

# Lung Damage from Smoking COPD

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# Declarations

No conflicts of interest

I work for Queensland Health

Gold Coast University Hospital

# Outline

- 1) COPD introduction and epidemiology
- 2) Pathophysiology of COPD
- 3) Natural history and risk factors
- 4) Clinical features and differential diagnosis
- 5) Diagnosis and imaging
- 6) Complications
- 7) Reducing risk
- 8) Pharmacotherapy – some pearls
- 9) Non pharmacotherapy

# COPD

## COPD

- Persistent airflow obstruction, not reversible
- Diagnosed with spirometry
- Preventable, treatable, progressive

## COPD

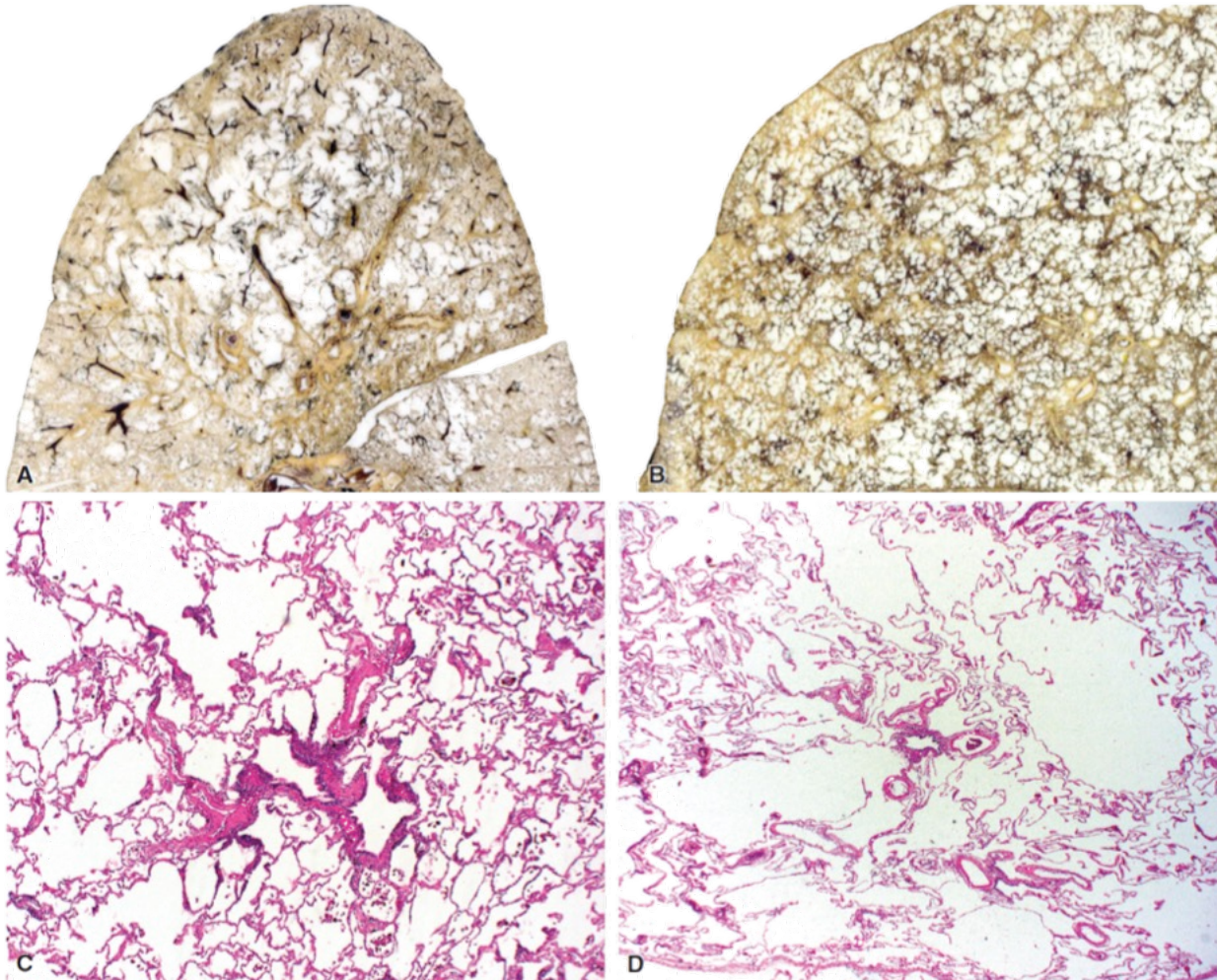
- Effects 9-14% over 40
- 5<sup>th</sup> greatest contributor to burden of disease
- 6<sup>th</sup> most common cause of death
- Costs 8.8 billion annually
- Smoking is the most important risk factor

Much can be done to improve quality of life, exercise capacity and reduce morbidity and mortality

# COPD pathogenesis

- Persistent airflow limitation
- Chronic abnormal enhanced inflammatory response in the lungs
- Can't predict who will develop COPD
- Disease of phenotypes
  - Chronic bronchitis
  - Bronchiolitis
  - Emphysema

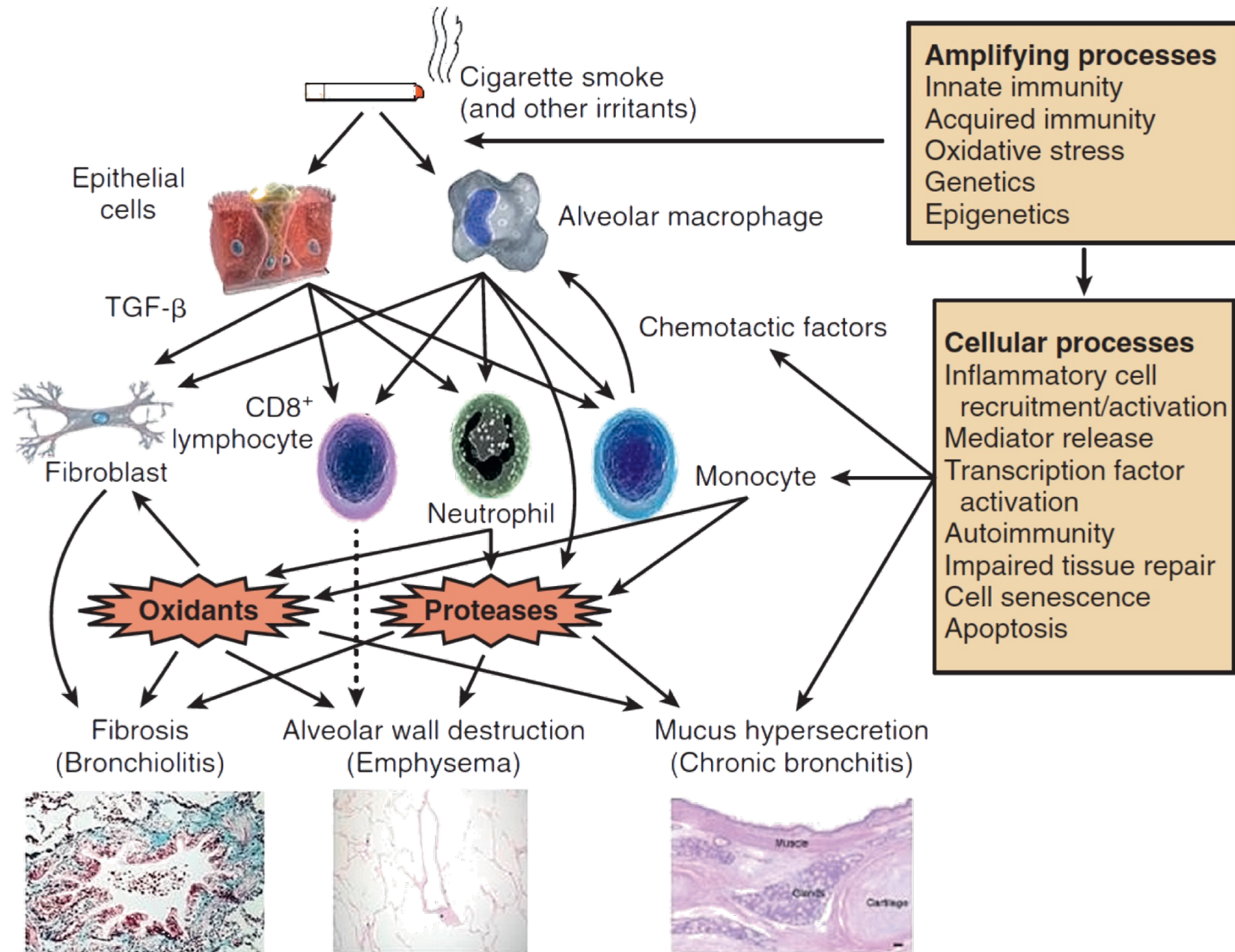
# COPD pathogenesis



Mucus hypersecretion, reduced mucociliary clearance, and increased permeability of the airspace epithelial barrier defines **chronic bronchitis**

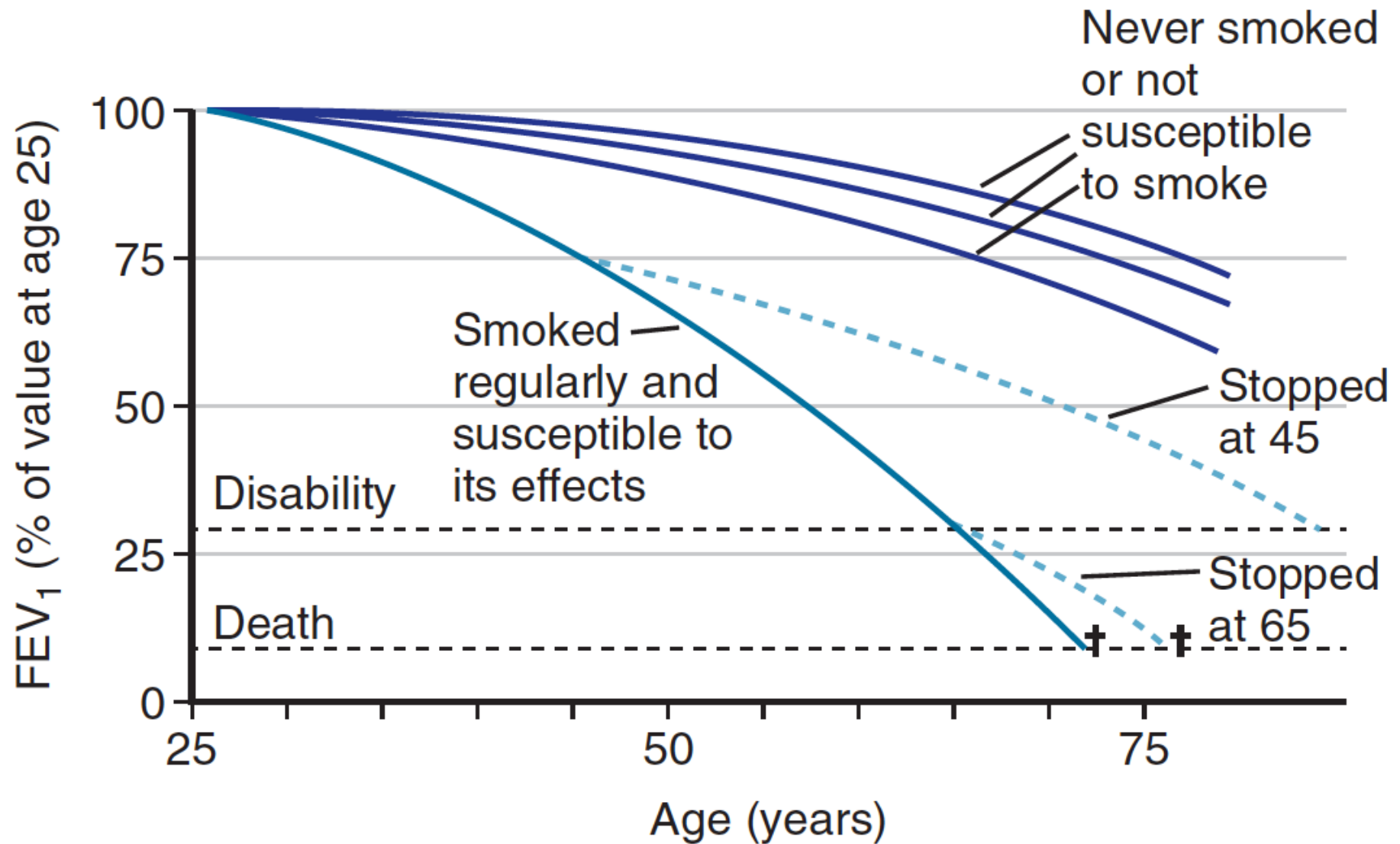
Permanent enlargement of airspaces distal to the terminal bronchioles defines **emphysema**

# Pathogenesis



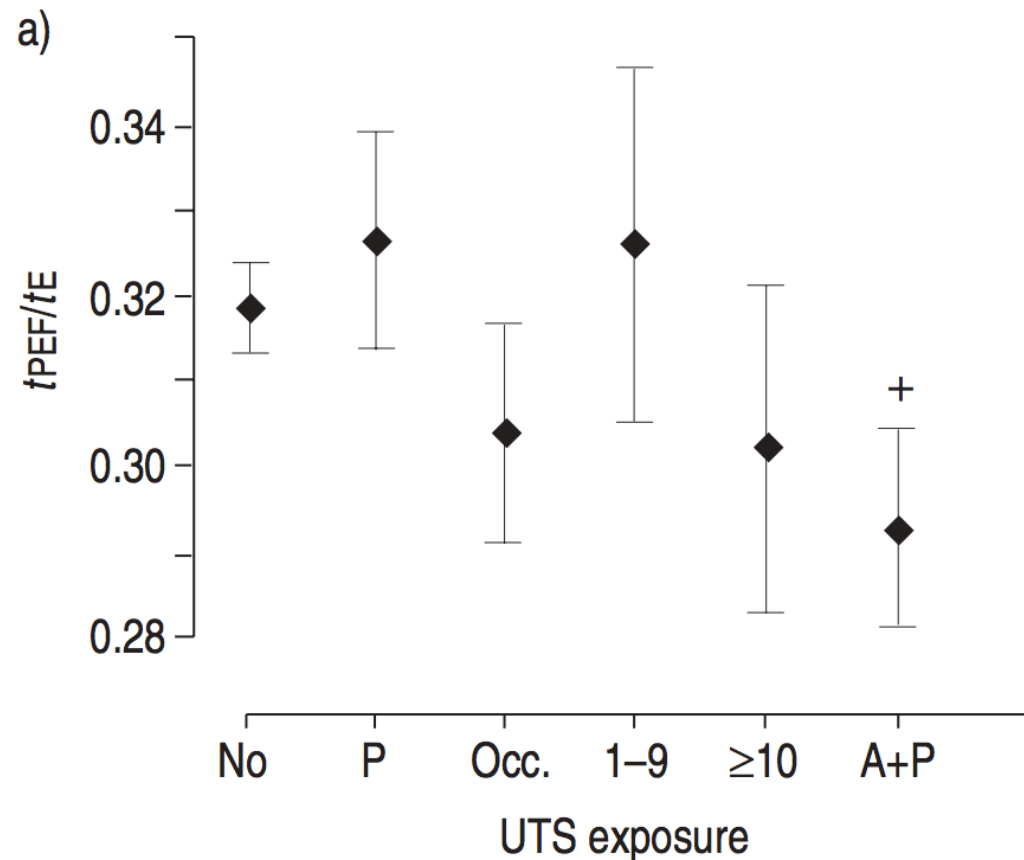


# Natural history





# Risk factors



Smoking  
reduces lung  
growth and  
development  
in utero

There is no  
difference  
between filters  
/ non filtered  
and marijuana

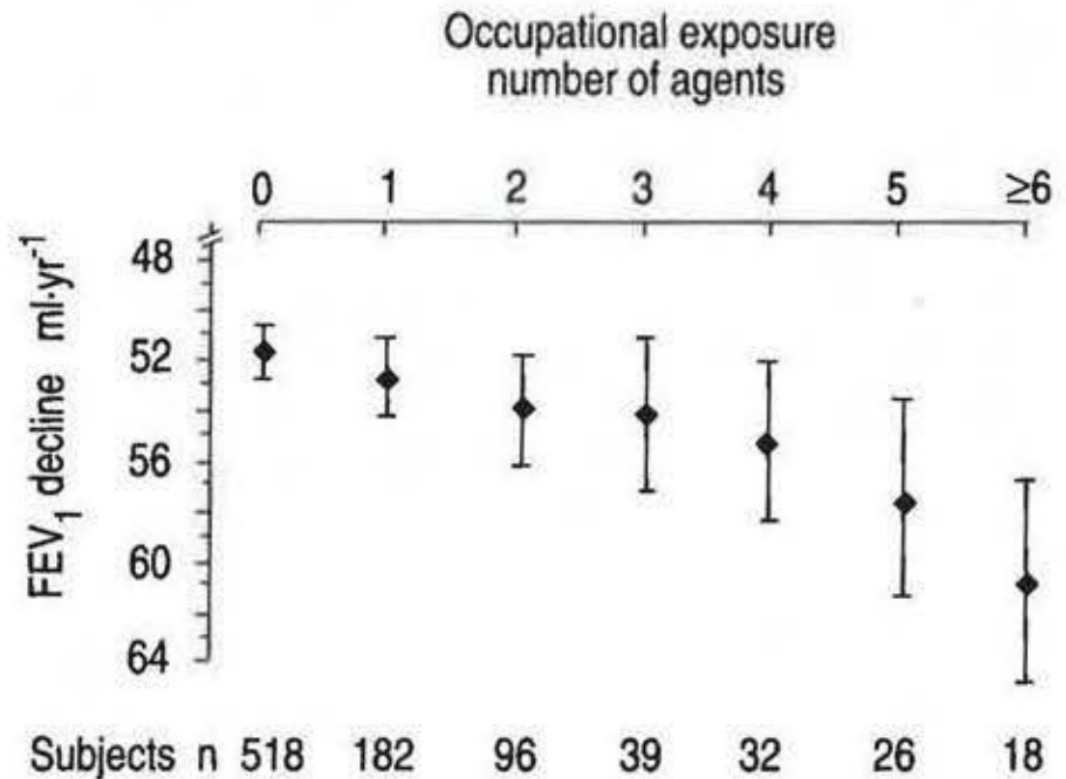
# Risk factors

## Environmental

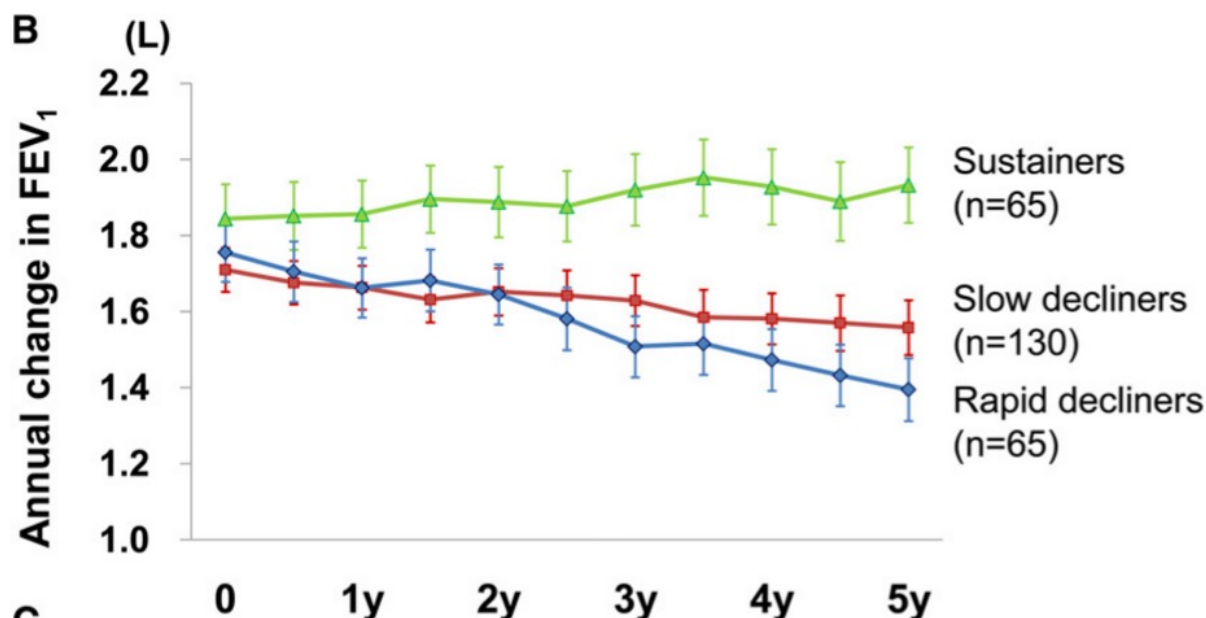
- Smoking
- Biomass fuel
- Occupational
- Outdoor air pollution

## Individual

- Genetics
- Asthma and airway hyper-reactivity
- Recurrent infections



# Severity, activity and impact of COPD

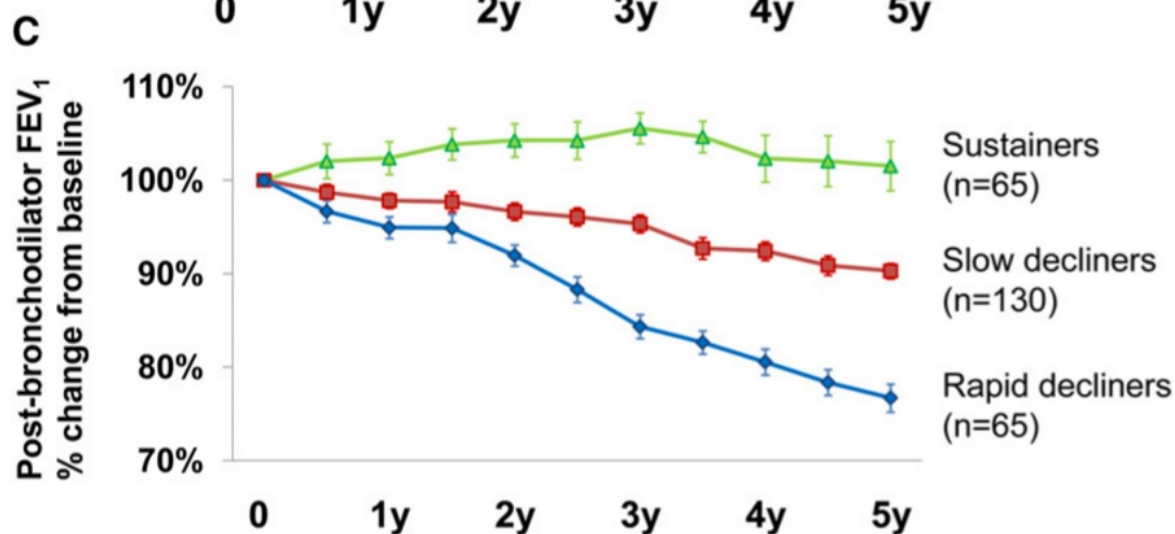


'extent of functional impairment of the target organ'

COPD is a heterogeneous disease

COPD activity

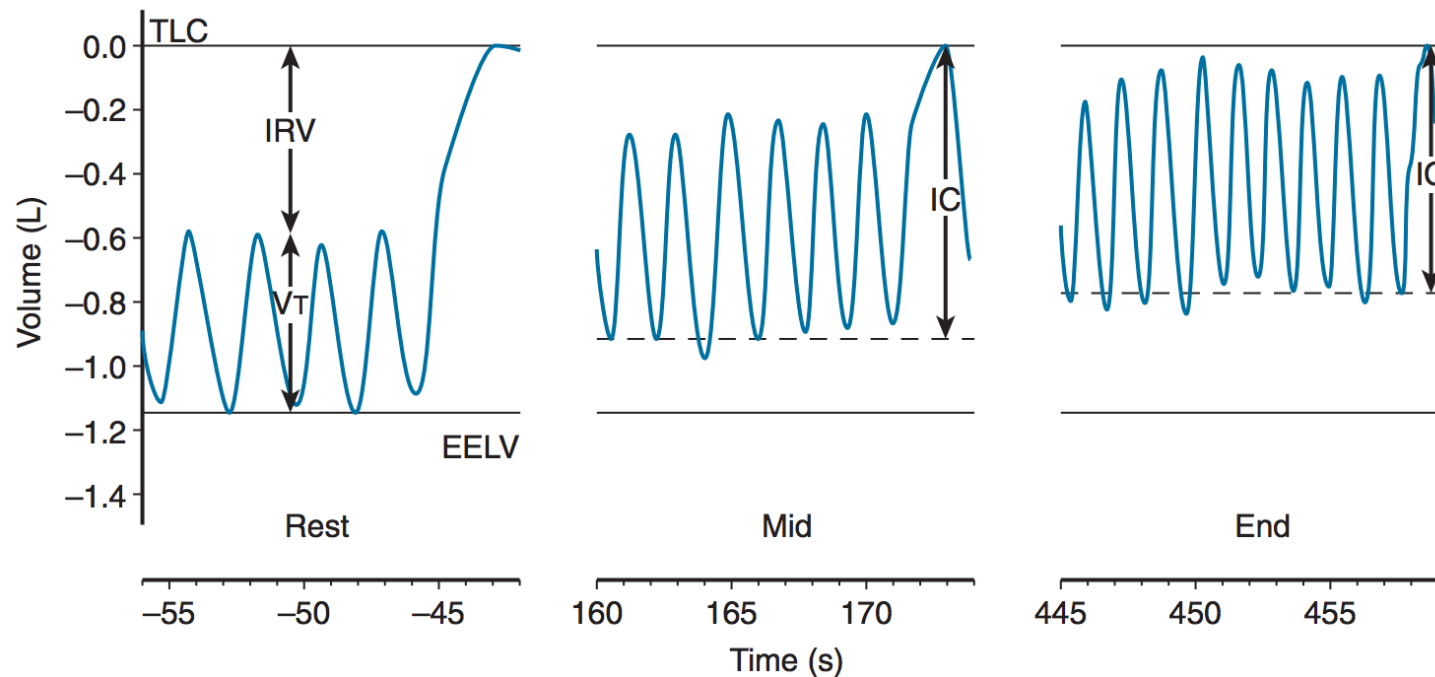
1. Clinical
2. Imaging
3. Biomarkers



Possible phenotypes

1. Disproportionate dyspnea
2. Persistent inflammation
3. Chronic bronchitis
4. Bacterial colonization
5. Emphysema / hyperinflation
6. Pulmonary hypertension

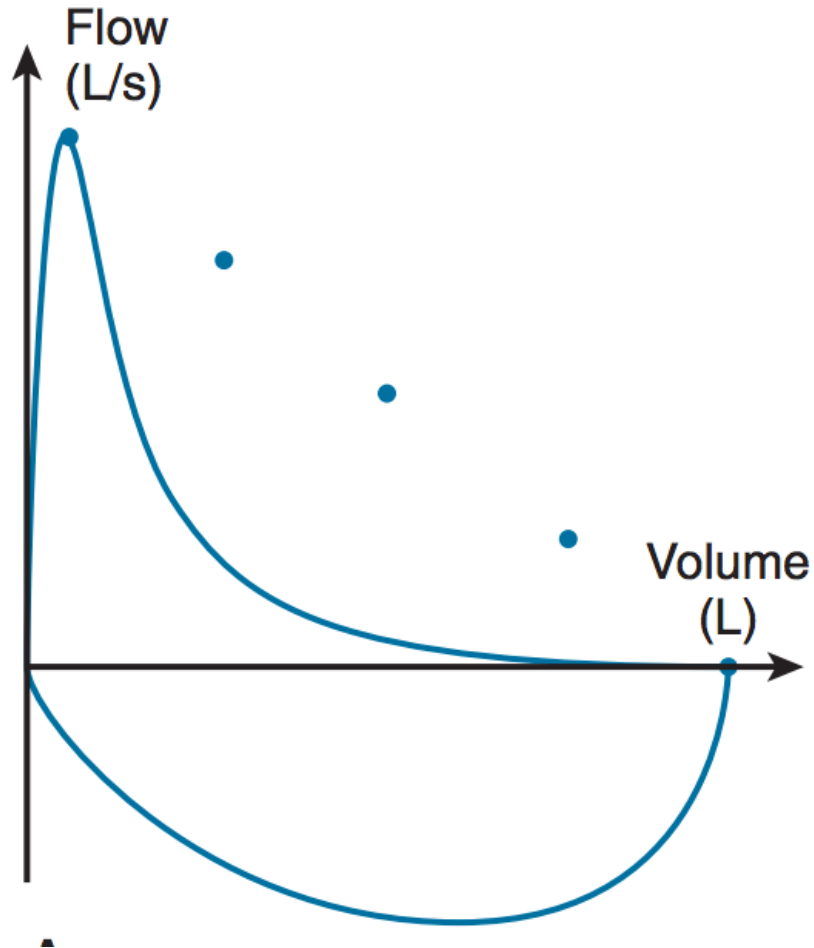
# Clinical features



**Symptoms** – dyspnea, cough, sputum, night-time symptoms

**Signs** – wheeze, hyperinflation, cor-pulmonale

# Pulmonary function testing and diagnosis



Reduced FEV<sub>1</sub>/FVC

Increased TLV and RV

Reduced gas diffusion

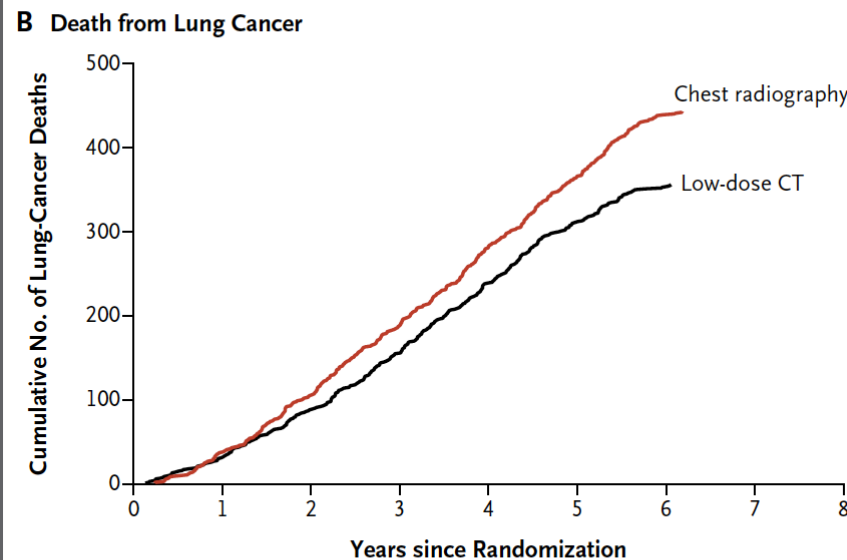
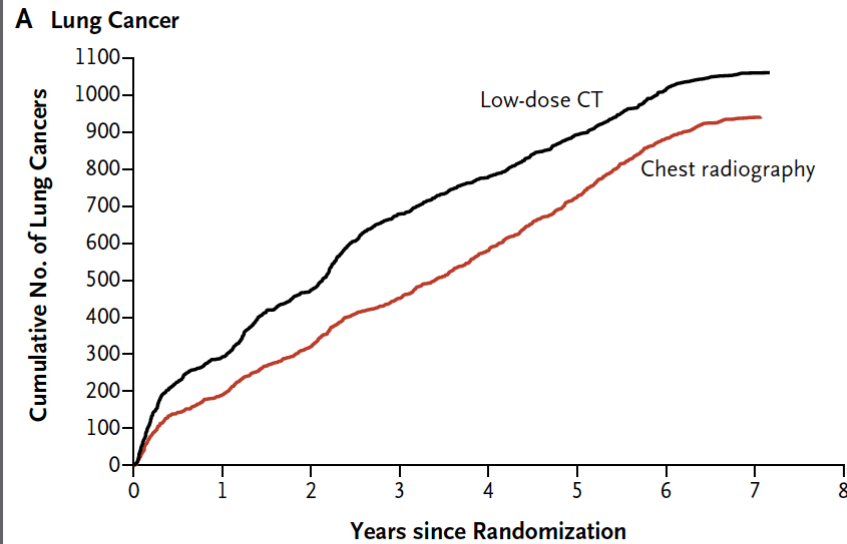
6MWD

# Imaging

CXR – radiolucency, diaphragmatic flattening, increased retrosternal airspace

CT – assessment of emphysema, bronchiectasis, evaluation of haemoptysis

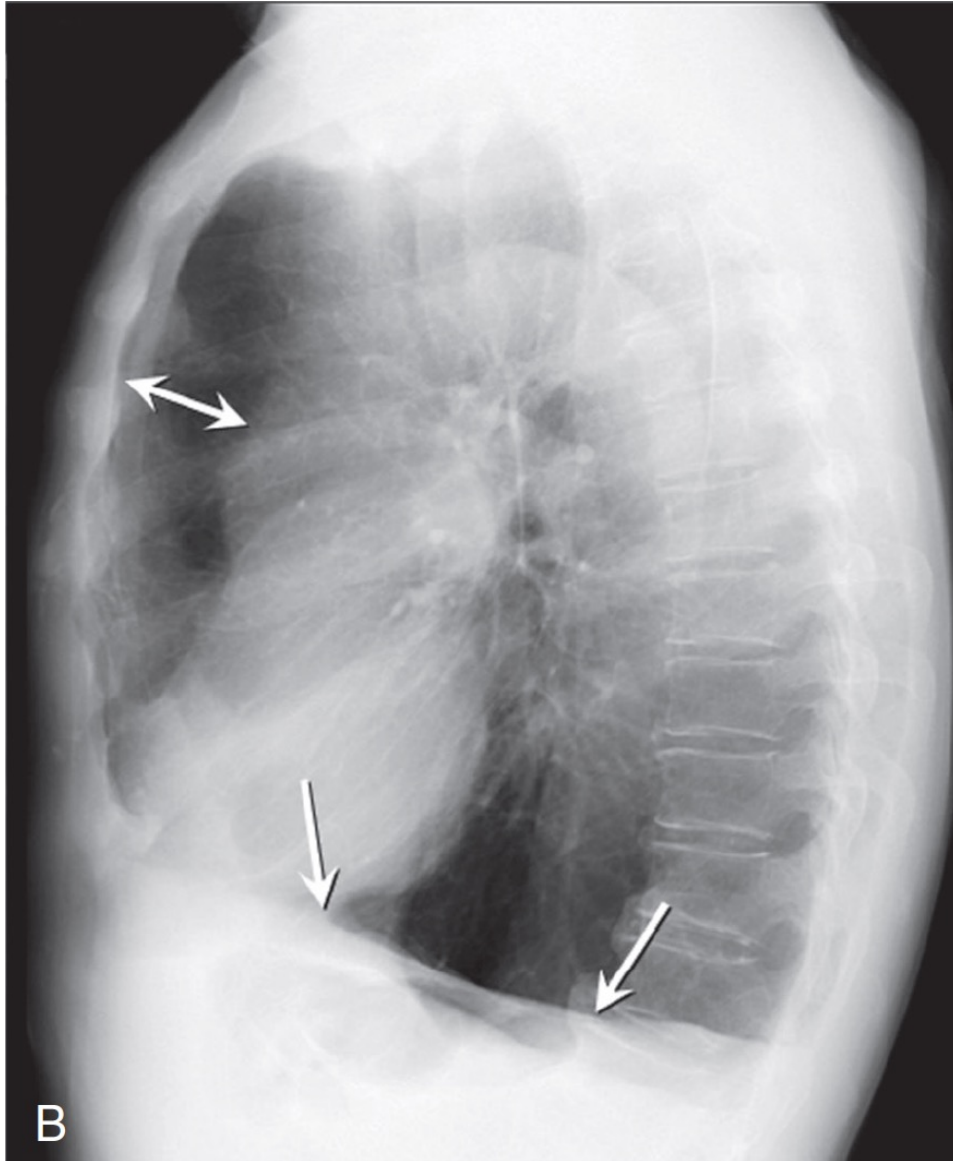
## Screening



**Figure 1. Cumulative Numbers of Lung Cancers and of Deaths from Lung Cancer.**

The number of lung cancers (Panel A) includes lung cancers that were diagnosed from the date of randomization through December 31, 2009. The number of deaths from lung cancer (Panel B) includes deaths that occurred from the date of randomization through January 15, 2009.

# Laboratory testing



ABG – hypoxaemia,  
hypercapnia

FBC– secondary  
erythrocytosis

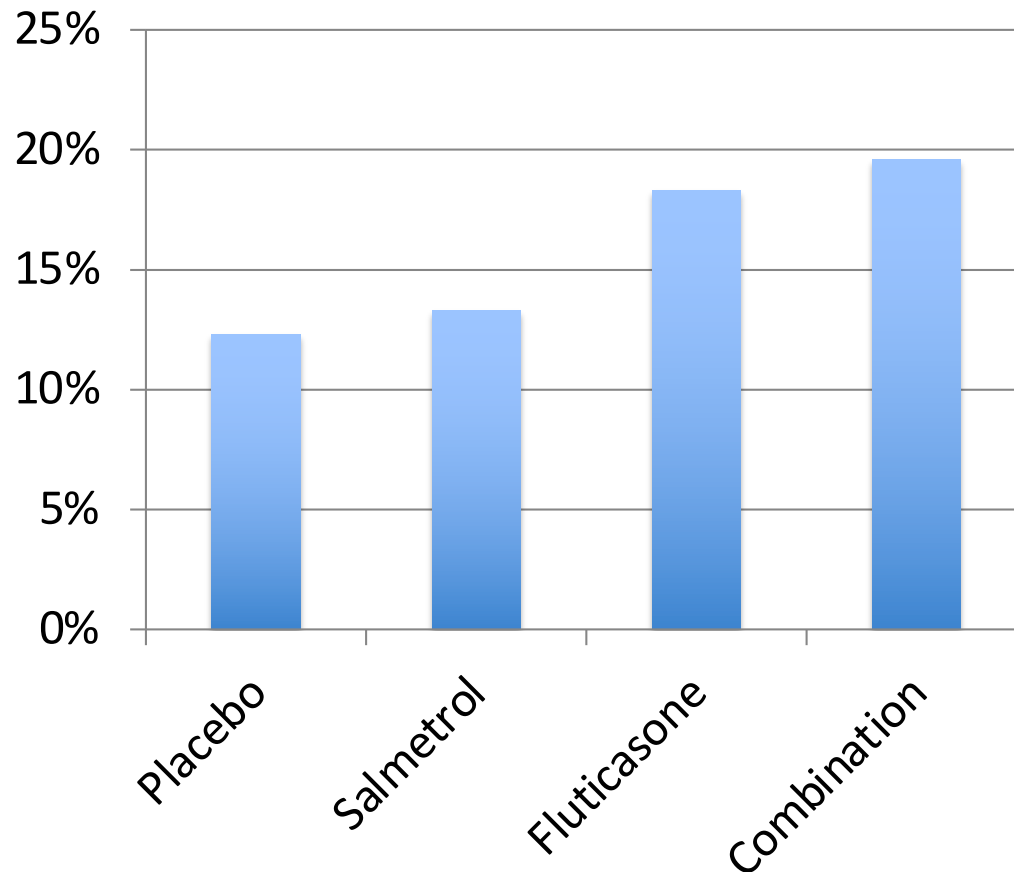
Alpha 1 anti-trypsin

Sputum



# Complications

**Pneumonia % of patients**



Pneumothoraces

Lung cancer

Pneumonia

Cor-pulmonale

Sleep difficulties

Systemic manifestations and comorbidities

– heart disease, diabetes, reflux, osteoporosis and depression

- Theophylline, prednisolone and beta-agonists worsen GORD

# Differential diagnosis

- Chronic obstructive asthma
- Chronic bronchitis without airflow obstruction
- Bronchiectasis
- Diffuse pan-bronchiolitis
- Lymphangioleiomyomatosis

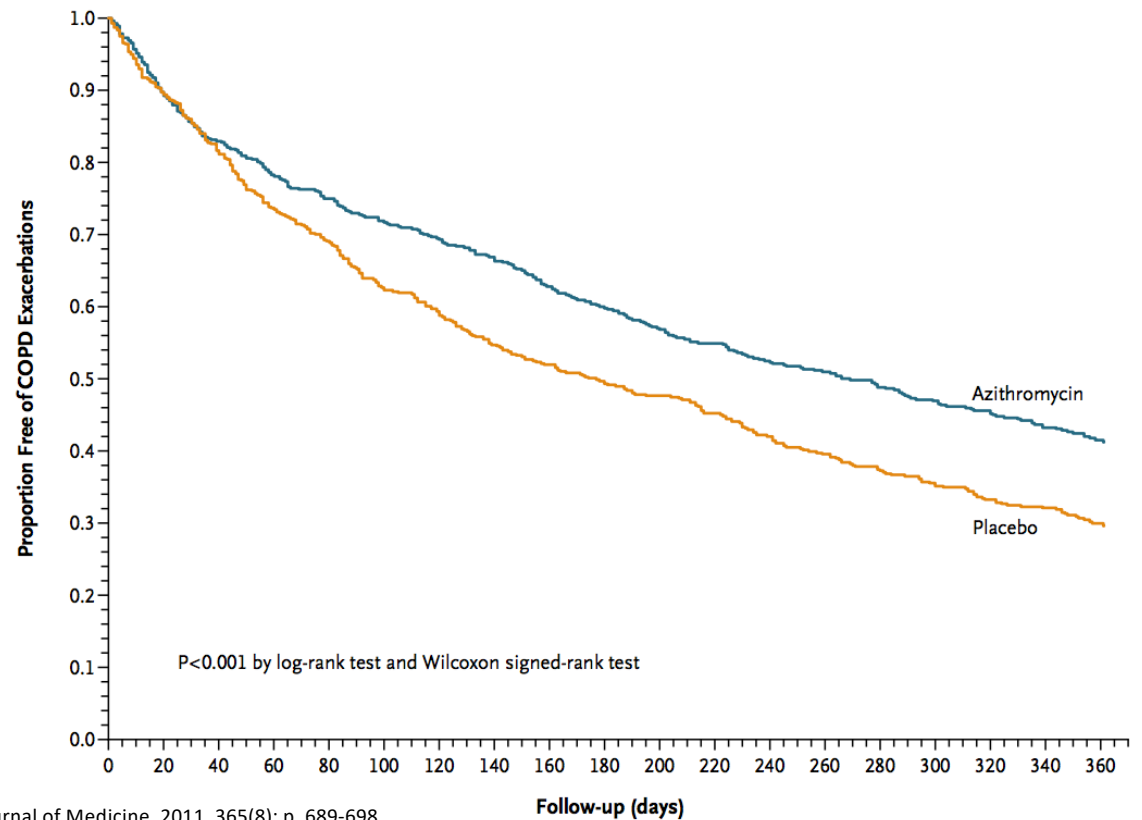
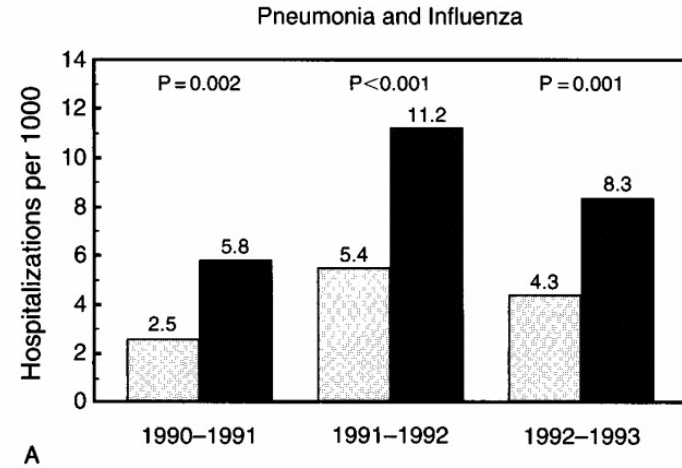
# Reducing risk

Prevention

Smoking  
cessation

Immunisations

Antibiotic  
prophylaxis



Albert, R.K., et al., *Azithromycin for prevention of exacerbations of COPD*. New England Journal of Medicine, 2011. 365(8): p. 689-698

Nichol, K.L., et al., *The efficacy and cost effectiveness of vaccination against influenza among elderly persons living in the community*. New England Journal of Medicine, 1994. 331(12): p. 778-784.

# Pharmacotherapy

## Stepwise Management of Stable COPD

	MILD	MODERATE	SEVERE
<b>Typical Symptoms</b>	<ul style="list-style-type: none"> <li>few symptoms</li> <li>breathless on moderate exertion</li> <li>recurrent chest infections</li> <li>little or no effect on daily activities</li> </ul>	<ul style="list-style-type: none"> <li>increasing dyspnoea</li> <li>breathless walking on level ground</li> <li>increasing limitation of daily activities</li> <li>cough and sputum production</li> <li>exacerbations requiring oral corticosteroids and/or antibiotics</li> </ul>	<ul style="list-style-type: none"> <li>dyspnoea on minimal exertion</li> <li>daily activities severely curtailed</li> <li>experiencing regular sputum production</li> <li>chronic cough</li> <li>exacerbations of increasing frequency and severity</li> </ul>
<b>Lung Function</b>	FEV <sub>1</sub> ≈ 60-80% predicted	FEV <sub>1</sub> ≈ 40 -59% predicted	FEV <sub>1</sub> < 40% predicted
<b>Non-Pharmacological Interventions</b>  Management of stable COPD should centre around supporting smoking patients to quit. Encouraging physical activity and maintenance of a normal weight range are also important. Pulmonary rehabilitation is recommended in symptomatic patients.	<b>RISK REDUCTION</b> Check smoking status, support smoking cessation, recommend annual influenza and pneumococcal vaccine according to immunisation handbook		
	<b>OPTIMISE FUNCTION</b> Encourage physical activity, review nutrition, provide education, develop GP management plan and initiate regular review		
	<b>CONSIDER CO-MORBIDITIES</b> especially osteoporosis, coronary disease, lung cancer, anxiety and depression		
	<b>REFER TO PULMONARY REHABILITATION</b> and consider psychosocial needs, agree written action plan		
			Consider oxygen therapy, surgery, palliative care and advanced care directives
<b>Pharmacological Interventions</b>  The aim of pharmacological treatment may be to treat symptoms (e.g. breathlessness) or to prevent deterioration (either by decreasing exacerbations or by reducing decline in quality of life) or both. A stepwise approach is recommended, irrespective of disease severity, until adequate control has been achieved.	<b>CHECK DEVICE USAGE TECHNIQUE AND ADHERENCE AT EACH VISIT</b> - Up to 90% of patients don't use devices correctly		
	<b>SHORT-ACTING RELIEVER MEDICATION:</b> Short-acting beta <sub>2</sub> -agonist (SABA) or short-acting muscarinic antagonist (SAMA). Refer to Table 1 overleaf.		
	<b>SYMPTOM RELIEF:</b> Long-acting muscarinic antagonist (LAMA) and/or long-acting beta <sub>2</sub> -agonist (LABA). Refer to Table 1 overleaf. <b>These medicines may also help to prevent exacerbations. **SEE PRECAUTIONS<sup>1-3**</sup></b>		
		<b>EXACERBATION PREVENTION:</b> When FEV <sub>1</sub> <50% predicted AND 2 or more exacerbations in the previous 12 months, consider commencing inhaled corticosteroid (ICS)/LABA combination therapy. <b>**SEE PRECAUTIONS<sup>4**</sup></b>	
			Consider low dose theophylline

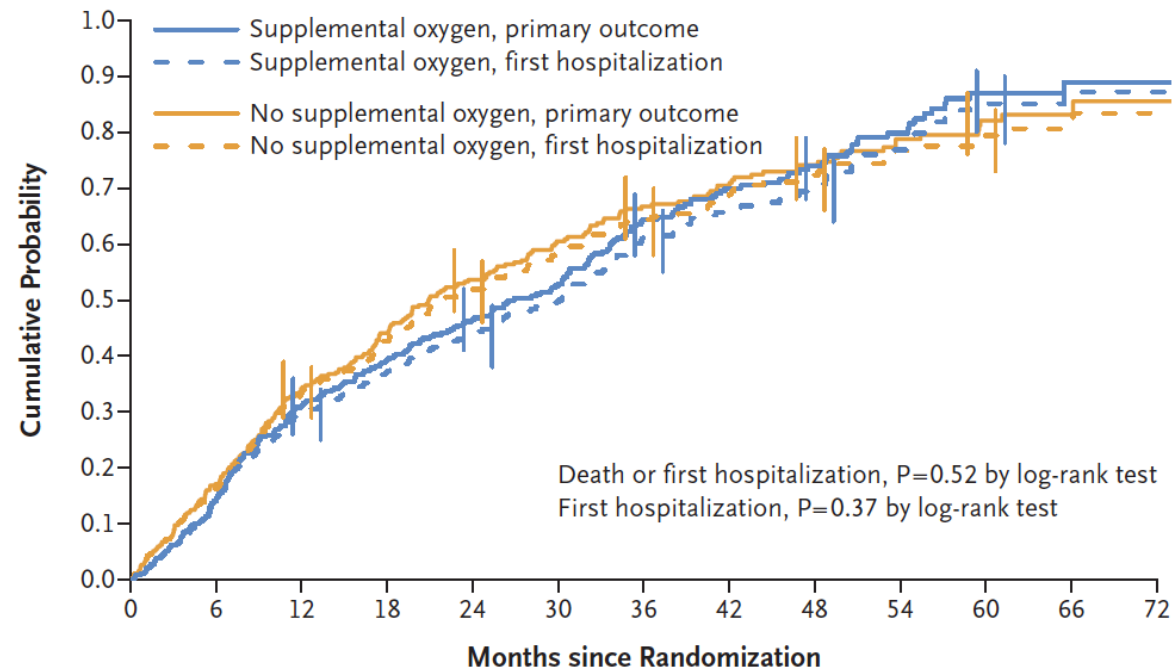
# Some pearls regarding pharmacotherapy

- When to use LAMA / LABA combination therapy?
  - COPD assessment tool
  - $CAT < 15$  = LAMA
  - $CAT > 15$  = LAMA / LABA combination therapy
- When to use an ICS?
  - Patients with elevated eosinophils and more than two exacerbations a year

# Non pharmacological treatment

- Sputum clearance
- Oxygen – a treatment for hypoxaemia not breathlessness!!
- Pulmonary rehabilitation

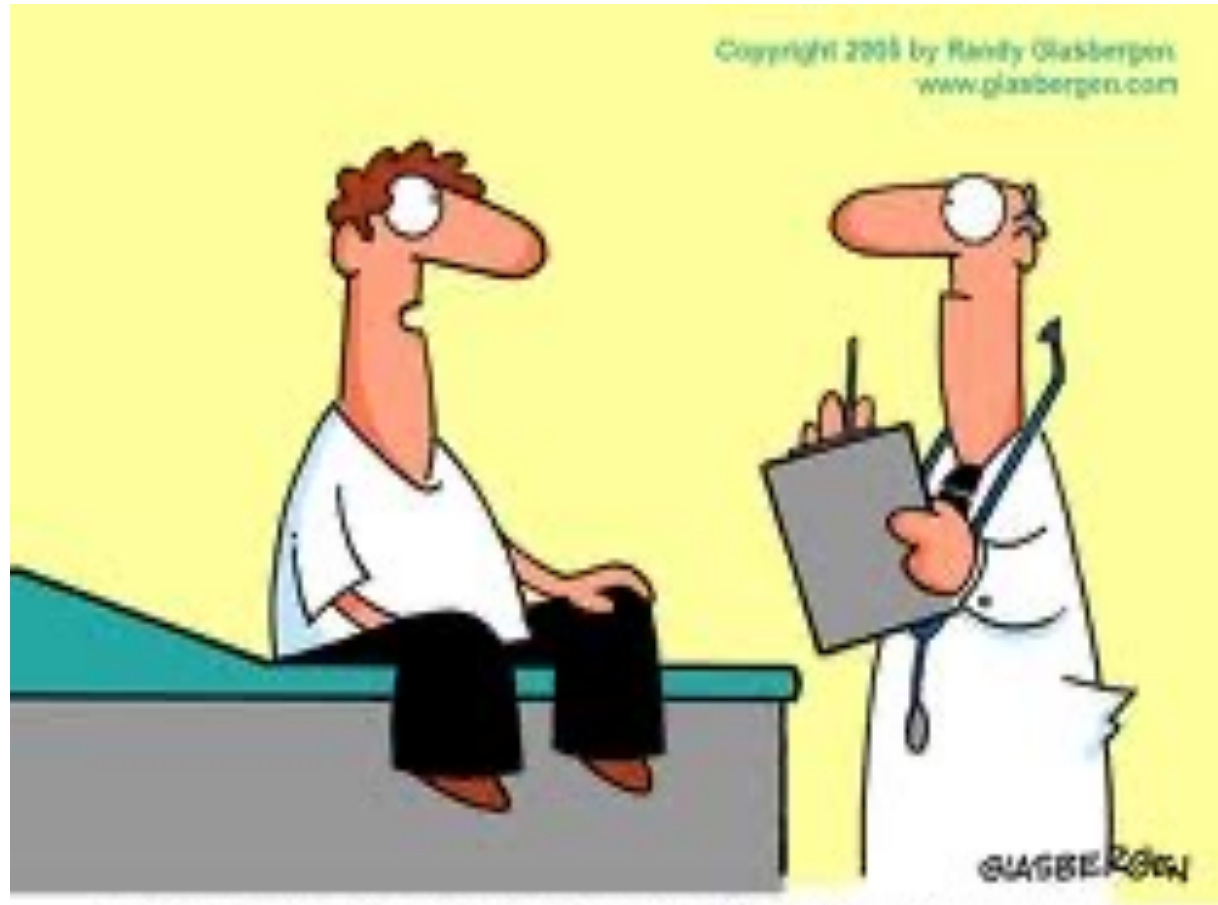
A Primary Outcome (Death or First Hospitalization) or First Hospitalization



**No. at Risk**

No supplemental oxygen	370	304	232	181	139	102	76	59	43	29	21	7	1
Supplemental oxygen	368	314	243	198	158	125	86	61	44	24	13	6	1

# Questions



**"I already diagnosed myself on the Internet.  
I'm only here for a second opinion."**