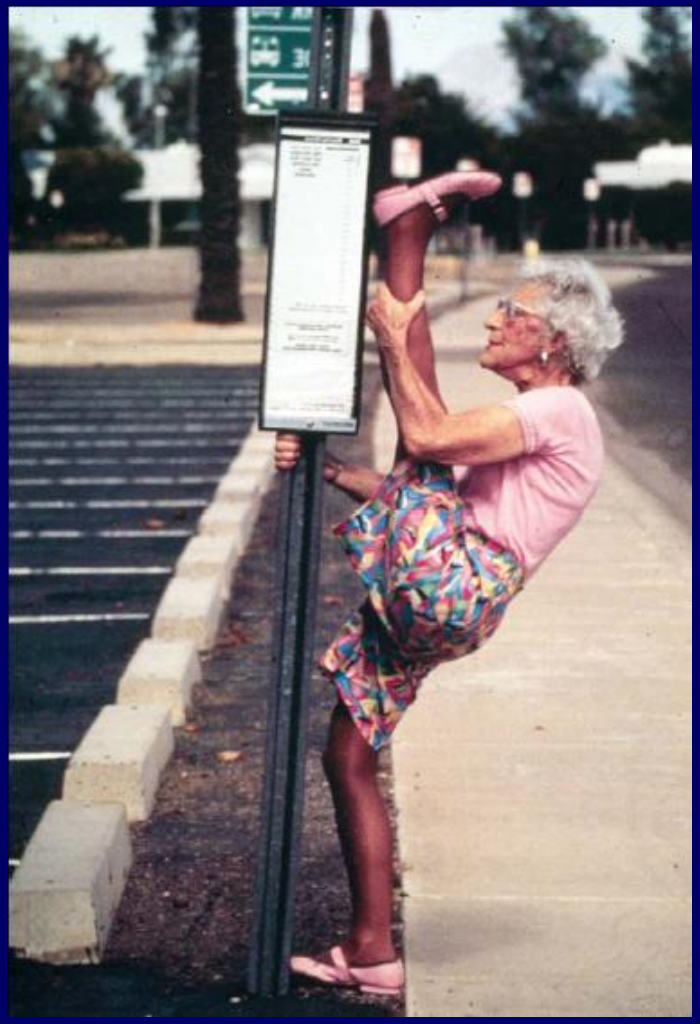
* p<0.001 vs placebo,

† p<0.001 vs salmeterol,

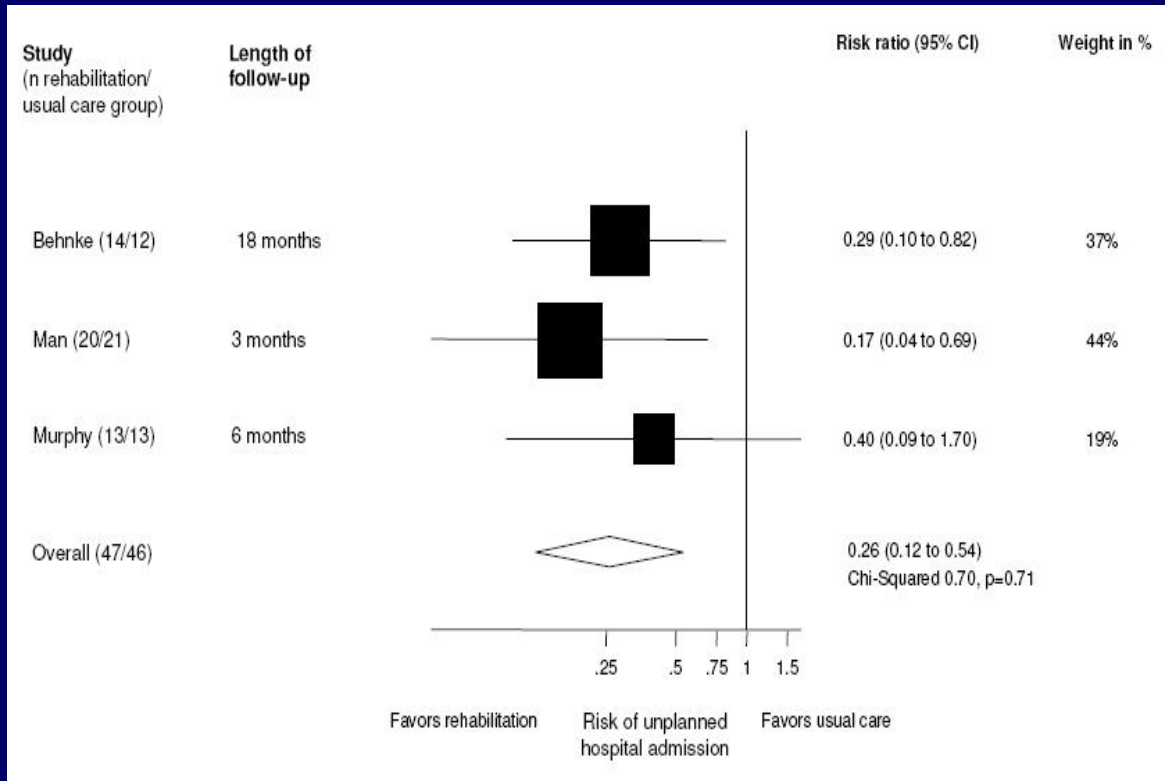
\# p=0.017 vs fluticasone

Calverley NEJM 2007

Pulmonary rehabilitation for COPD

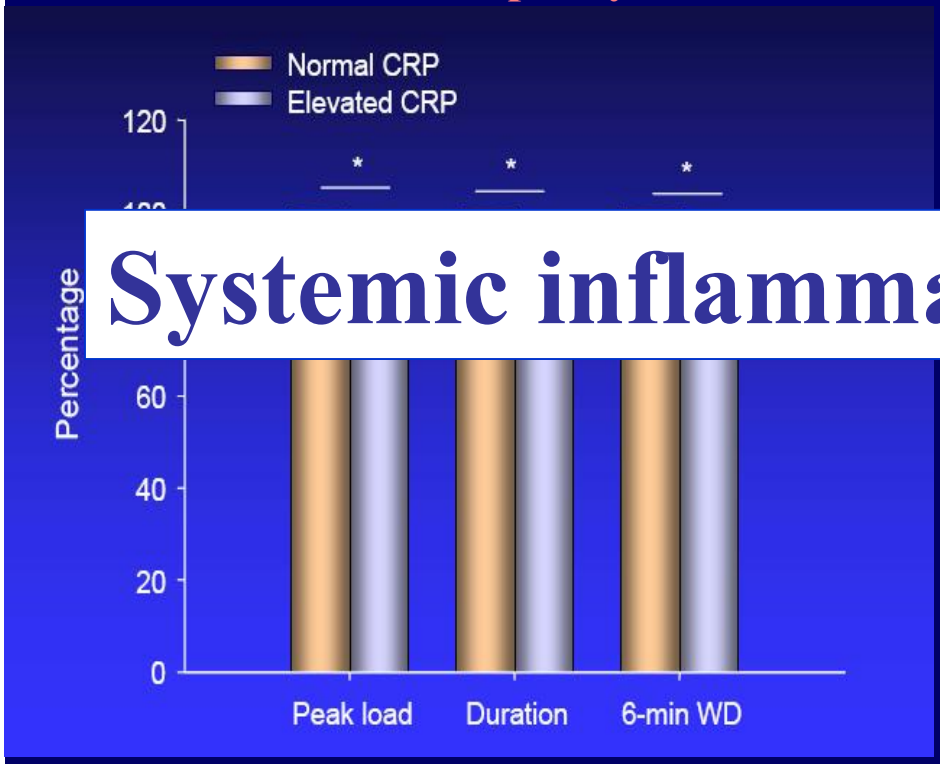


- Improves exercise tolerance
- Improves breathlessness
- Improves quality of life
- Reduces re-admission to hospital with exacerbations of COPD

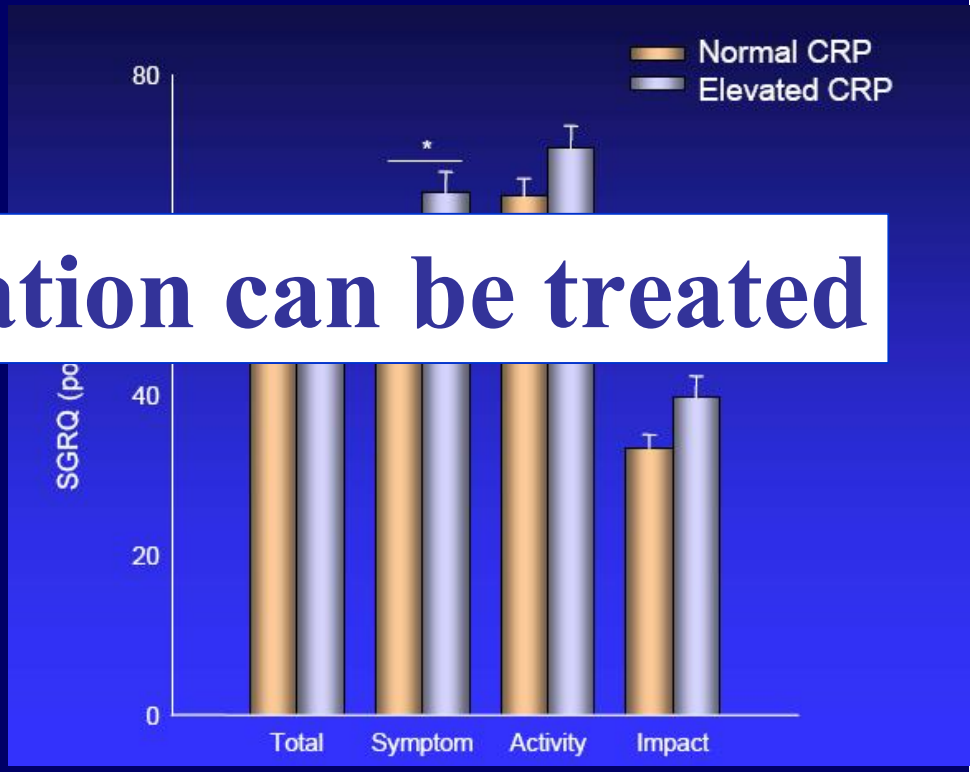


Systemic inflammation , function and health status in COPD

Exercise capacity



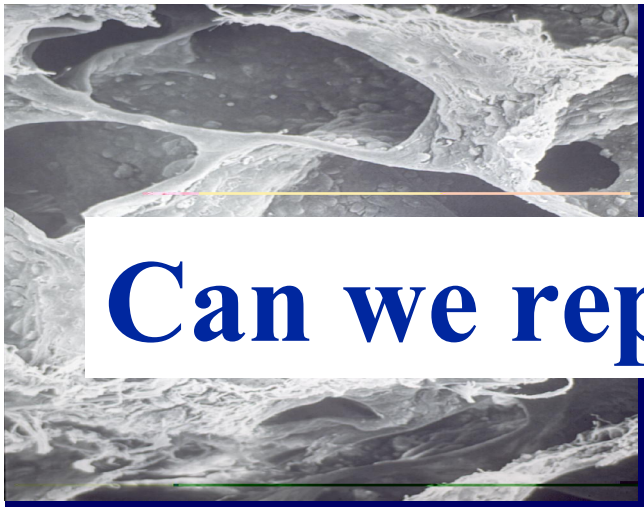
Health status



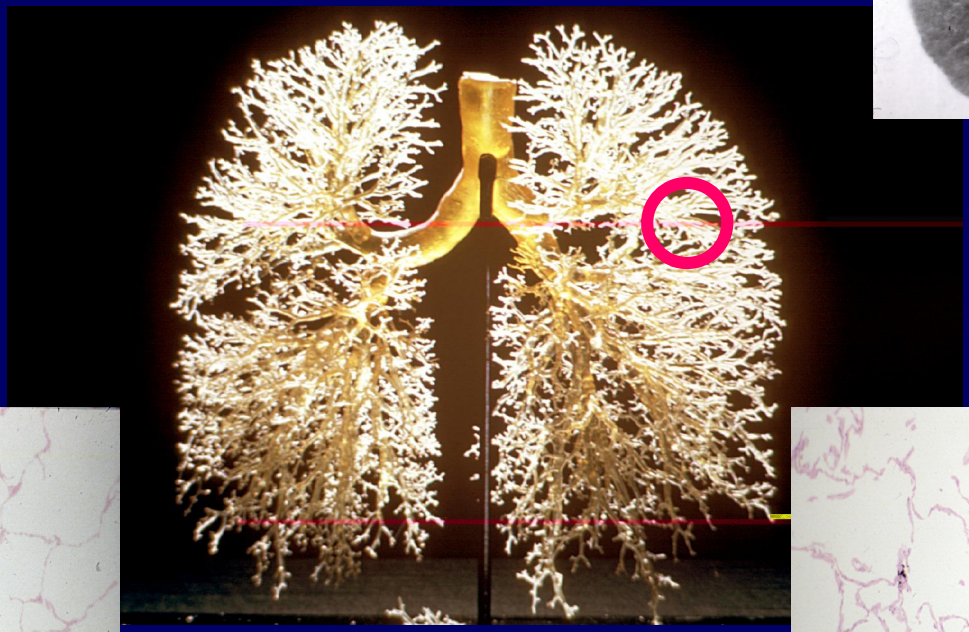
Systemic inflammation can be treated

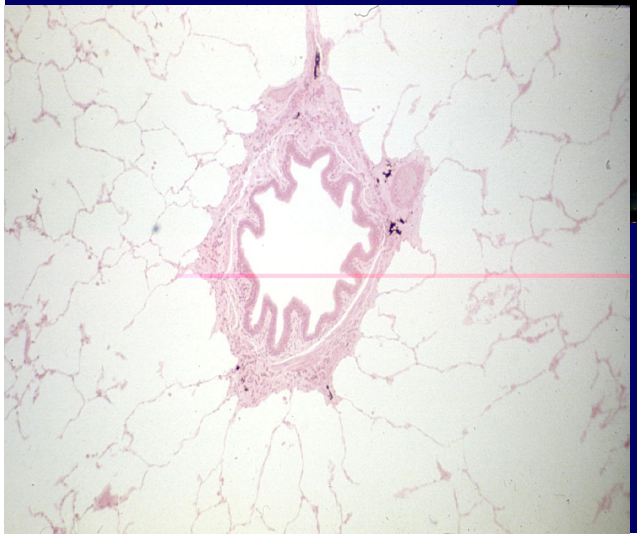
Broekhuizen Thorax 2006

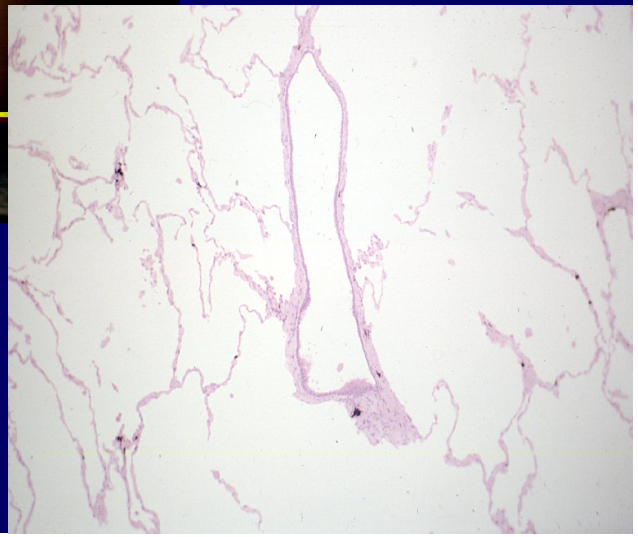
Can we repair the emphysema ?



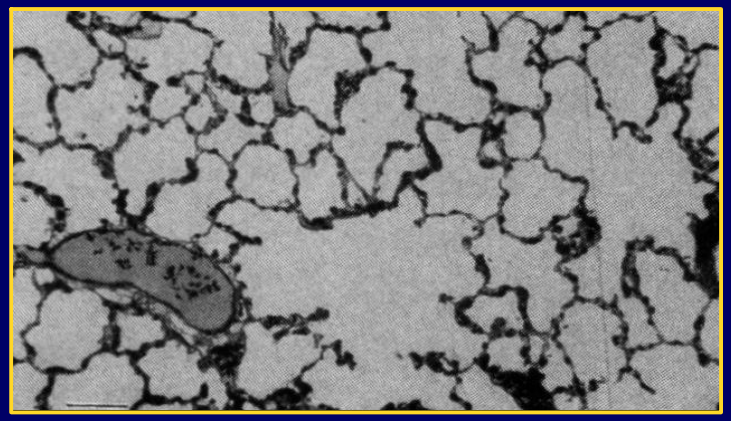
EMPHYSEMA
Macroscopic/
Microscopic







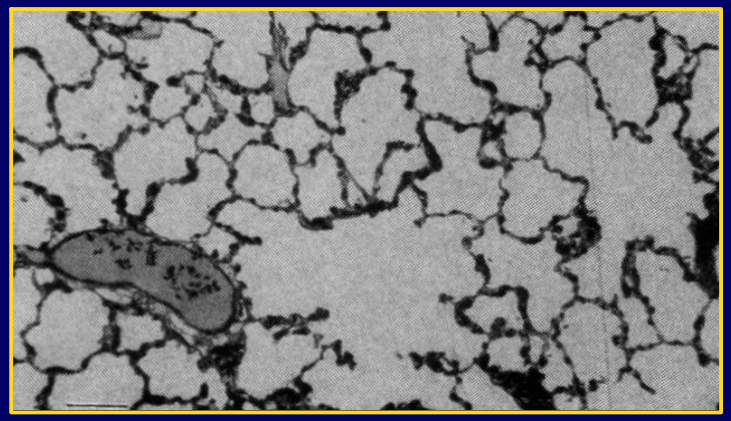
Retinoic acid reverses elastase-induced pulmonary emphysema in rats



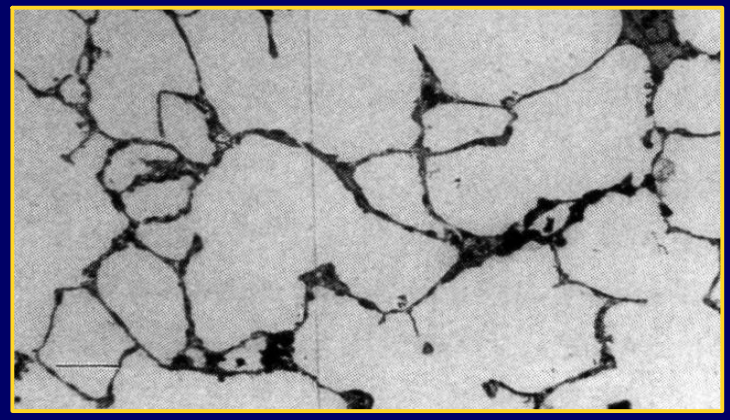
Normal

Massaro et al. Nature Med 1997

Retinoic acid reverses elastase-induced pulmonary emphysema in rats



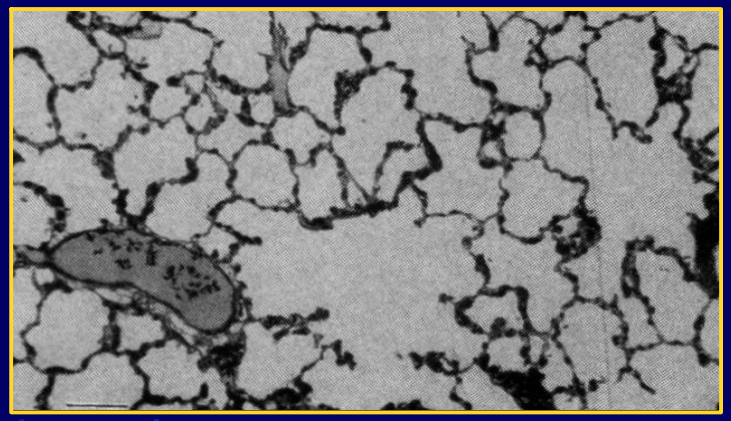
Normal



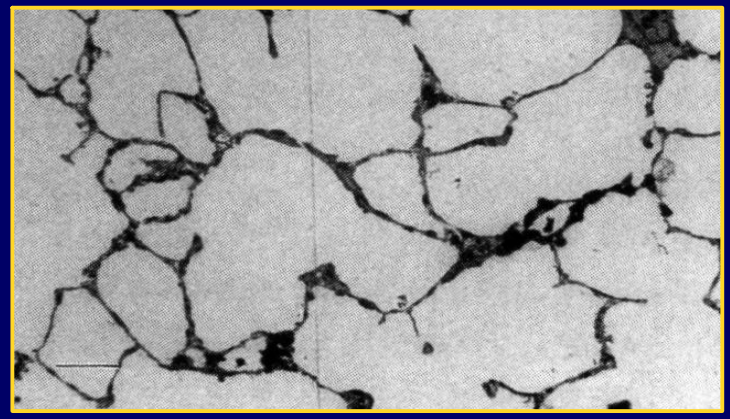
After elastase

Massaro et al. Nature Med 1997

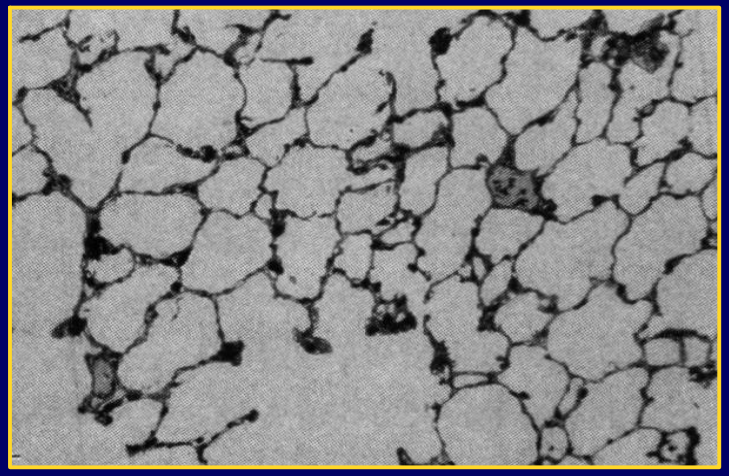
Retinoic acid reverses elastase-induced pulmonary emphysema in rats



Normal



After elastase



Retinoic acid after elastase

Massaro et al. Nature Med 1997

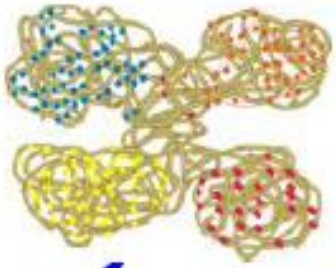
Tissue Engineering

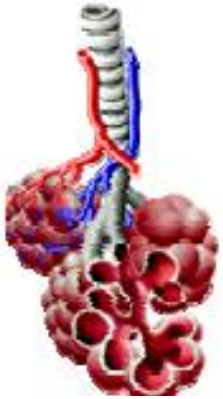
Short term
<5 years

Medium
5-10 years

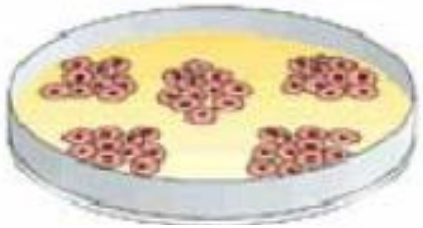
Long term
10-20 years (!)

3D Organoids





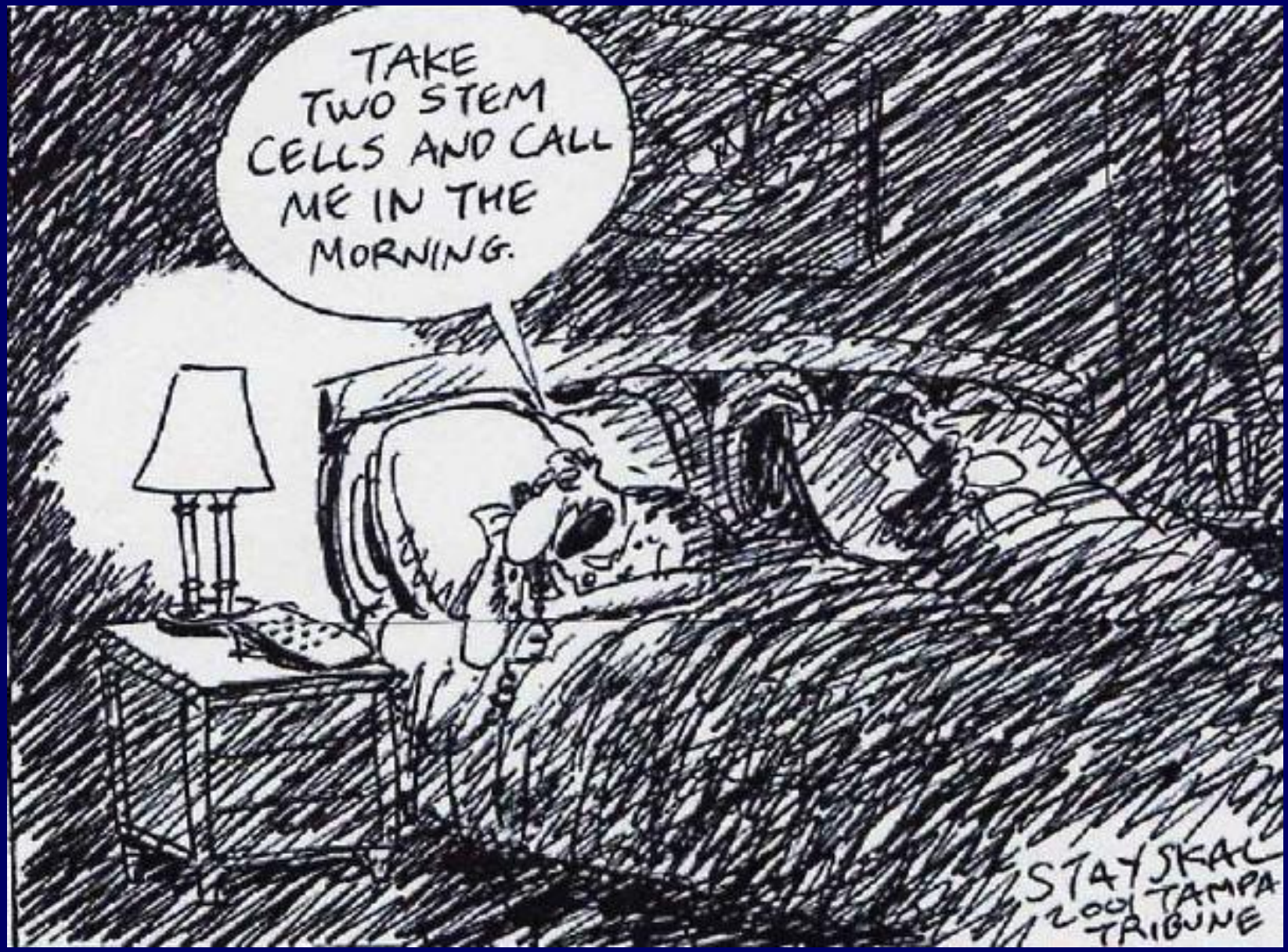
Cell therapy for local repair



Stem Cells

Lung Implants

Tissue engineering- the future for chronic diseases ?

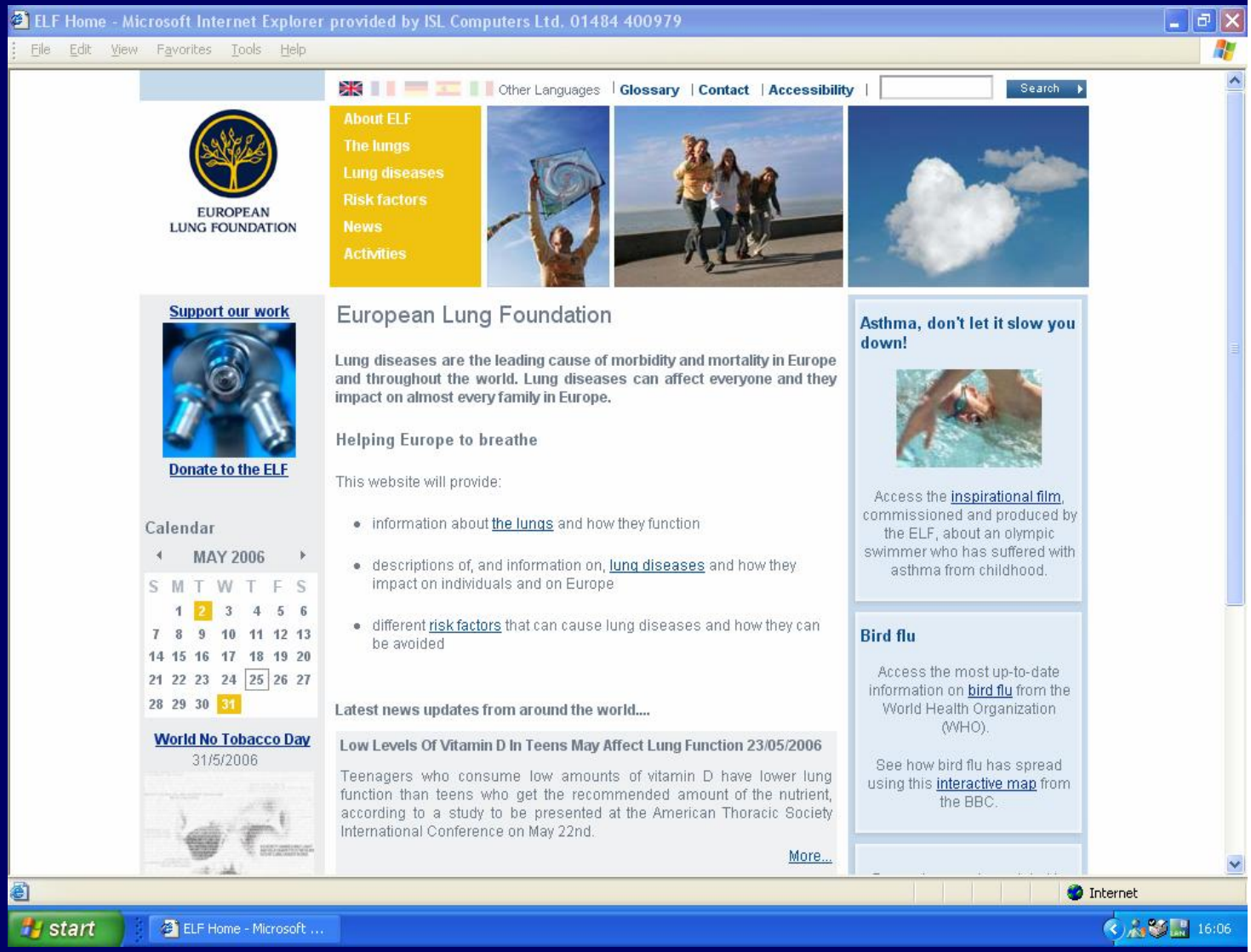


New Advances in COPD

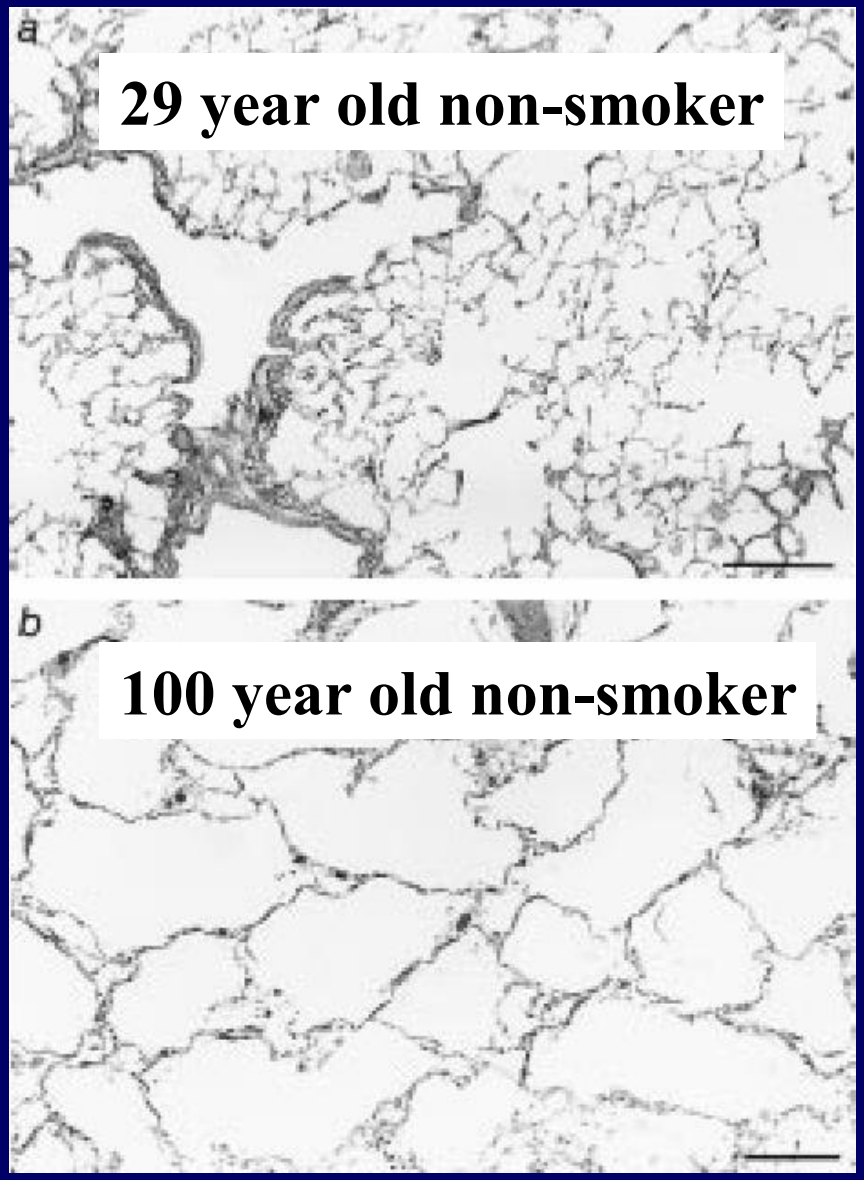
- Assessment
- Understanding disease processes
- Treatment

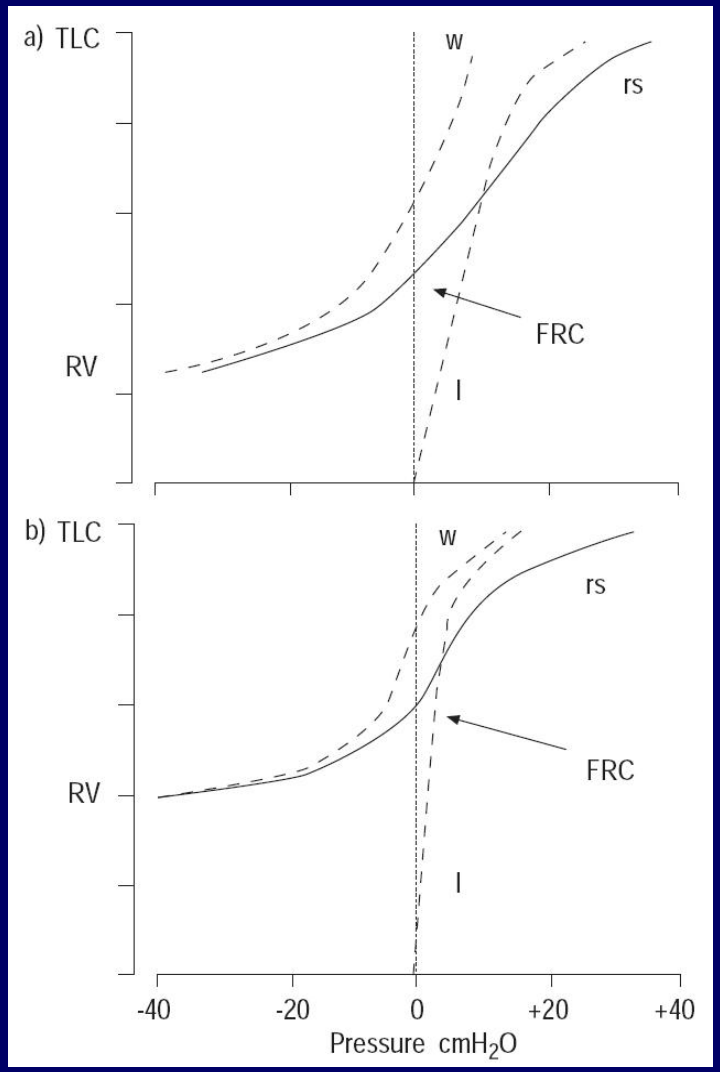
EUROPEAN
LUNG FOUNDATION

Website



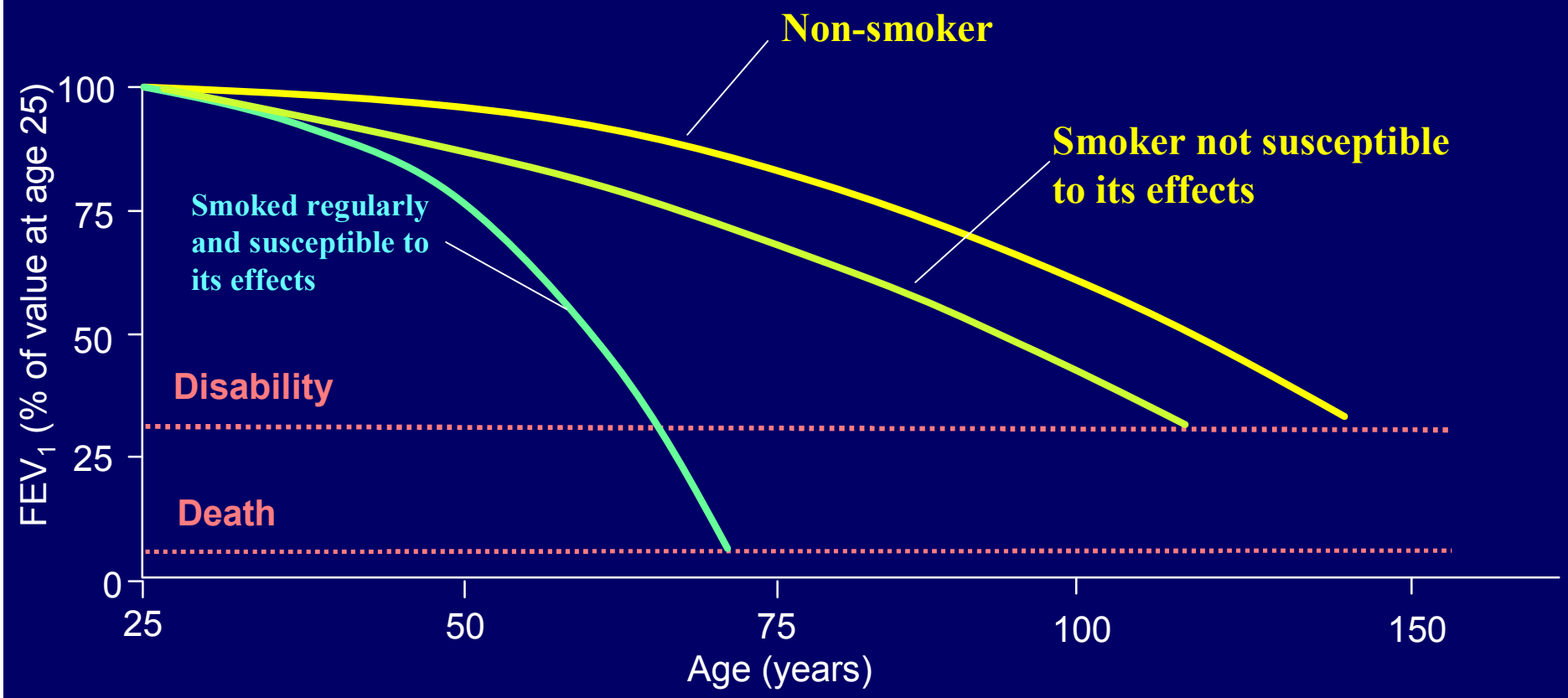
Emphysema and aging





Janssens et al. Eur Respir J 1999; 13: 197

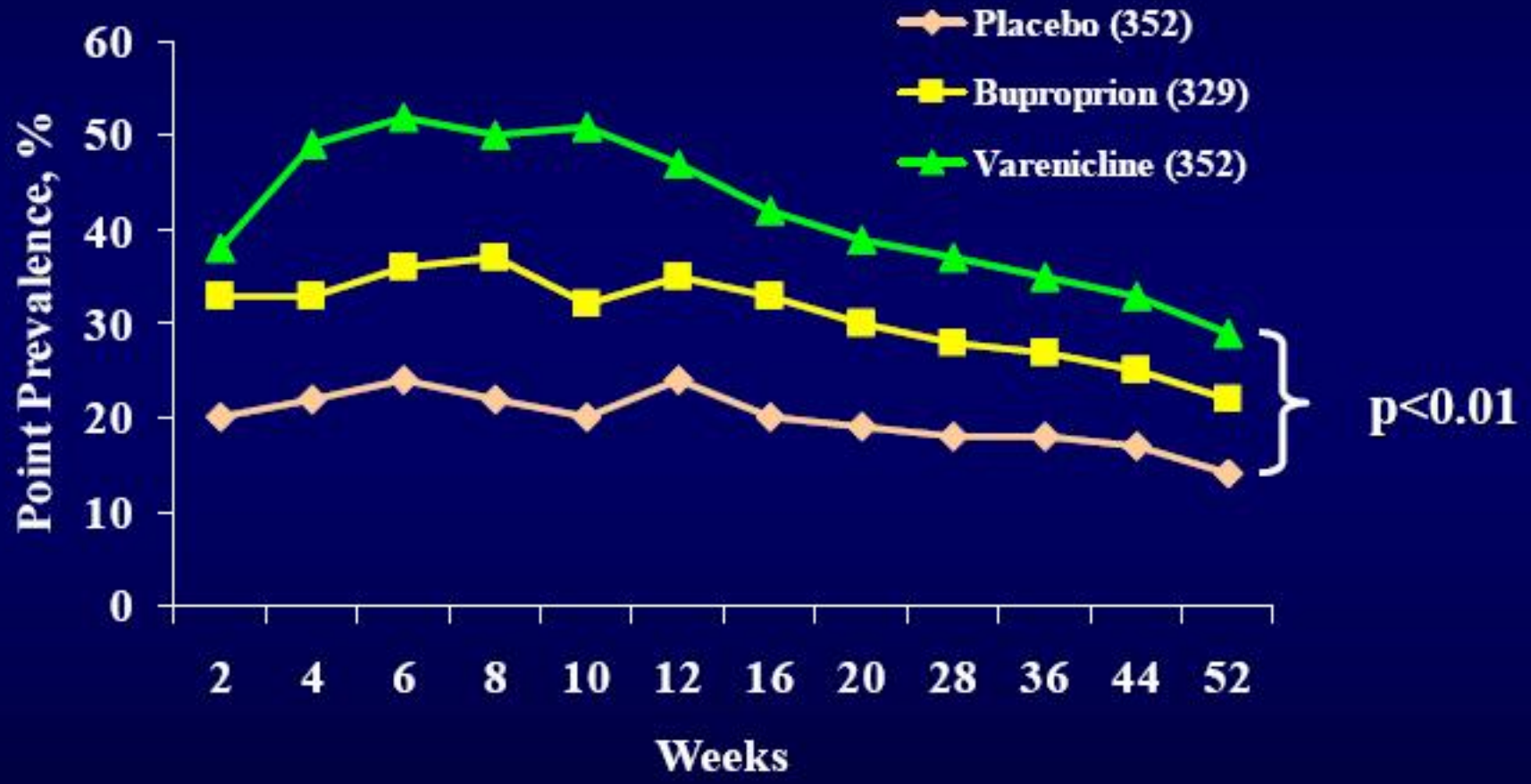
Natural history of COPD



An extrapolation of Fletcher and Peto. 1977

"Are you sure you don't want to add something about smoking?"

Varenicline and Smoking Cessation



Gonzales et al JAMA 2006;296:47

EUROPEAN LUNG FOUNDATION

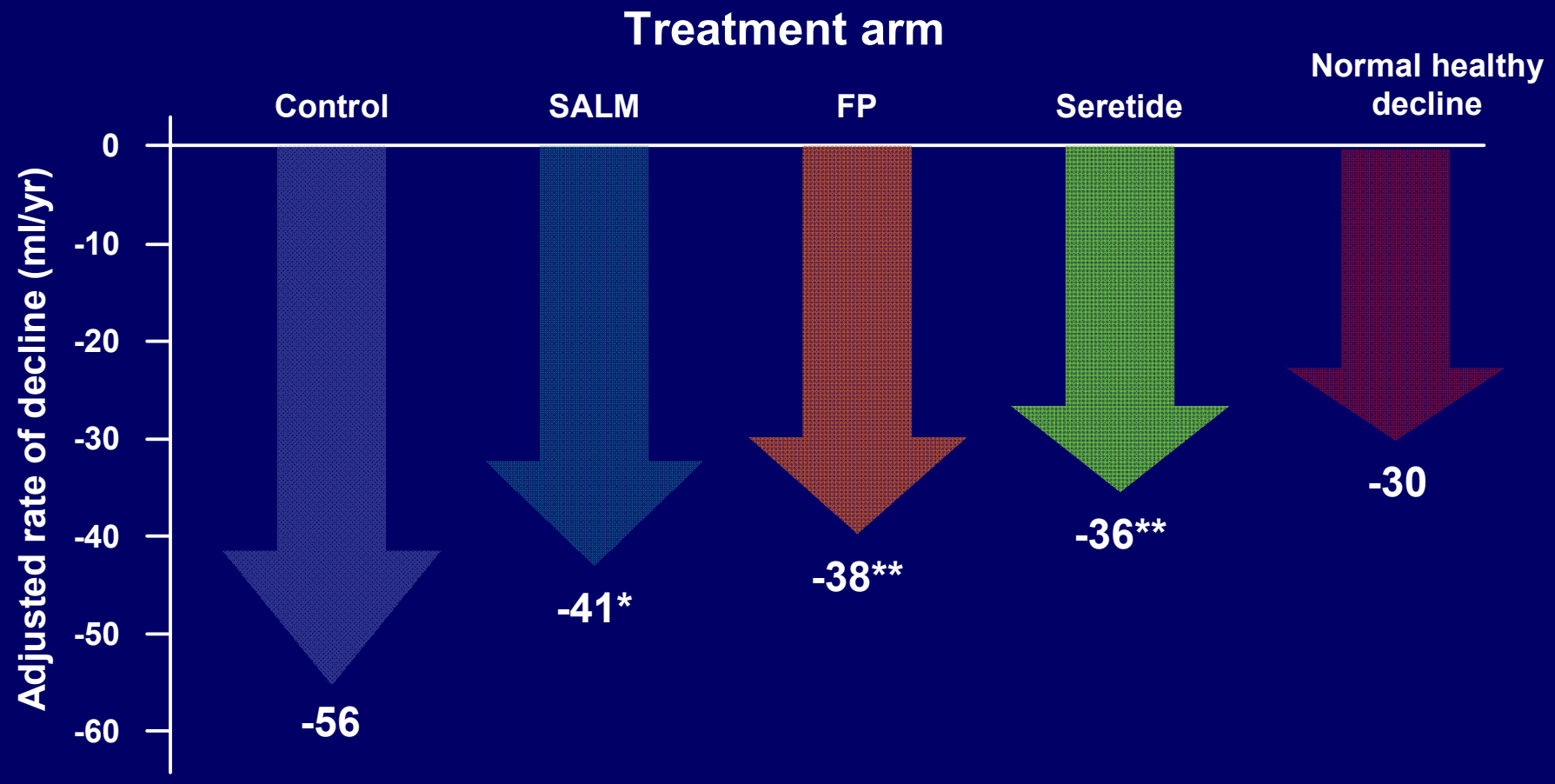
Factsheets

How can I interpret air pollution levels?

Many countries and international agencies have developed systems to show the different levels of air pollution in different areas each day and this alerts the population when levels are excessive. One of these, from the UK Department of Health, is shown below. This system works by grading each concentration of pollutant, and ranking it at a level between 1 and 10. These levels are then split into four categories: low; moderate; high; and very high.

Band	Index	O_3 µg/m^3	NO_2 µg/m^3	PM µg/m^3	SO_2 µg/m^3
Low	1	0–32	0–95	0–16	0–88
	2	33–66	96–190	17–32	89–176
	3	67–99	191–286	33–49	177–265
Moderate	4	100–126	287–381	50–57	266–354
	5	127–152	382–476	58–66	355–442
	6	153–179	478–572	67–74	443–531
High	7	180–239	573–635	75–82	532–708
	8	240–299	636–700	83–91	709–886
	9	300–359	701–763	92–99	887–1063
Very high	10	≥360	≥764	≥100	≥1064

Rate of decline of FEV_1
<50% pre-bronchodilator FEV_1

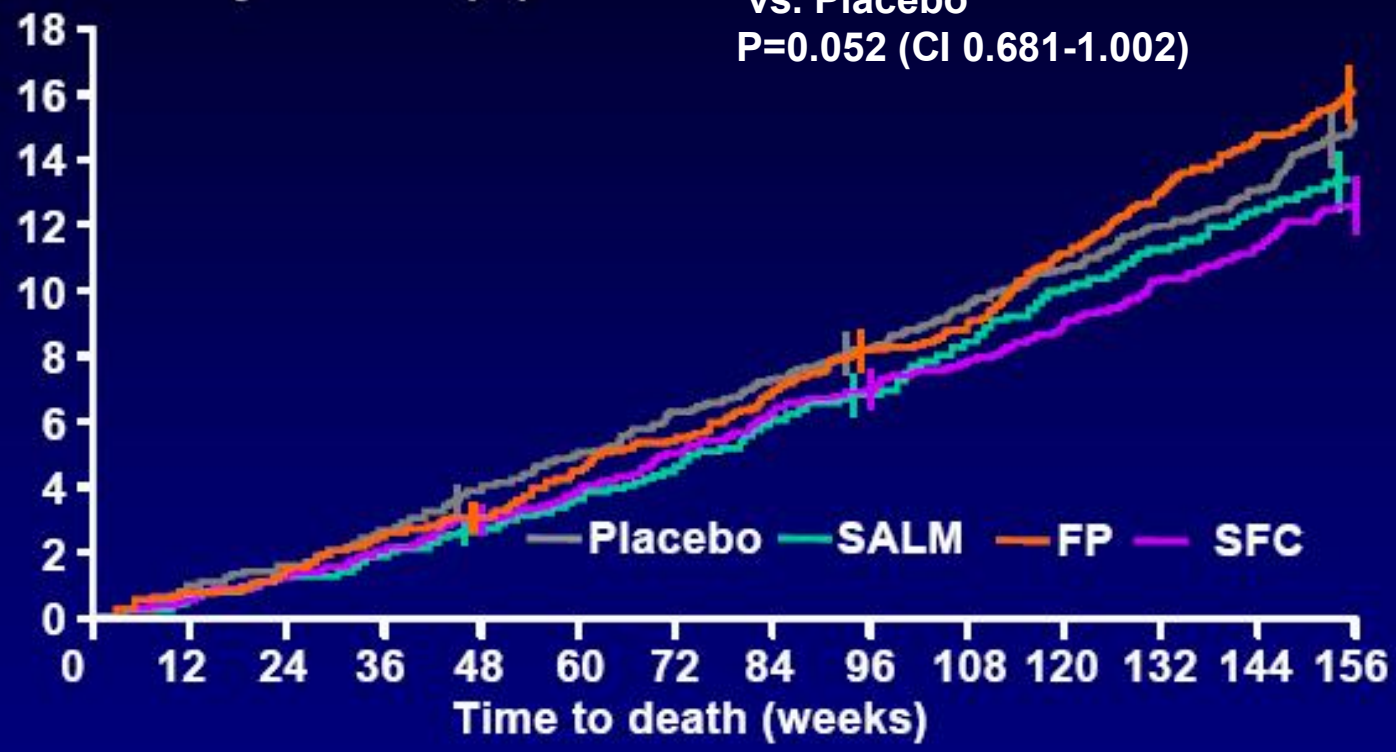


*p=0.004,
**p<0.001

GSK Data on File SERTCODOF012 <50% FEV_1

All-cause mortality at 3 years

RR reduction in mortality of 17.5%
Absolute reduction 2.6% over 3 years
Seretide ™ 500 Accuhaler ™
vs. Placebo
P=0.052 (CI 0.681-1.002)



Number alive				
Placebo	1524	1464	1399	1293
FP	1533	1487	1426	1339
SALM	1521	1481	1417	1316
SFC	1534	1487	1409	1288

Vertical bars are standard errors

Calverley *et al.* NEJM 2007

COPD: Life Continues…

Asthma versus COPD

- different diseases
- different treatments
- different prognoses

www.ginasthma.com

www.goldcopd.org

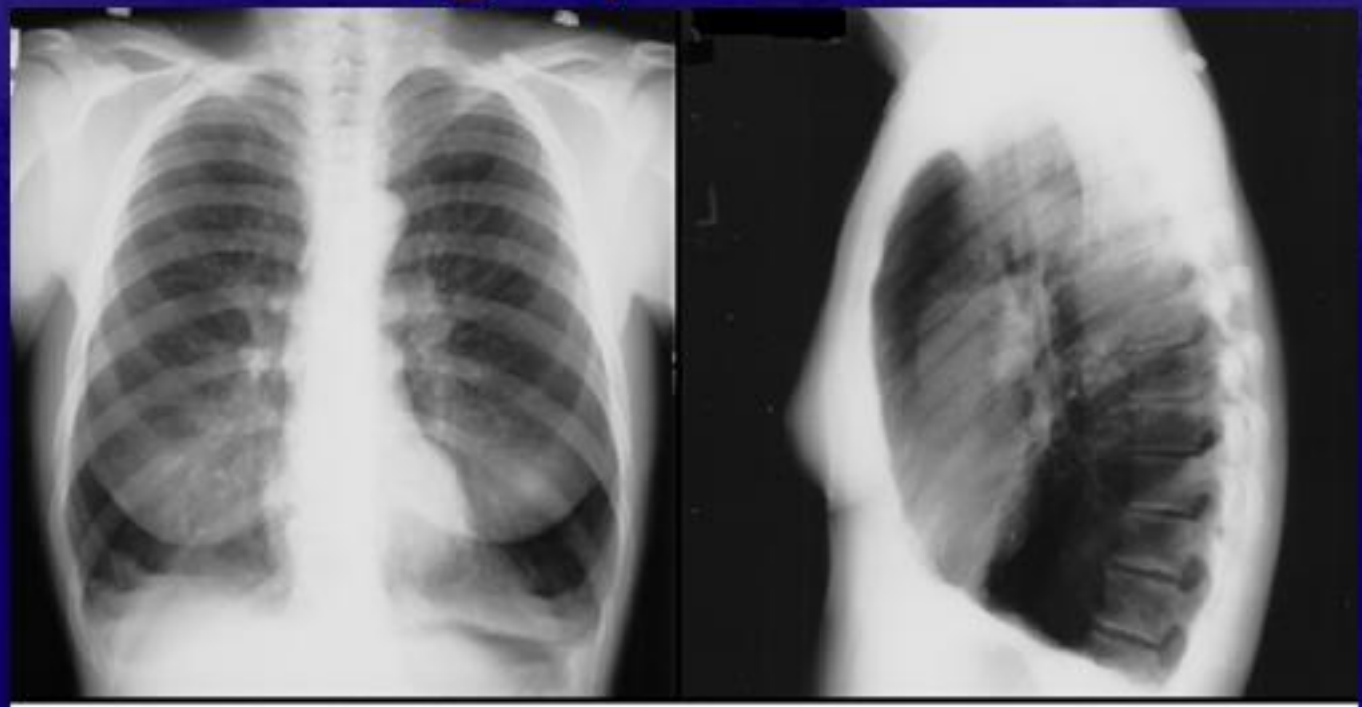
Asthma versus COPD

Additional investigations

- Imaging

- Allergy testing

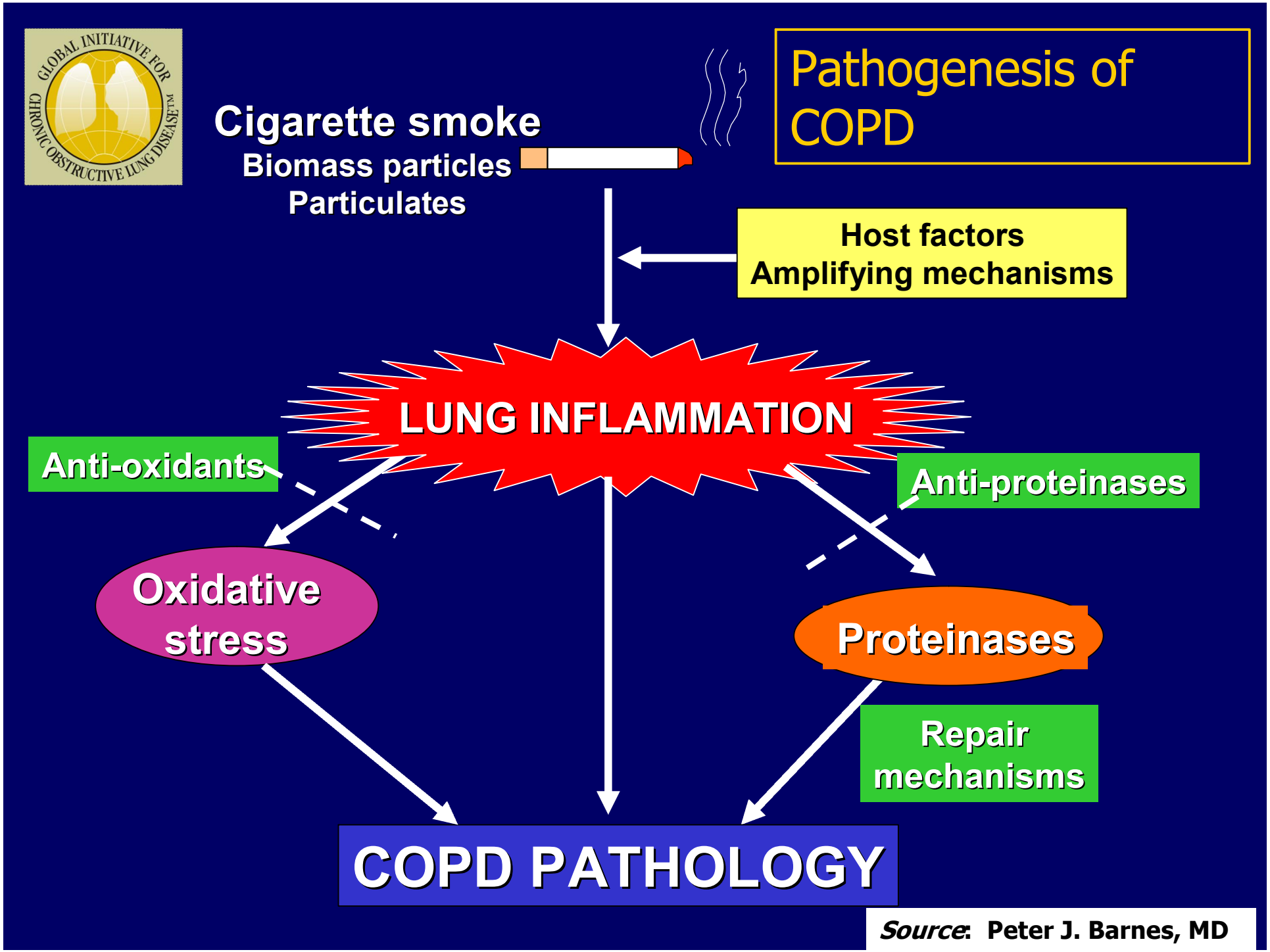
chest radiograph



PA (left) and lateral (right) radiographs of a young woman with alpha-1-antitrypsin deficiency and typical changes of severe obstructive lung disease. There is diminished vascularity (arterial deficiency pattern) along with flattened diaphragms and an increase in the AP dimension of the chest.

Bullae
Focal absence of pulmonary vessels
Reduction in vessel calibre, vessel tapering
Signs of overinflation

Sensitivity for emphysema ~ 40%
Thurlbeck and Simon 1978
Sensitive in diagnosi but not quantification in Moderate –severs disease
Thurlbeck and Muller 1999


Pathogenesis of COPD
Cigarette smoke
Biomass particles
Particulates
Host factors
Amplifying mechanisms
LUNG INFLAMMATION
Anti-oxidants
Anti-proteinases
Oxidative stress
Proteinases
Repair mechanisms
COPD PATHOLOGY
Source: Peter J. Barnes, MD

Changes in Small Airways in COPD Patients

Inflammatory exudate in lumen

Disrupted alveolar attachments

Thickened wall with inflammatory cells
- macrophages, $CD8^+$ cells, fibroblasts

Peribronchial fibrosis

Lymphoid follicle

Source: Peter J. Barnes, MD

Risk Factors for COPD

Genes

Exposure to particles

- Tobacco smoke
- Occupational dusts, organic and inorganic
- Indoor air pollution from heating and cooking with biomass in poorly ventilated dwellings
- Outdoor air pollution

Lung growth and development

Oxidative stress

Gender

Age

Respiratory infections

Socioeconomic status

Nutrition

Comorbidities

Management of Stable COPD

Assess and Monitor COPD: Key Points

- A clinical diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough or sputum production, and/or a history of exposure to risk factors for the disease.
- The diagnosis should be confirmed by spirometry. A post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of airflow limitation that is not fully reversible.
- Comorbidities are common in COPD and should be actively identified.

Management of Stable COPD

Assess and Monitor COPD: Spirometry

- Spirometry should be performed after the administration of an adequate dose of a short-acting inhaled bronchodilator to minimize variability.
- A post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of airflow limitation that is not fully reversible.
- Where possible, values should be compared to age-related normal values to avoid overdiagnosis of COPD in the elderly.

COPD and Co-Morbidities

COPD has significant extrapulmonary (systemic) effects including:

- Weight loss
- Nutritional abnormalities
- Skeletal muscle dysfunction

Brief Strategies to Help the Patient Willing to Quit Smoking

- ASK — Systematically identify all tobacco users at every visit.
- ADVISE — Strongly urge all tobacco users to quit.
- ASSESS — Determine willingness to make a quit attempt.
- ASSIST — Aid the patient in quitting.
- ARRANGE — Schedule follow-up contact.

Management of Stable COPD

Reduce Risk Factors: Indoor/Outdoor Air Pollution

- Reducing the risk from indoor and outdoor air pollution is feasible and requires a combination of public policy and protective steps taken by individual patients.
- Reduction of exposure to smoke from biomass fuel, particularly among women and children, is a crucial goal to reduce the prevalence of COPD worldwide.

Therapy at Each Stage of COPD

I: Mild	II: Moderate	III: Severe	IV: Very Severe
▪ $FEV_1/FVC < 70\%$ ▪ $FEV_1 \geq 80\%$	▪ $FEV_1/FVC < 70\%$ ▪ $50\% \leq FEV_1 < 80\%$ predicted	▪ $FEV_1/FVC < 70\%$ ▪ $30\% \leq FEV_1 < 50\%$ predicted	▪ $FEV_1/FVC < 70\%$ ▪ $FEV_1 < 30\%$ predicted *or* $FEV_1 < 50\%$ predicted plus chronic respiratory failure

Active reduction of risk factor(s); influenza vaccination

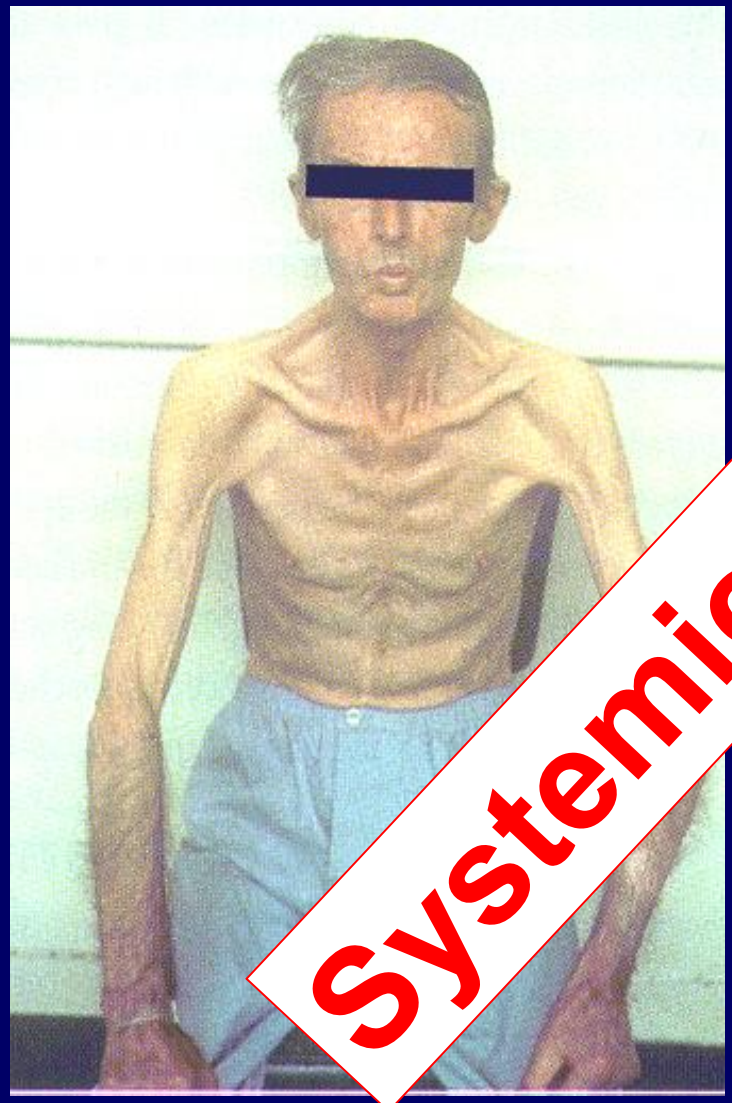
Add short-acting bronchodilator (when needed)

Add regular treatment with one or more long-acting bronchodilators (when needed); ***Add*** rehabilitation

Add inhaled glucocorticosteroids if repeated exacerbations

Add long term oxygen if chronic respiratory failure. ***Consider*** surgical treatments

Patient with COPD and Cachexia



Systemic Phenotype

- loss i… mass (FFM)
- low… ass index (BMI)
- r… ortality
- …d diet supplement resist.

- elevated TNFα
- loss in myosin heavy chain
- Increased oxidative stress
- muscle apoptosis

These COPD patients have different phenotypes

Should they both receive the same Treatment ?

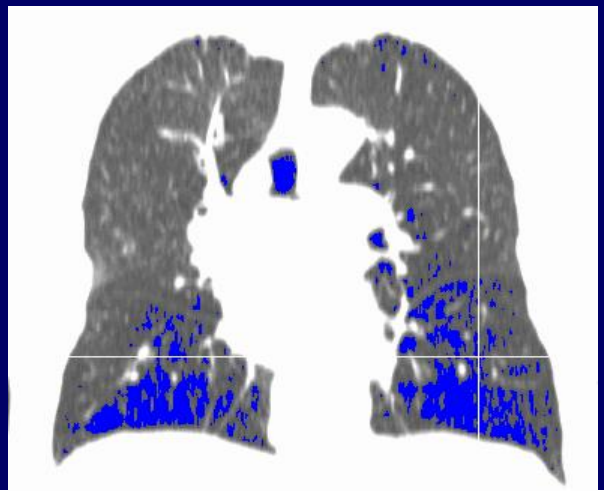
From T Petty

Facts About COPD

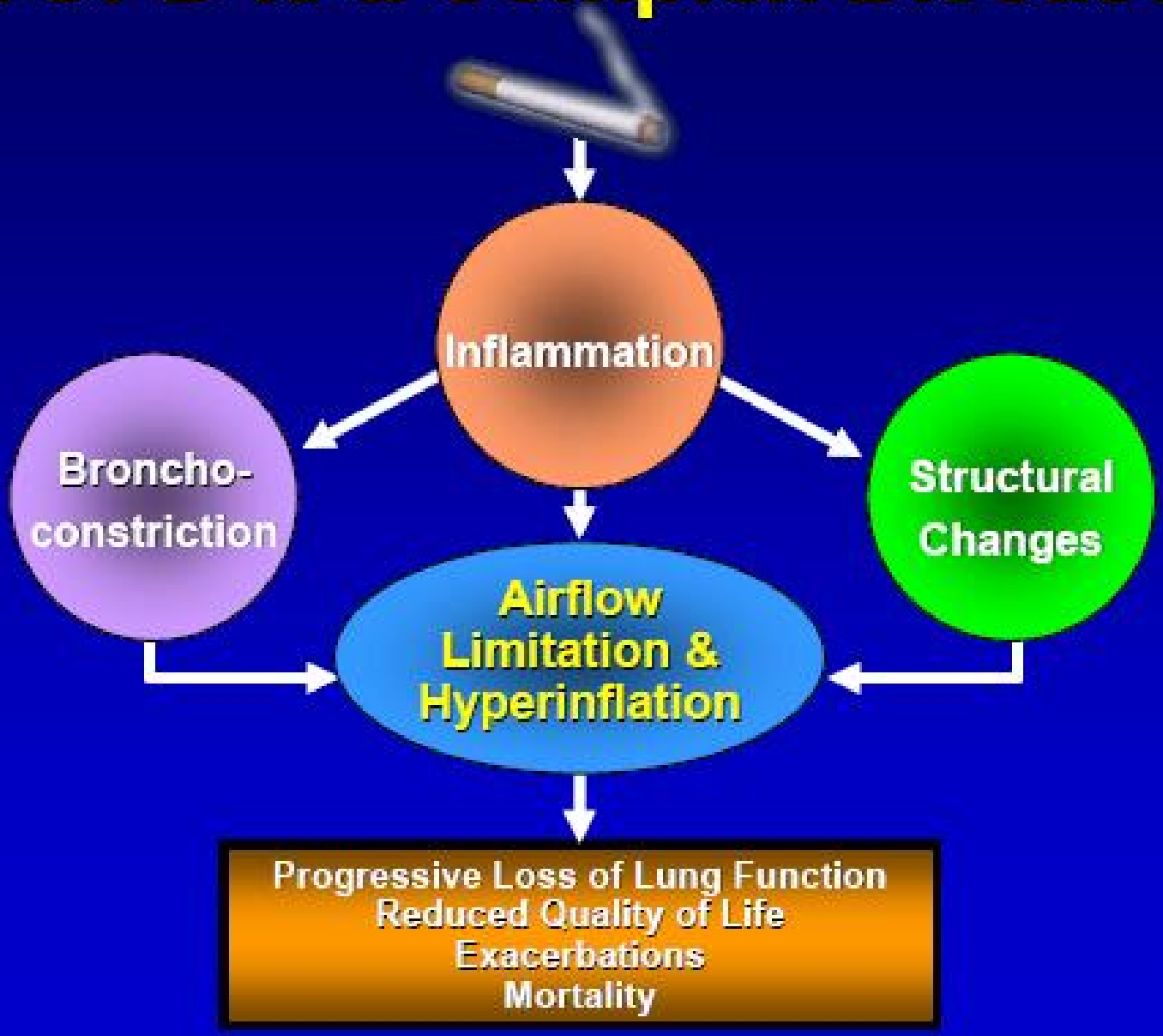
- COPD is the 4th leading cause of death in the United States (behind heart disease, cancer, and cerebrovascular disease).
- In 2000, the WHO estimated 2.74 million deaths worldwide from COPD.
- In 1990, COPD was ranked 12th as a burden of disease; by 2020 it is projected to rank 5th.

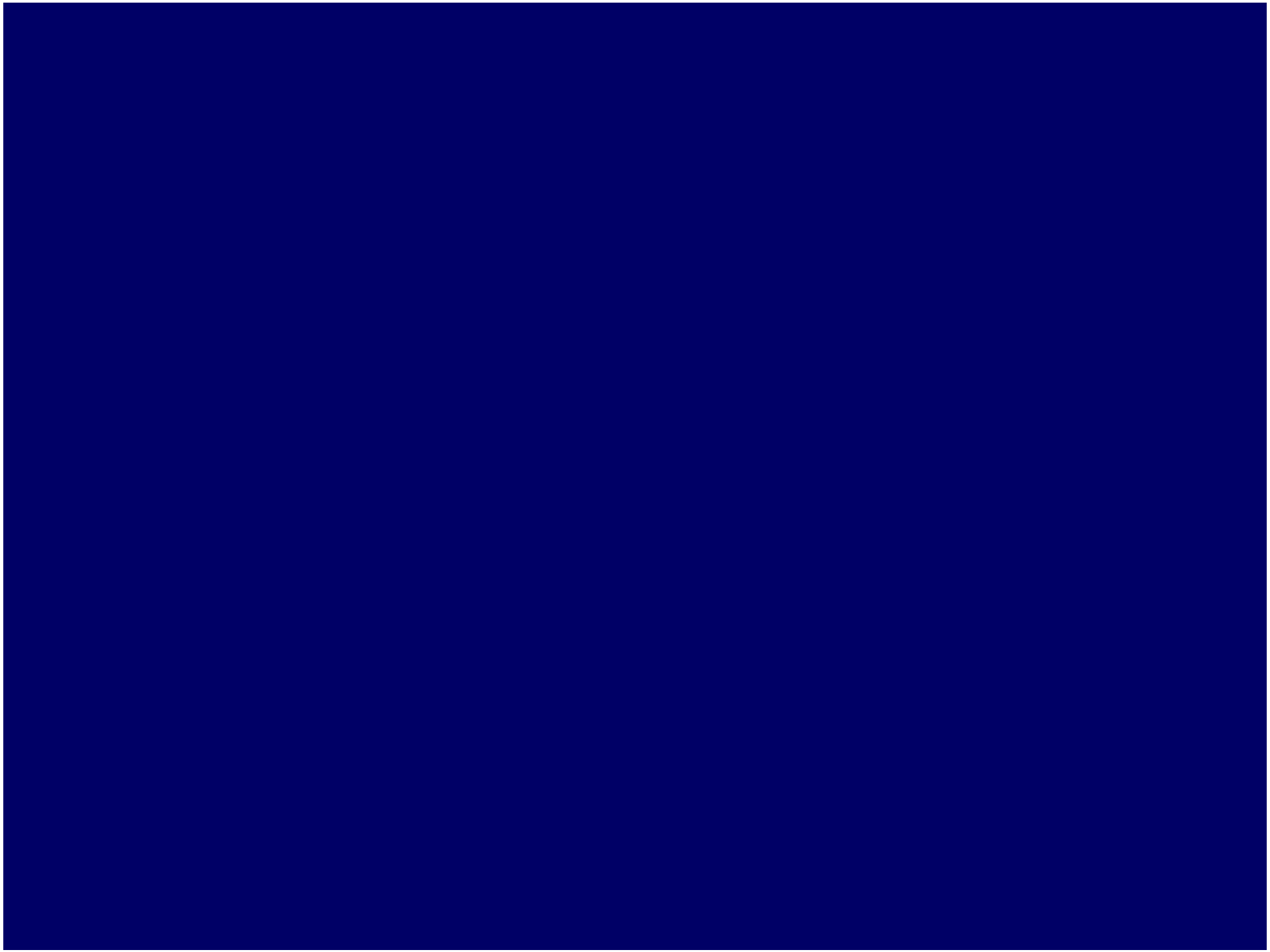
Alpha –1 antitrypsin deficiency
(α_1 proteinase deficiency)

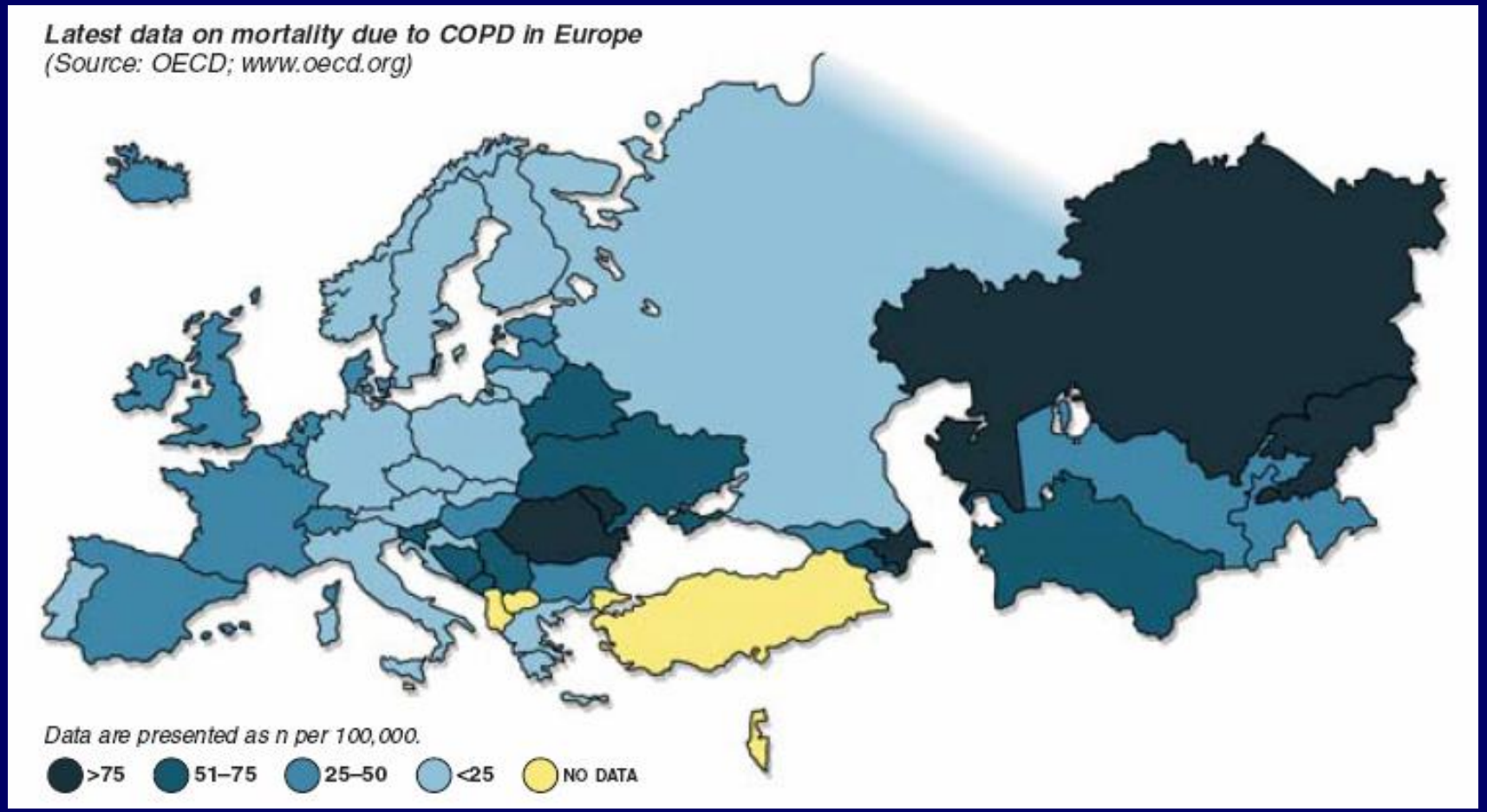
- Pi ZZ 1/5000 Live births in UK
- Liver disease in some cases in childhood
- Emphysema < 50 years of age often in 4th decade
- Some individuals lead a normal life
- Panlobular predominantly basal emphysema
- Smoking is a cofactor in the risk of emphysema



COPD is a Complex Disease






Latest data on mortality due to COPD in Europe
(Source: OECD; www.oecd.org)
Data are presented as n per 100,000.
>75
51–75
25–50
<25
NO DATA

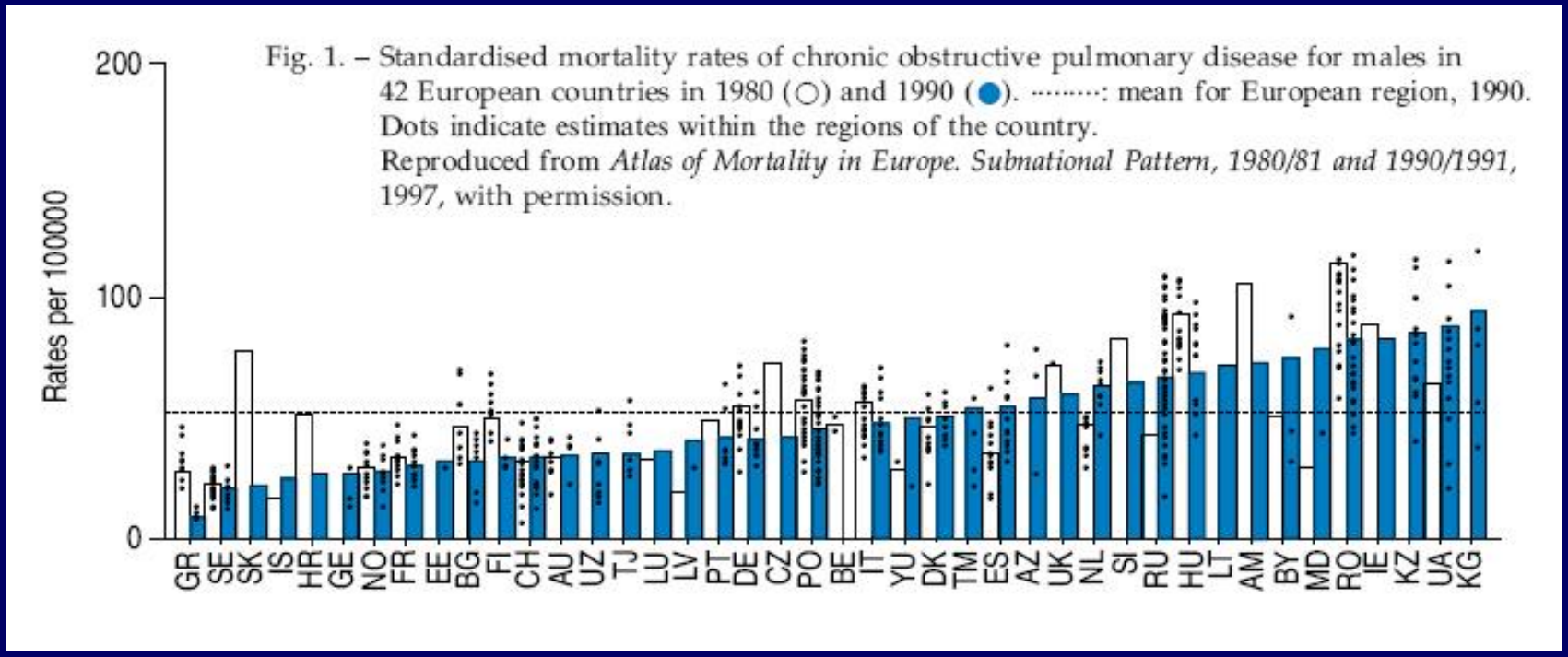


Fig. 1. – Standardised mortality rates of chronic obstructive pulmonary disease for males in 42 European countries in 1980 (○) and 1990 (●). ·····: mean for European region, 1990. Dots indicate estimates within the regions of the country.
Reproduced from *Atlas of Mortality in Europe. Subnational Pattern, 1980/81 and 1990/1991*, 1997, with permission.

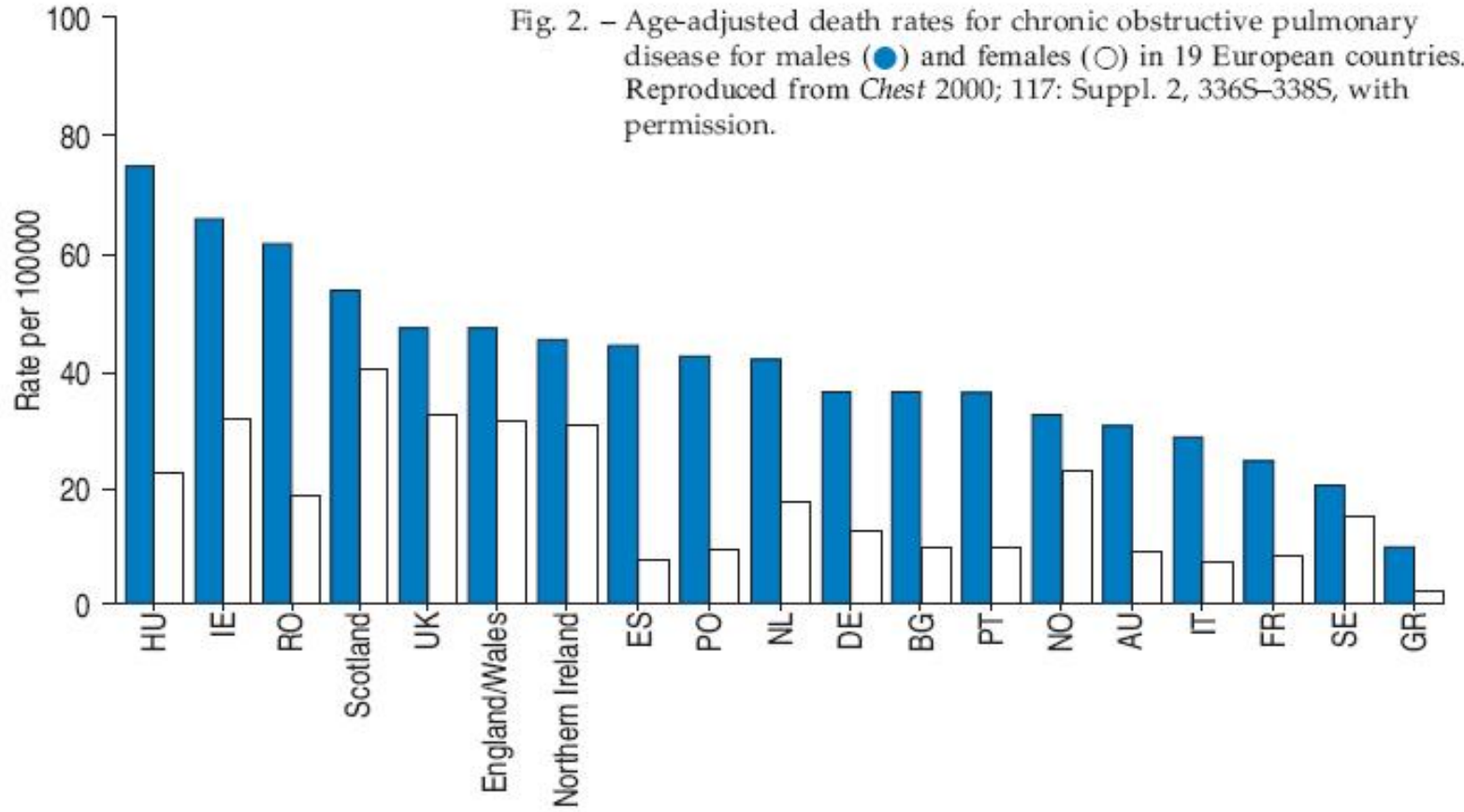


Fig. 2. – Age-adjusted death rates for chronic obstructive pulmonary disease for males (●) and females (○) in 19 European countries. Reproduced from *Chest* 2000; 117: Suppl. 2, 336S–338S, with permission.

EU25 - Principal causes of death by age group, in percent

	Cancer	Circulatory diseases	Respiratory diseases	Digestive diseases	External causes[1]	Others[1]
All age groups	**25.3**	**41.0**	**8.0**	**4.6**	**5.2**	**15.9**
0-19 years old	7.2	3.2	2.8	0.9	26.6	59.3
20-44 years old	19.7	13.8	2.5	6.6	38.0	19.4
45-64 years old	41.4	26.3	4.1	7.6	8.3	12.3
65-84 years old	29.1	42.0	8.2	4.2	2.8	13.7
Over 85 years old	11.6	52.0	10.6	3.5	2.9	19.4

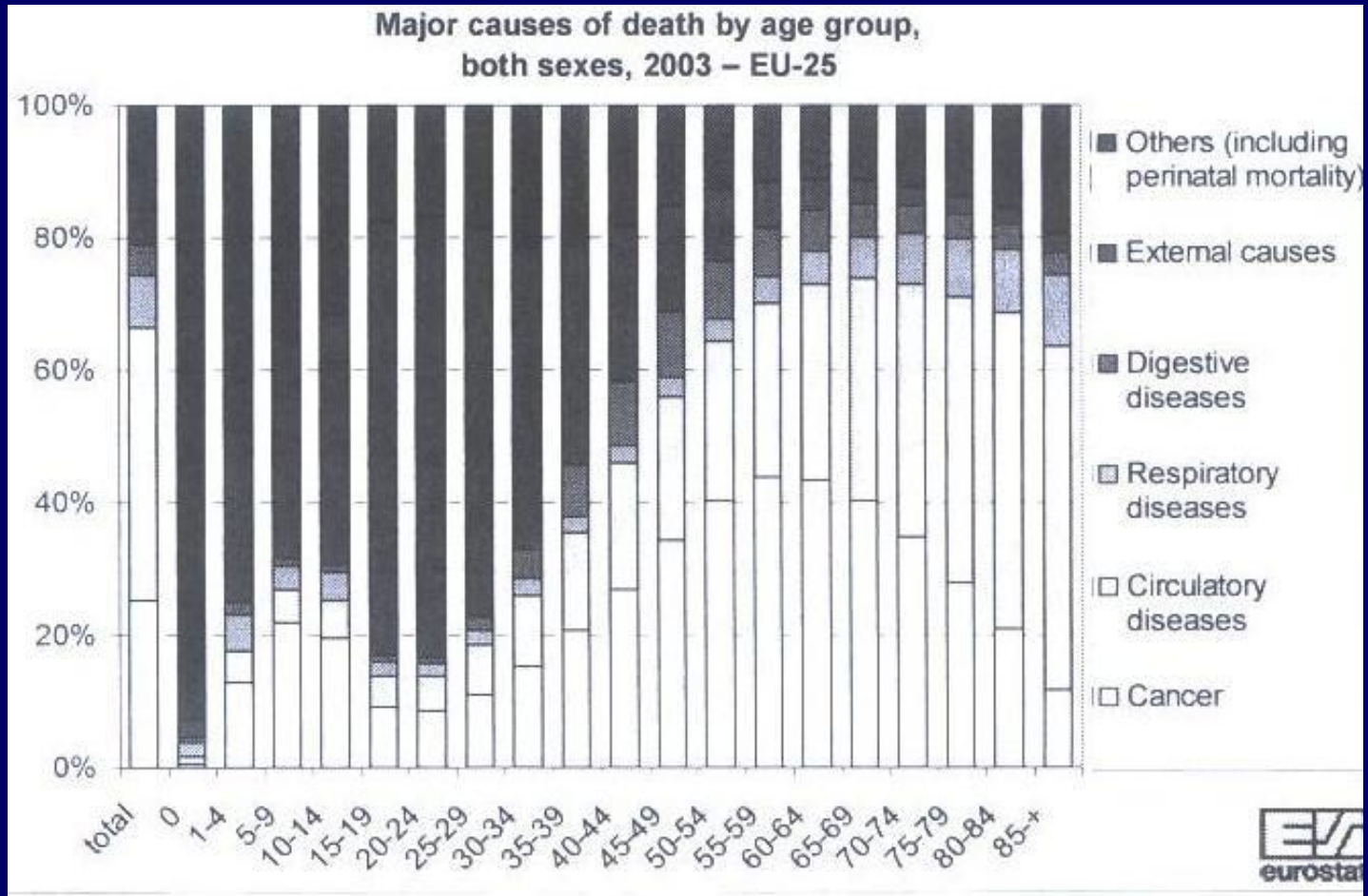
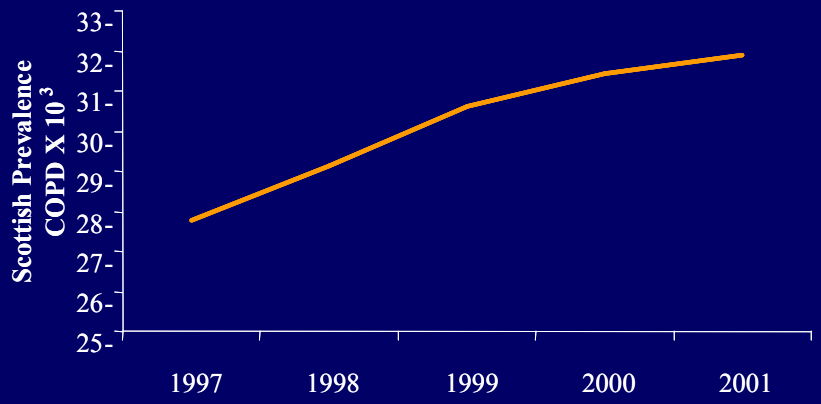


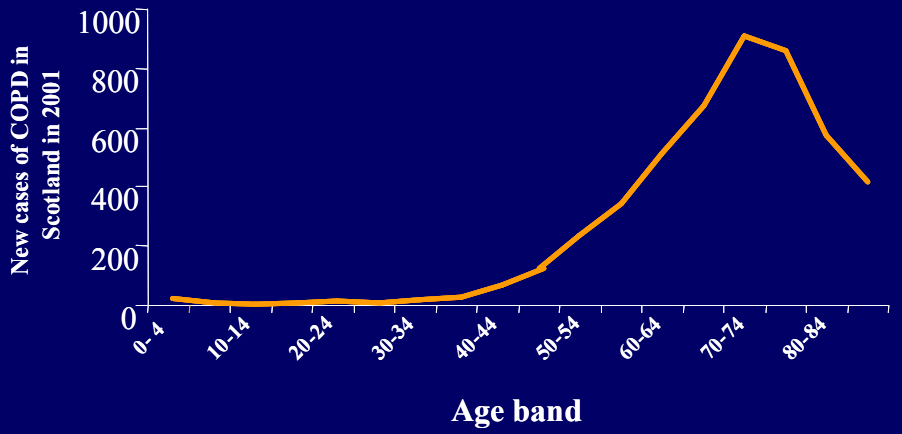
Figure 1: Main causes of death by 5-year age group

COPD epidemiology in Scotland

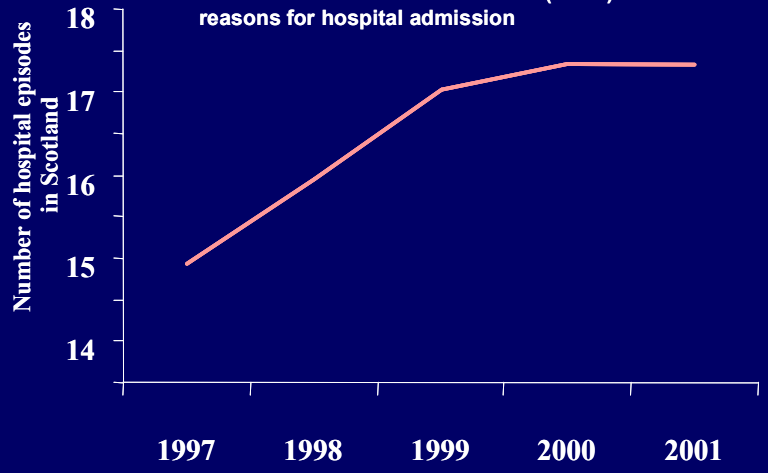
The number of people with COPD
is substantial and rising



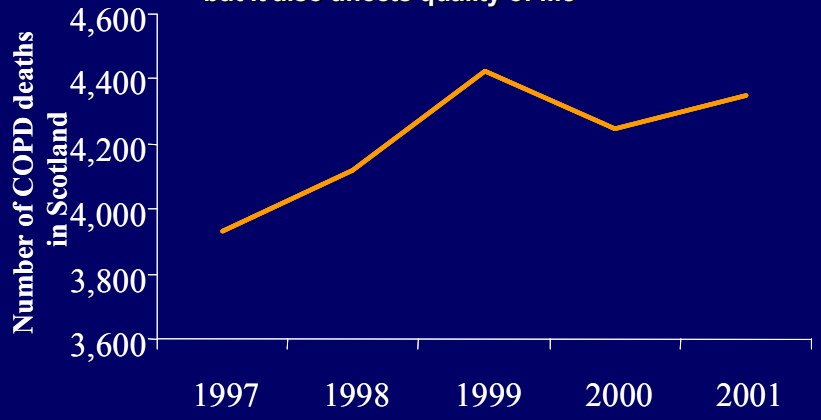
Those most likely to be affected
already have the poorest health



COPD is one of the most common (1 in 8)
reasons for hospital admission



COPD is a major killer
but it also affects quality of life



Mortality of COPD

- 30,000 in UK [1]
- 5% of all deaths [2]
- 4% of all females [2]
- 6% of all males [2]

Ref. 1. The Burden of Lung Disease BTS, Nov 2001

2. Calverley PMA, Thorax 2002

Hospital admission for COPD

- 26% of medical admissions are for respiratory disease
- half due to COPD !

220,000 admissions/year

- mean length of stay 7.5 days
- over 1 million bed days [1]
- 1 in 8 of all admissions [2]

Ref 1: Crocket A, Men's Health Journal 2003

2: NICE website

Consultations for COPD

- Annual GP consultation rates 2 x angina
- 417/1000 for patients 45-64 years
- 1032/1000 for patients 75-84 years

Pearson, BTS Guidelines Group / Standards of Care Committee

Thorax 1997

COPD and Systemic Effects

COPD has significant extrapulmonary (systemic) effects including:

- Weight loss
- Nutritional abnormalities
- Skeletal muscle dysfunction

COPD and Co-Morbidities

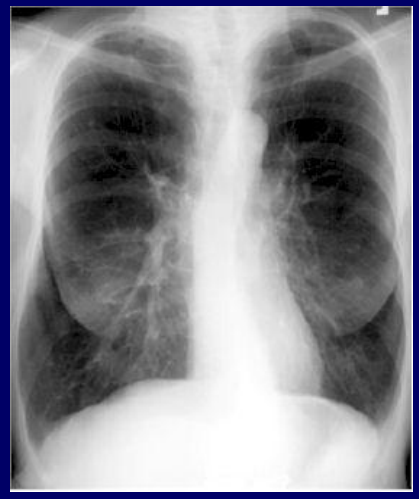
COPD patients are at increased risk for:

- **Myocardial infarction, angina**
- **Osteoporosis**
- **Respiratory infection**
- **Depression**
- **Diabetes**
- **Lung cancer**

Air Trapping

- Occurs in all patients with COPD
- Results in an increase in the work of breathing
- Places respiratory muscles at a mechanical disadvantage
- Contributes to the sensation of breathlessness (dyspnea)

Normal



Hyperinflation

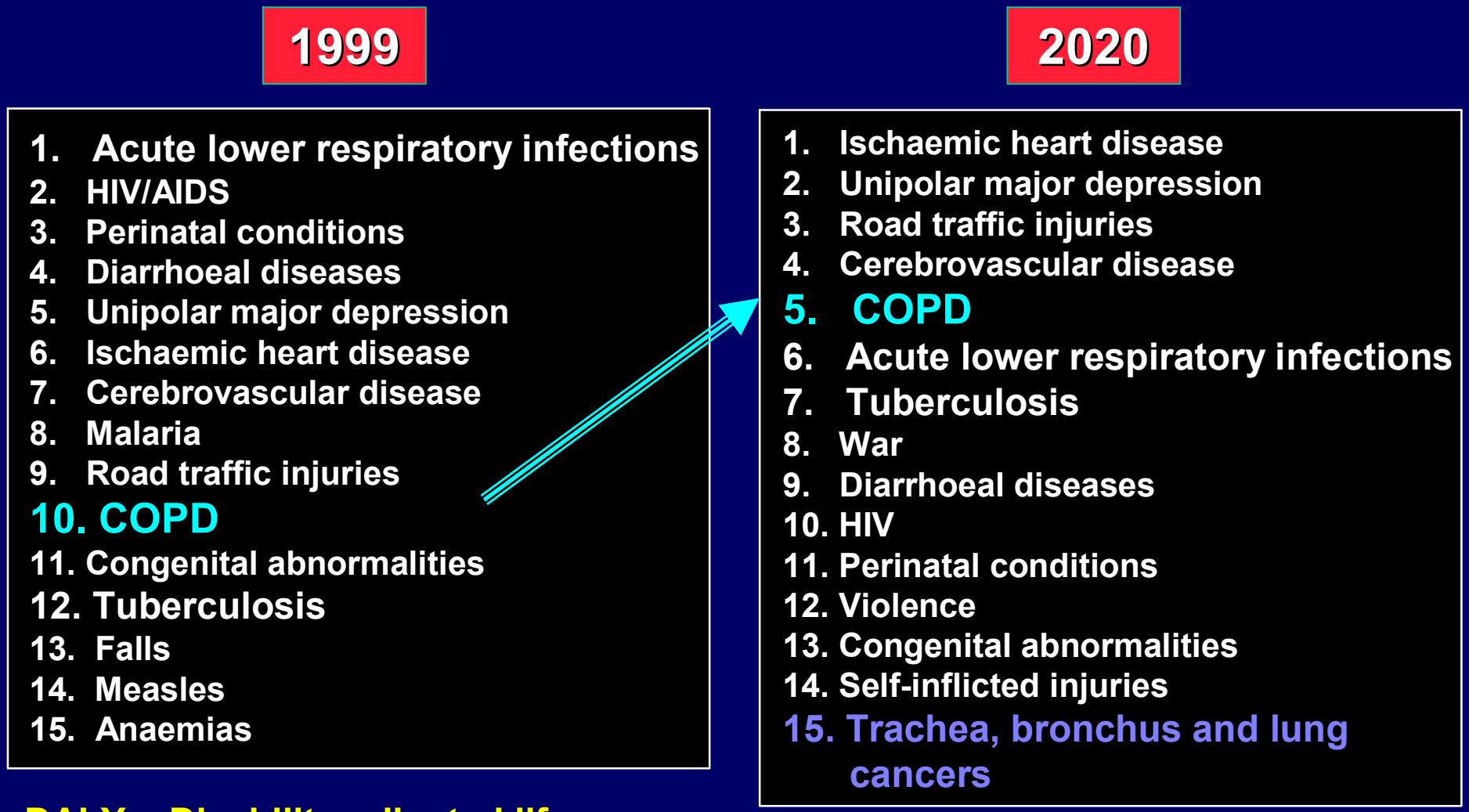
Images courtesy of Denis O'Donnell, Queen's University, Kingston, Canada

Leading causes of death

	1990		2020
Ischemic heart disease	1	→	1
Cerebrovascular disease	2	→	2
COPD	6	→	3
Lower respiratory infection	3	→	4
Lung cancer	10	→	5
Road traffic accidents	9	→	6
Tuberculosis	7	→	7
Stomach cancer	14	→	8

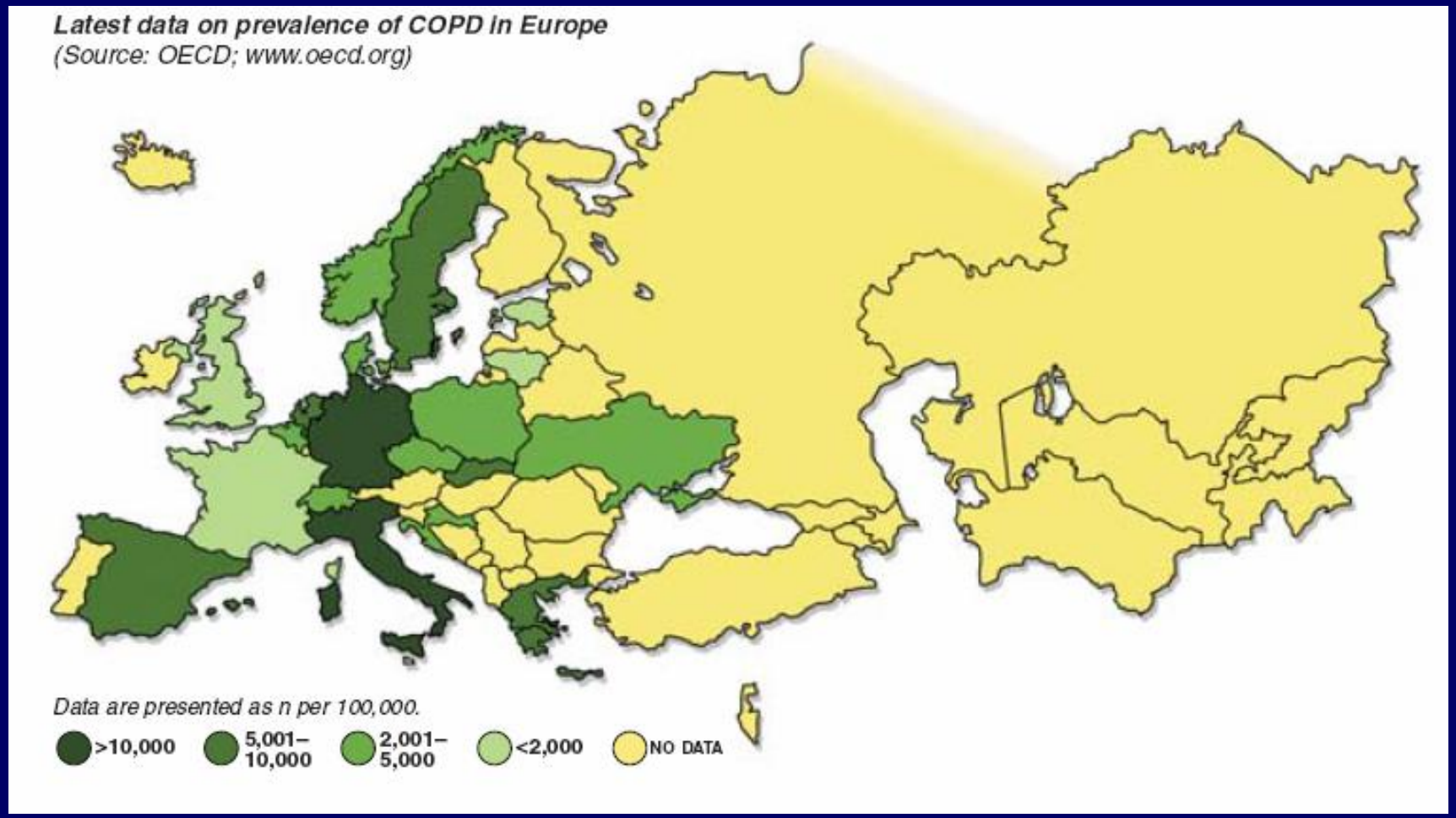
WHO Global Burden of Disease study

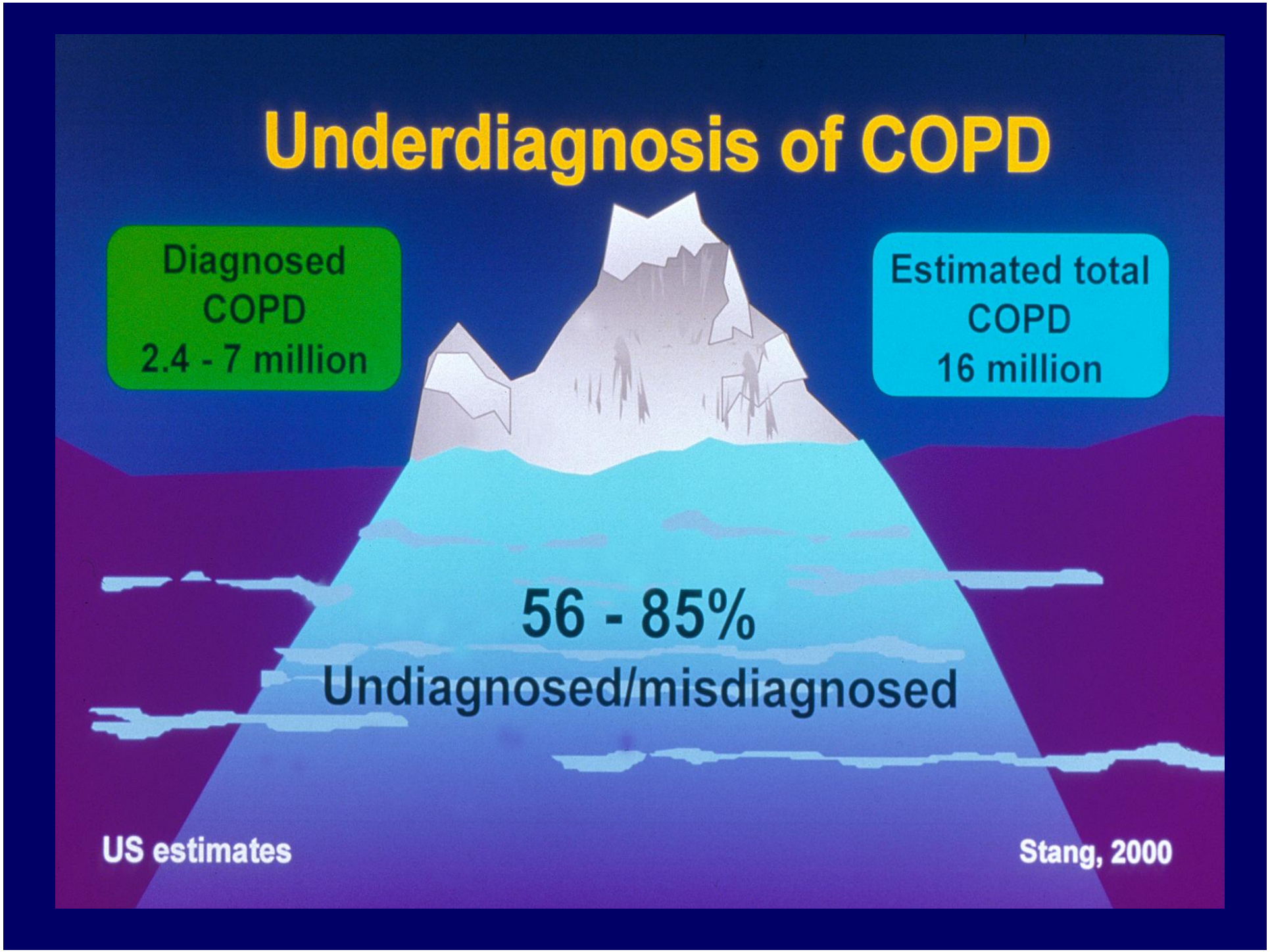
Increasing burden of diseases and Injuries: change in rank order of DALYs



DALY = Disability-adjusted life year

Source: WHO
Evidence, Information and Policy, 2000

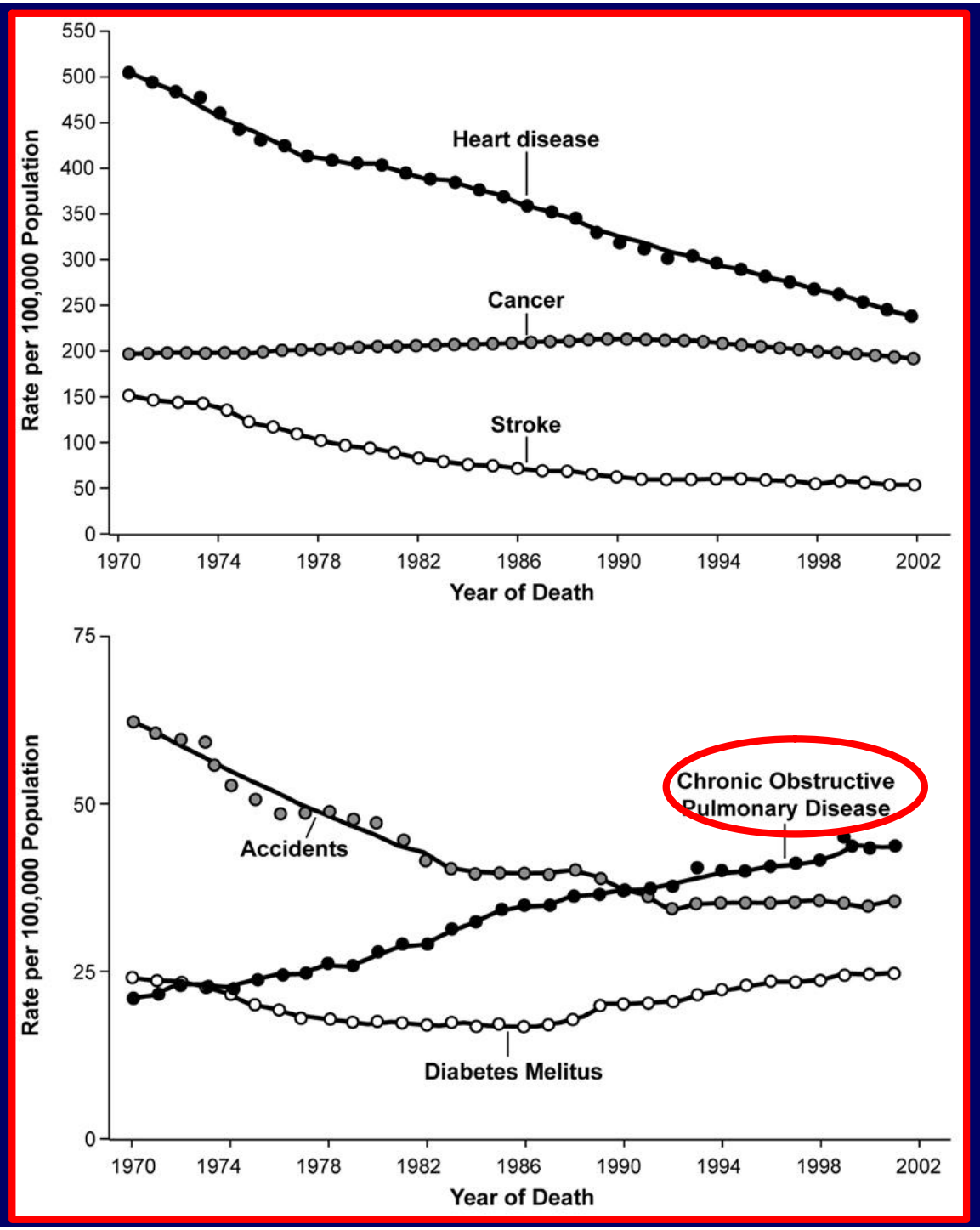

Latest data on prevalence of COPD in Europe
(Source: OECD; www.oecd.org)
Data are presented as n per 100,000.
>10,000
5,001–10,000
2,001–5,000
<2,000
NO DATA


Underdiagnosis of COPD
Diagnosed COPD 2.4 - 7 million
Estimated total COPD 16 million
56 - 85%
Undiagnosed/misdiagnosed
US estimates
Stang, 2000

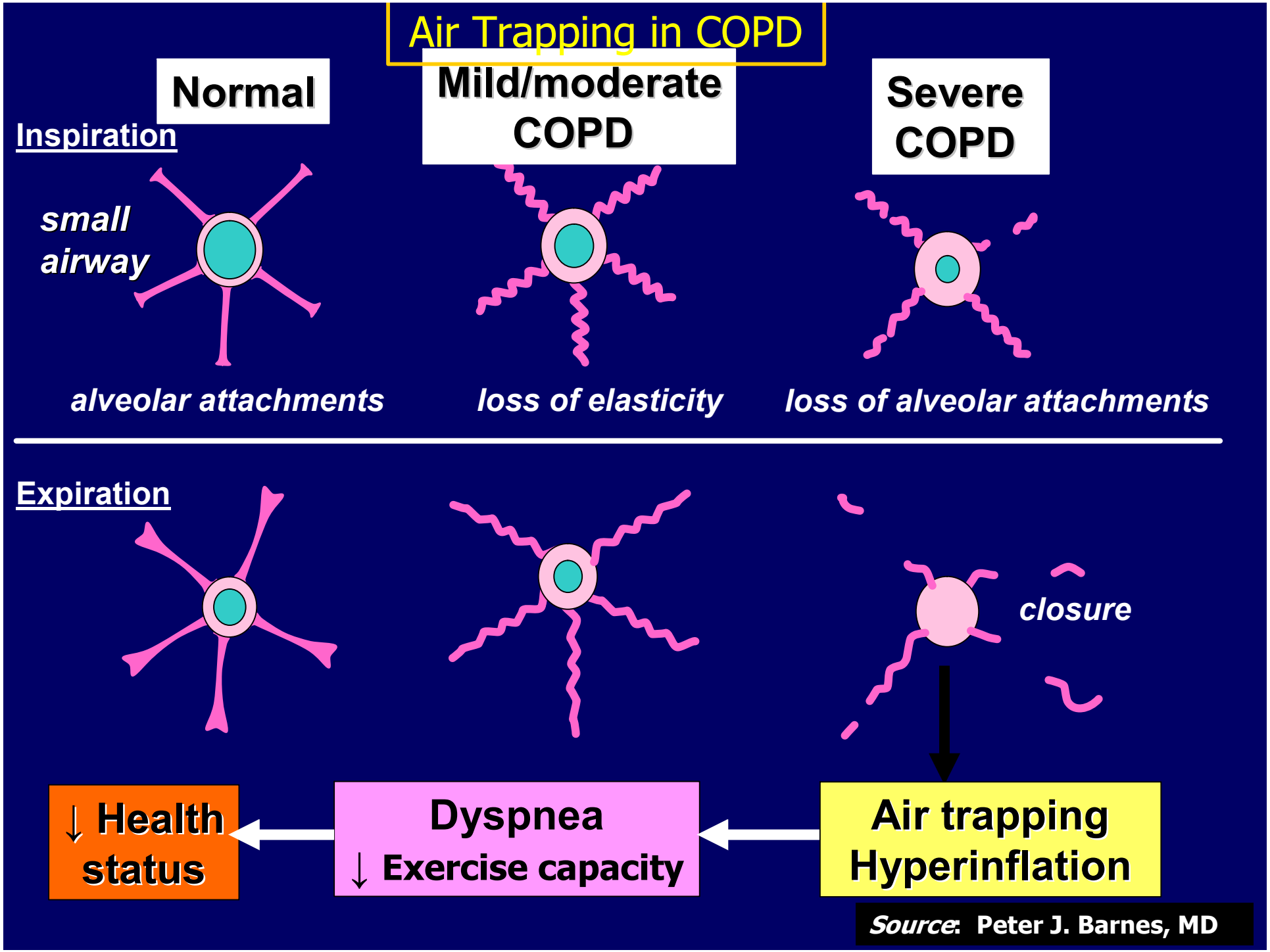
Burden of COPD: Key Points

- COPD is a leading cause of morbidity and mortality worldwide and results in an economic and social burden that is both substantial and increasing.
- COPD prevalence, morbidity, and mortality vary across countries and across different groups within countries.
- The burden of COPD is projected to increase in the coming decades due to continued exposure to COPD risk factors and the changing age

Of the six leading causes of death in the United States, only COPD has been increasing steadily since 1970



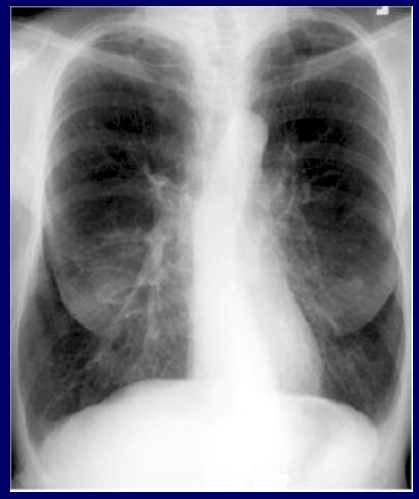
Source: Jemal A. et al. *JAMA* 2005


Air Trapping in COPD
Normal
Mild/moderate COPD
Severe COPD
Inspiration
small airway
alveolar attachments
loss of elasticity
loss of alveolar attachments
Expiration
closure
↓ Health status
Dyspnea
↓ Exercise capacity
Air trapping
Hyperinflation
Source: Peter J. Barnes, MD

Air Trapping

- Occurs in all patients with COPD
- Results in an increase in the work of breathing
- Places respiratory muscles at a mechanical disadvantage
- Contributes to the sensation of breathlessness

Normal



Hyperinflation

Images courtesy of Denis O'Donnell, Queen's University, Kingston, Canada

Impact of air trapping (hyperinflation)

Airway obstruction

Air trapping

Hyperinflation

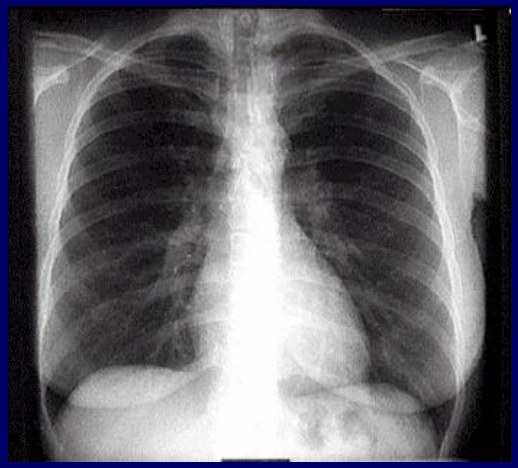
Dyspnoea

Deconditioning

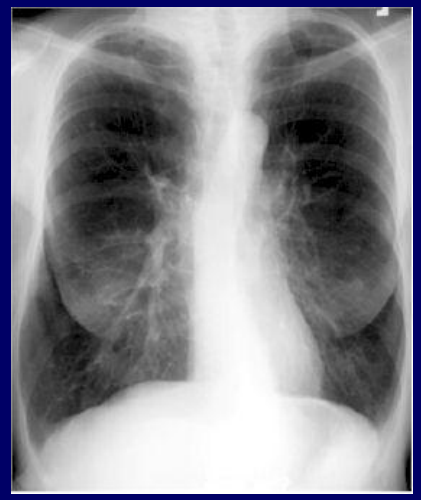
Reduced activity

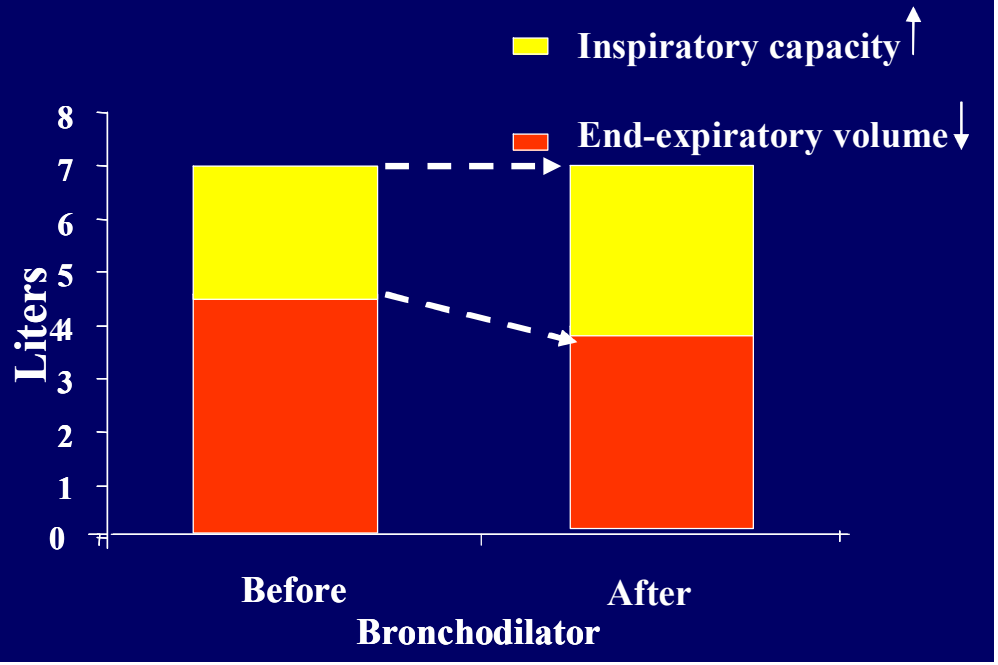
Poor health-related quality of life

Normal



Hyperinflation





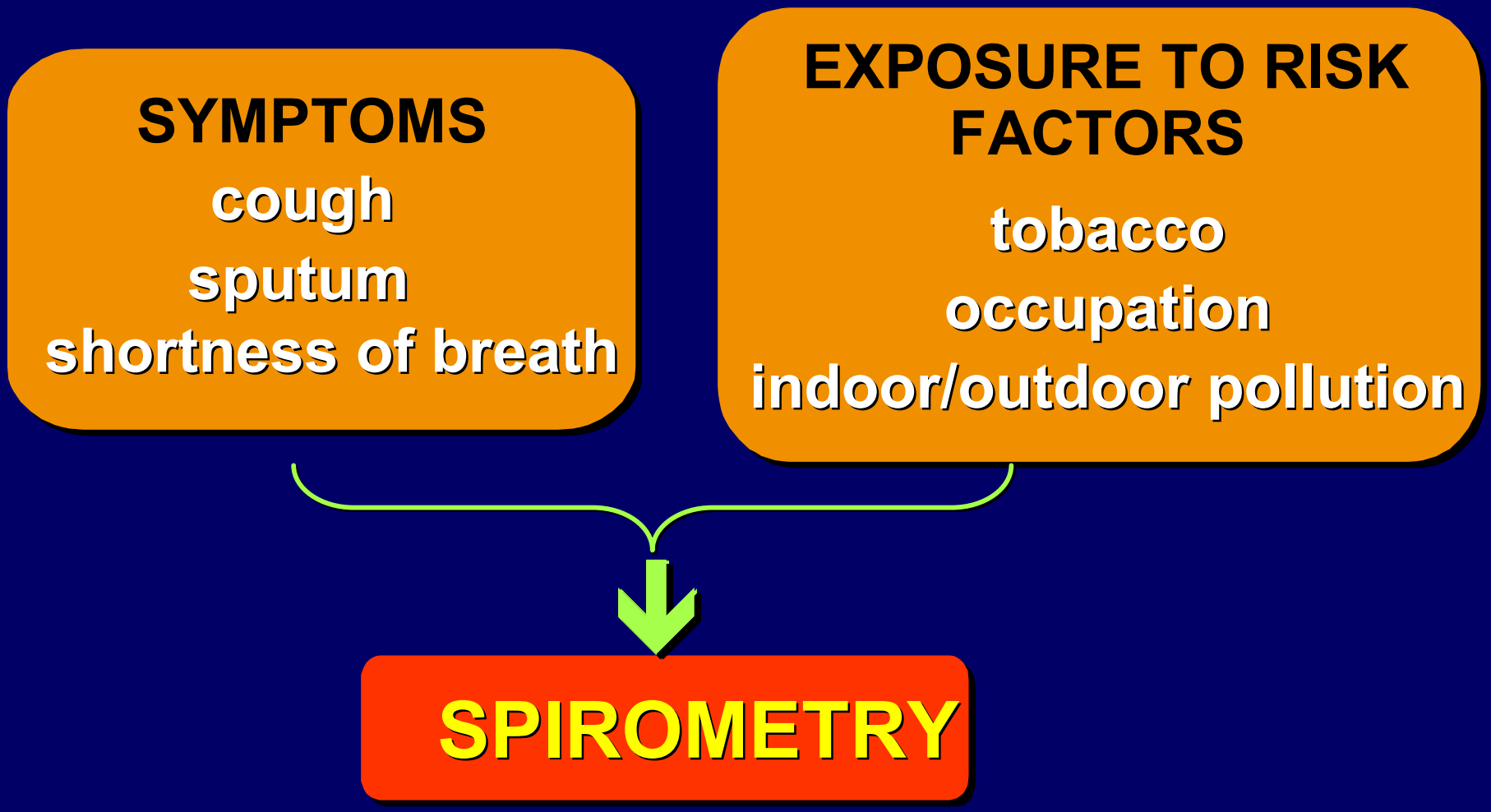
Air Trapping

- Occurs in all patients with COPD
- Results in an increase in the work of breathing
- Places respiratory muscles at a mechanical disadvantage
- Contributes to the sensation of breathlessness

Normal

Hyperinflation

Diagnosis of COPD



Definition of COPD

- COPD is a preventable and treatable disease. Its lung component is characterized by airflow limitation (or obstruction to the flow of air)that is not fully reversible.
- The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases.
- COPD has significant extra-pulmonary effects that may contribute to the severity in individual patients.

Standards for the diagnosis and treatment of patients with COPD : a summary of the ATS/ERS position paper

Diagnosis

The diagnosis of COPD should be considered in any patient who has the following: symptoms of cough; sputum production; or dyspnoea; or history of exposure to risk factors for the disease.

The diagnosis requires spirometry;

a post-bronchodilator forced expiratory volume in one second (FEV1)/forced vital capacity (FVC) ≤0.7 confirms the presence of airflow limitation that is not fully reversible.

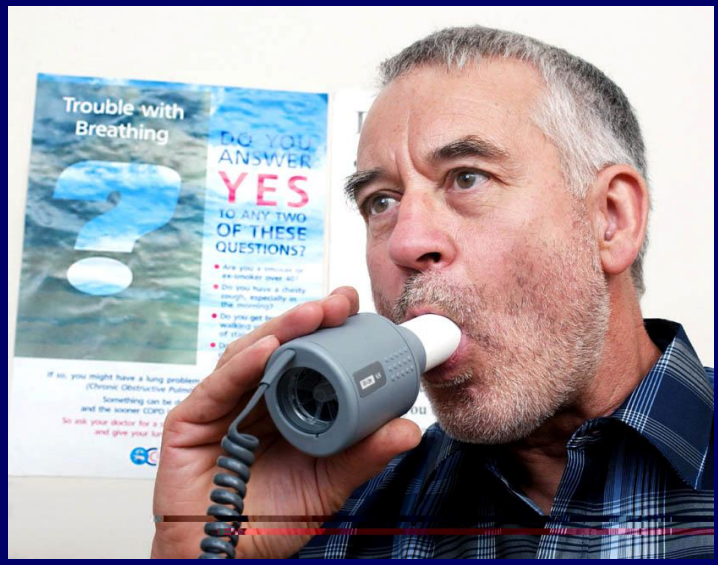
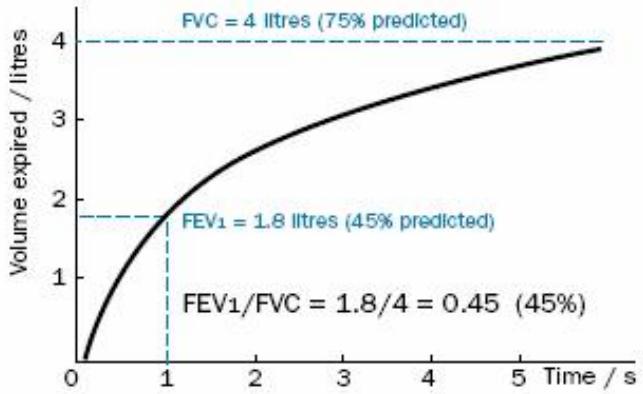
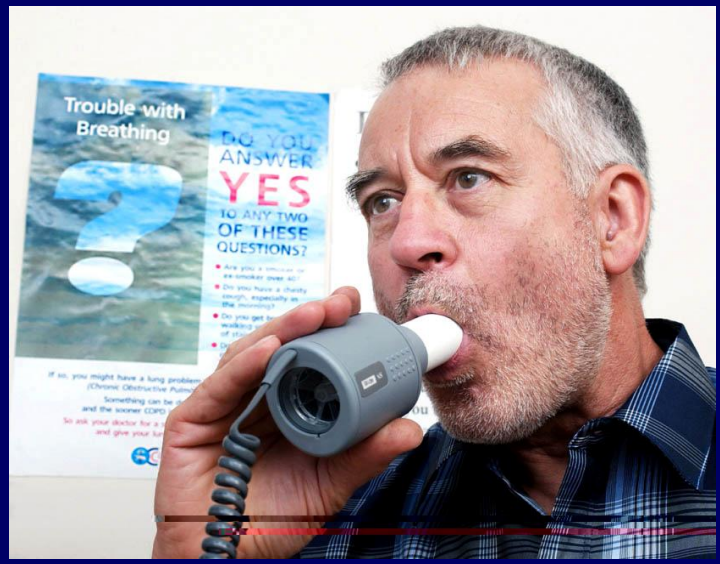


Figure 9a. Spirometry tracing of a patient with COPD – an *obstructive* picture



NICE recommendations: Diagnosis (2)

- If a diagnosis of COPD seems likely, perform spirometry
  - A diagnosis of airflow obstruction can be made if:
    - **$FEV_1/FVC < 0.7$**
    - **FEV_1 < 80% predicted**

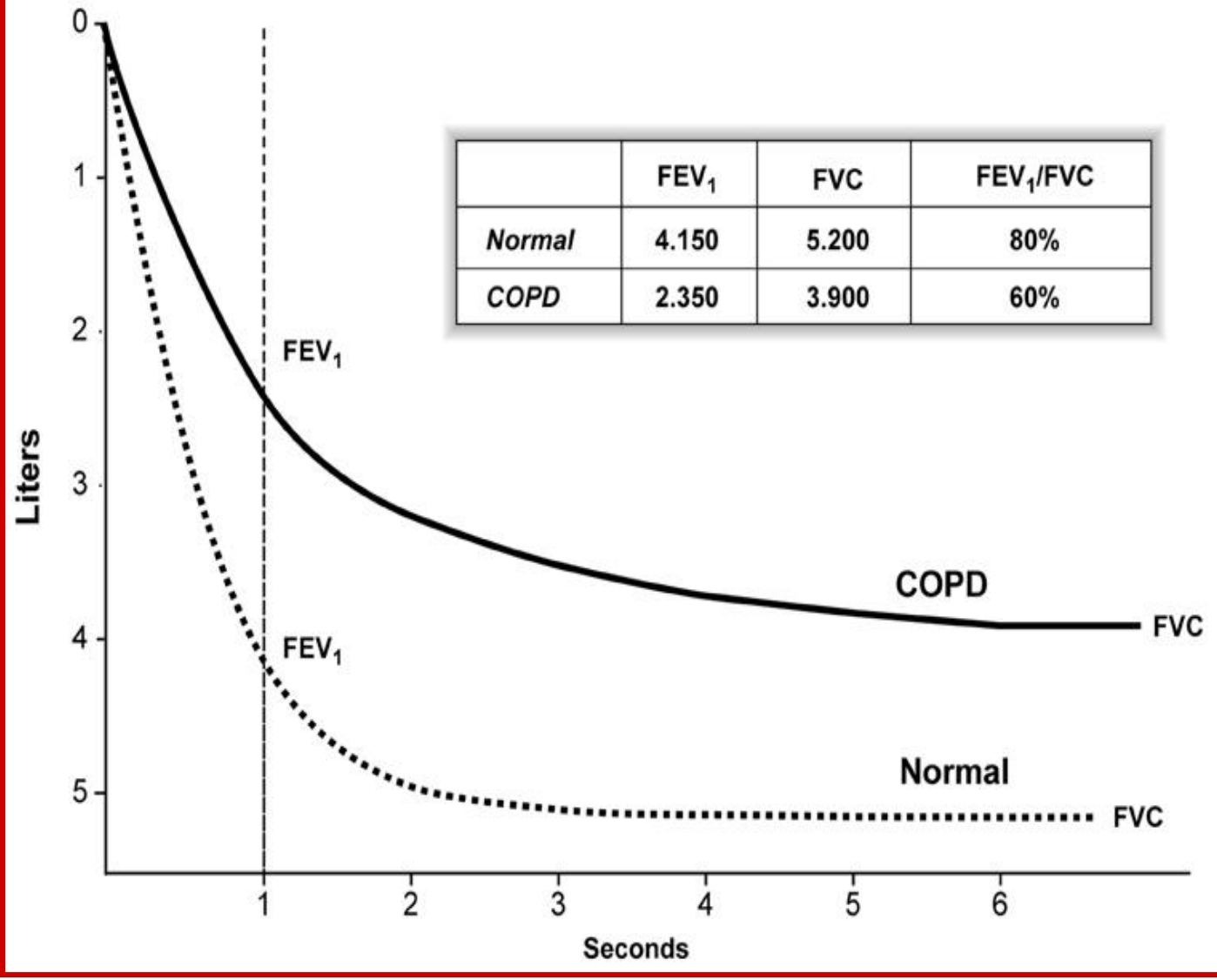


Diagnosis can be made on patients' symptoms and be confirmed with spirometry

Chronic Obstructive Pulmonary Disease. National clinical guidelines on management of chronic obstructive pulmonary disease in adults in primary and secondary care. Thorax March 2004; 59 (suppl 1)

Spirometry: Normal and Patients with COPD

	FEV_1	FVC	FEV_1/FVC
Normal	4.150	5.200	80%
COPD	2.350	3.900	60%



COPD and Co-Morbidities

COPD patients are at increased risk for:

- Myocardial infarction, angina
- Osteoporosis
- Respiratory infection
- Depression
- Diabetes
- Lung cancer