



Dr Rob Young

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Auckland City Hospital

Managing COPD - Case Studies - Concurrent Workshop

Friday, 21 June 2013

Start 2:00pm

Start 3:05pm

Duration: 55mins

Duration: 55mins

Skellerup

Skellerup



Rotorua GP CME 2013

NZMA
New Zealand Medical Association

General Practice Conference & Medical Exhibition

20-23 June 2013 | Energy Events Centre | Rotorua

Managing COPD – case studies.

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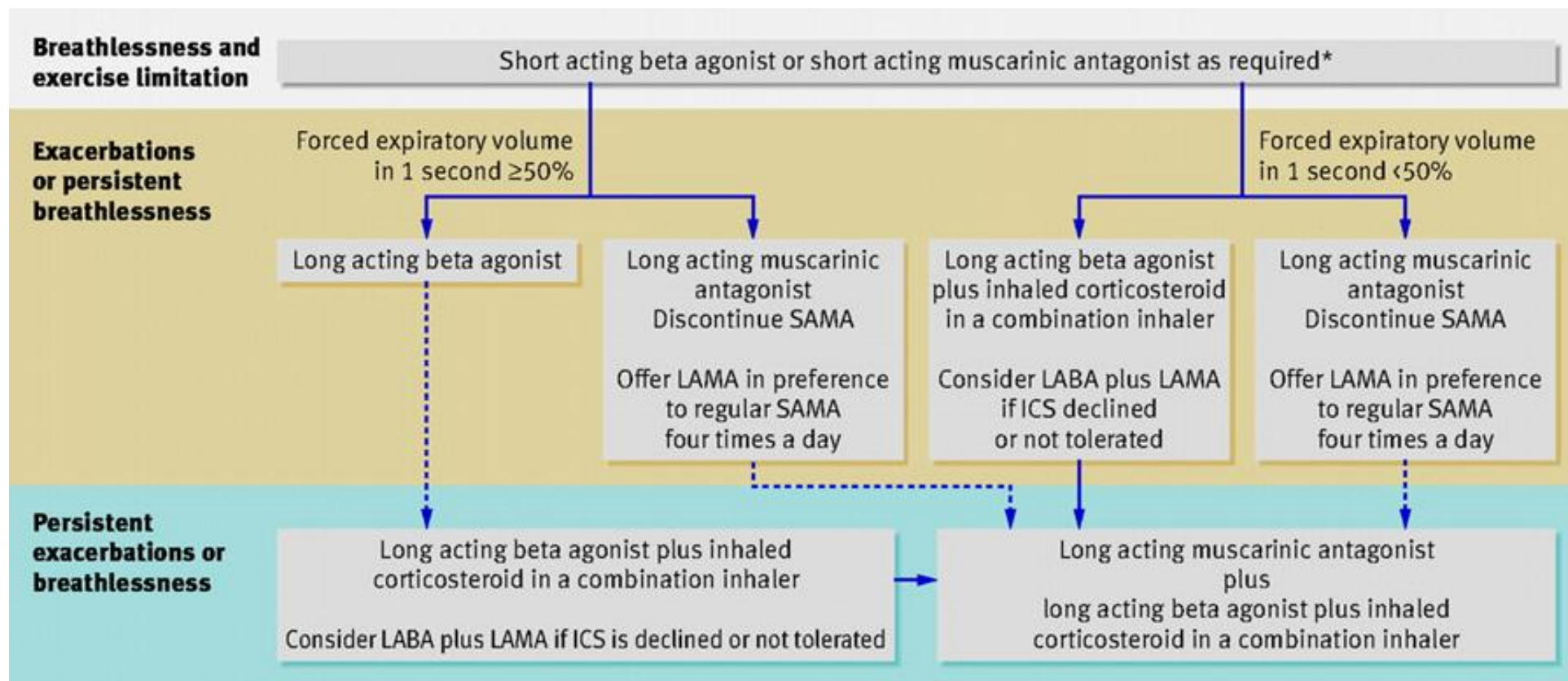
Department of Medicine, Auckland City Hospital and
University of Auckland, New Zealand

GP CME 2013, Rotorua



THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

COPD Management - ?confused



Abbreviations: SAMA = short acting muscarinic antagonist, LAMA = long acting muscarinic antagonist, LABA = long acting beta agonist, ICS = inhaled corticosteroid

* Short acting beta agonist (as required) may continue at all stages

—→ Offer therapy (strong evidence) - - - - -→ Consider therapy (less strong evidence)

COPD Management - ?confused

Patient-centred management of stable COPD in primary care

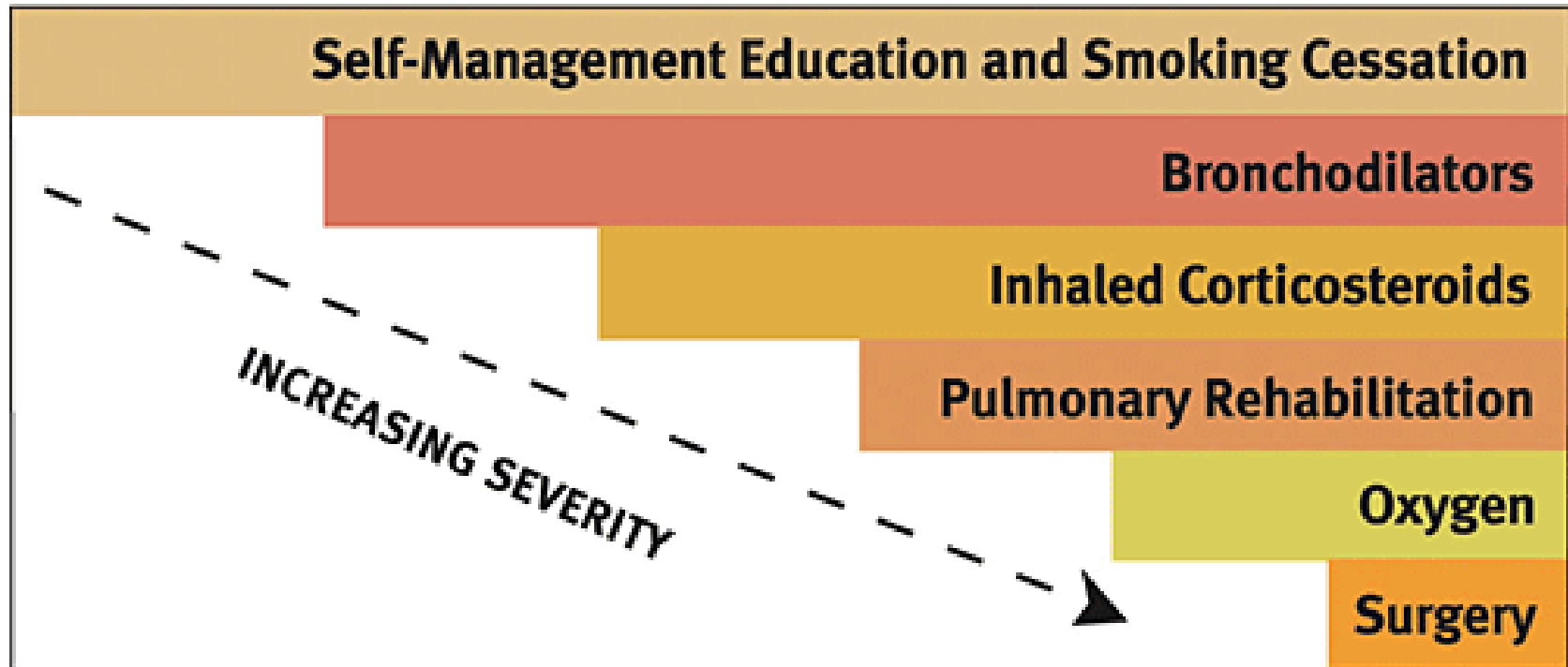
For all patients:

- provide smoking cessation advice
- provide patient education/self management
- assess co-morbidity
- give dietary advice if BMI >25 kg/m²
- promote exercise
- offer pneumococcal vaccination
- offer annual influenza vaccination
- refer to a dietary specialist if BMI <20 kg/m²

SYMPTOMS?	FUNCTIONAL LIMITATION?	EXACERBATIONS	HYPOXIA?	HOLISTIC CARE
BREATHLESSNESS Prescribe short-acting bronchodilators (beta ₂ agonist/ antimuscarinic) for relief of symptoms	MRC score ≥3 Optimise pharmacotherapy See NICE pharmacotherapy algorithm	(Oral steroids/ antibiotics/hospital admissions) Optimise pharmacological therapy	Oxygen saturation ≤92% at rest in air FEV ₁ <30% predicted Refer for oxygen assessment	Check social support (e.g. carers and benefits) Treat co-morbidities
PERSISTENT SYMPTOMS Offer pharmacotherapy in line with NICE guideline	Offer pulmonary rehabilitation Screen for anxiety/ depression	Discuss action plans including use of standby oral steroids and antibiotics		Consider palliative therapy or secondary care referral for resistant symptoms
PRODUCTIVE COUGH Consider use of mucolytics				Refer to specialist palliative care teams for end-of-life care

COPD - simplified

TREATMENT OPTIONS FOR COPD



But how do you define severity?

COPD Case Studies – key messages

1. COPD is grossly under-diagnosed - spirometry is required to confirm the diagnosis
2. Patients with COPD under-report COPD-related symptoms that reduce their quality of life – these should be screened for.
3. The natural history of COPD is highly variable and quite different to asthma – know your patient's phenotype and beware of their co-morbidities.

“COPD is highly prevalent,
underpercieved, underdiagnosed,
and undertreated”

Bart Celli 2008

What is COPD and why diagnose it

- Affects 8% of adult population (1 in 10)
- Affects 20% of adult smokers (1 in 5)
- Affects 30% of adult general medical admissions
- Affects 50% of pneumonia over 65 yrs old

COPD and asthma are very different diseases

Diagnosis, Assess & Management of COPD

- **Diagnose** - assess expiratory flow (spirometry, PEFr)
- **Assess**
 - symptoms (CAT and MRC score)
 - exacerbation risk (PHx of exacerbation, FEV₁%pred)
 - COPD co-morbidities (anxiety/depression, muscle wasting/fatigue) and COPD-related co-morbidities (CHD/CHF, lung cancer, osteoporosis)
- **Manage** – reduce risk and reduce symptoms

Diagnosis, Assess & Management of COPD

- **Diagnose** - assess expiratory flow (spirometry, PEFR)

- **Assess**

- symptoms
- exacerbations
- COPD co-morbidities
wasting/fatigue
(CHD/CHF, lung cancer)

Diagnose

Assess

Manage

- **Manage** – reduce risk and reduce symptoms

FEV₁%pred)

on, muscle
-morbidity

Diagnosis, Assess & Manage COPD

Diagnose

Assess

Manage

- Manage – reduce risk and reduce symptoms

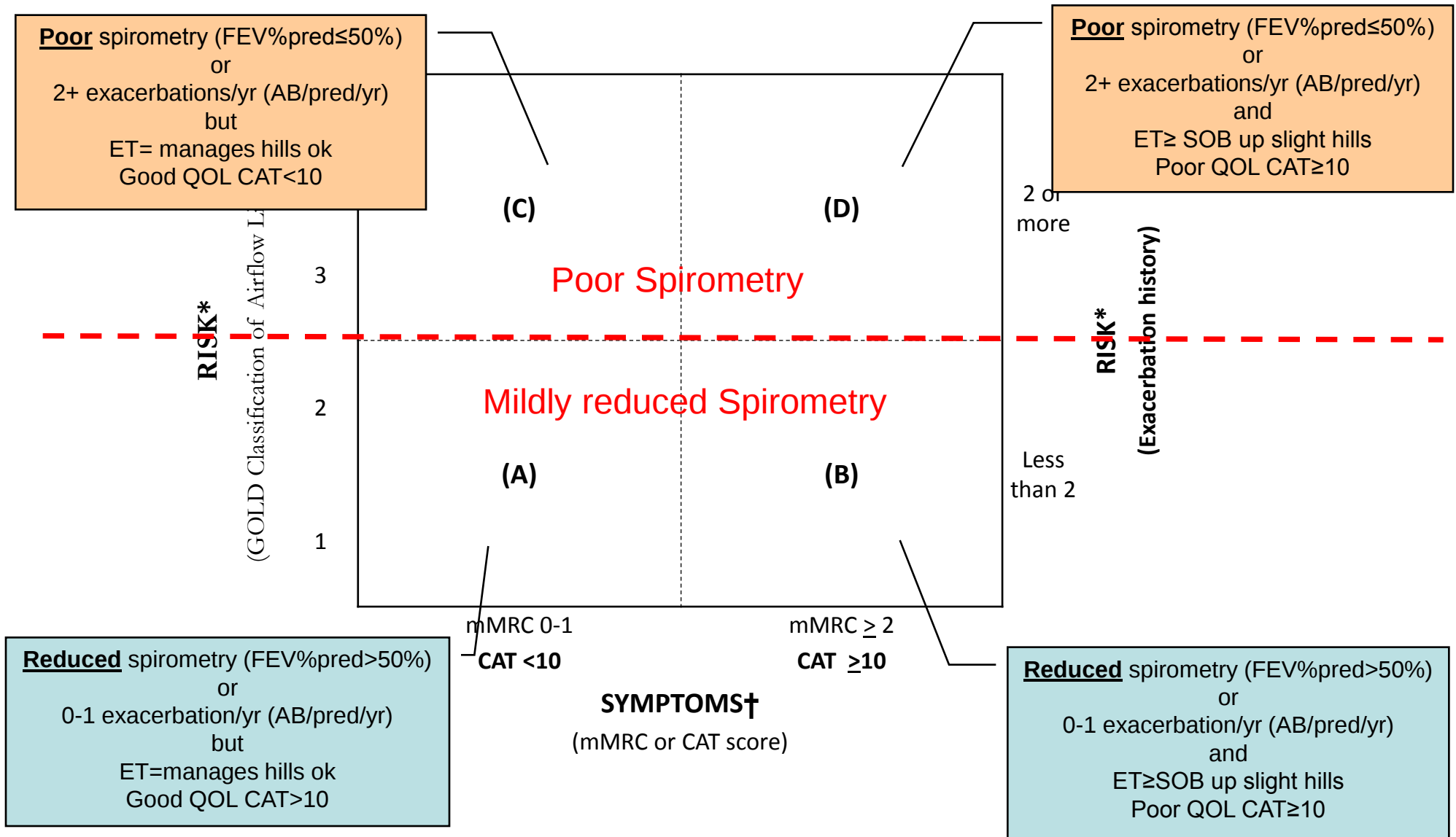
expiratory flow (spirometry, PEFER)

Symptom score

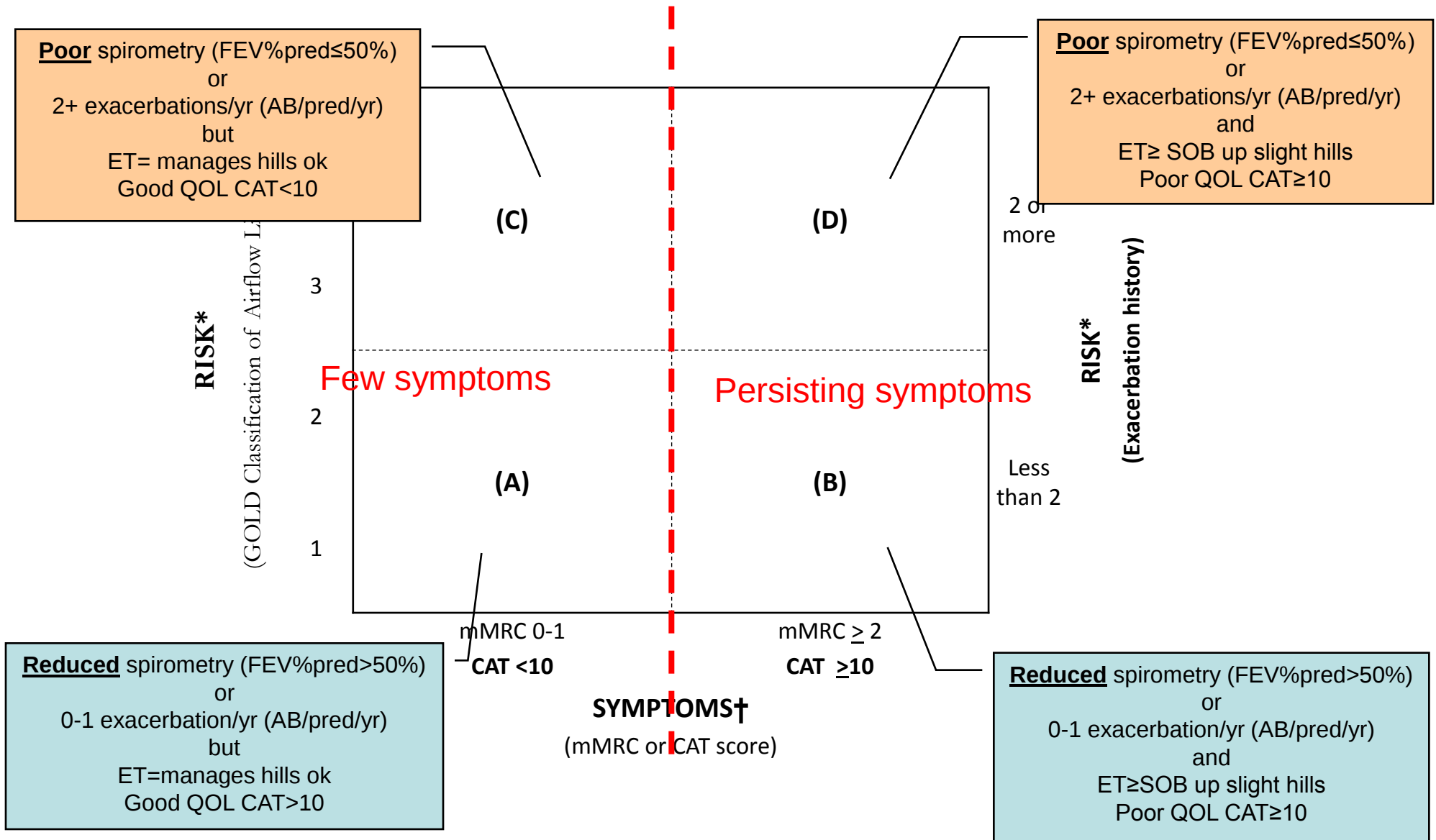
Expiratory flow

Xacerbation risk

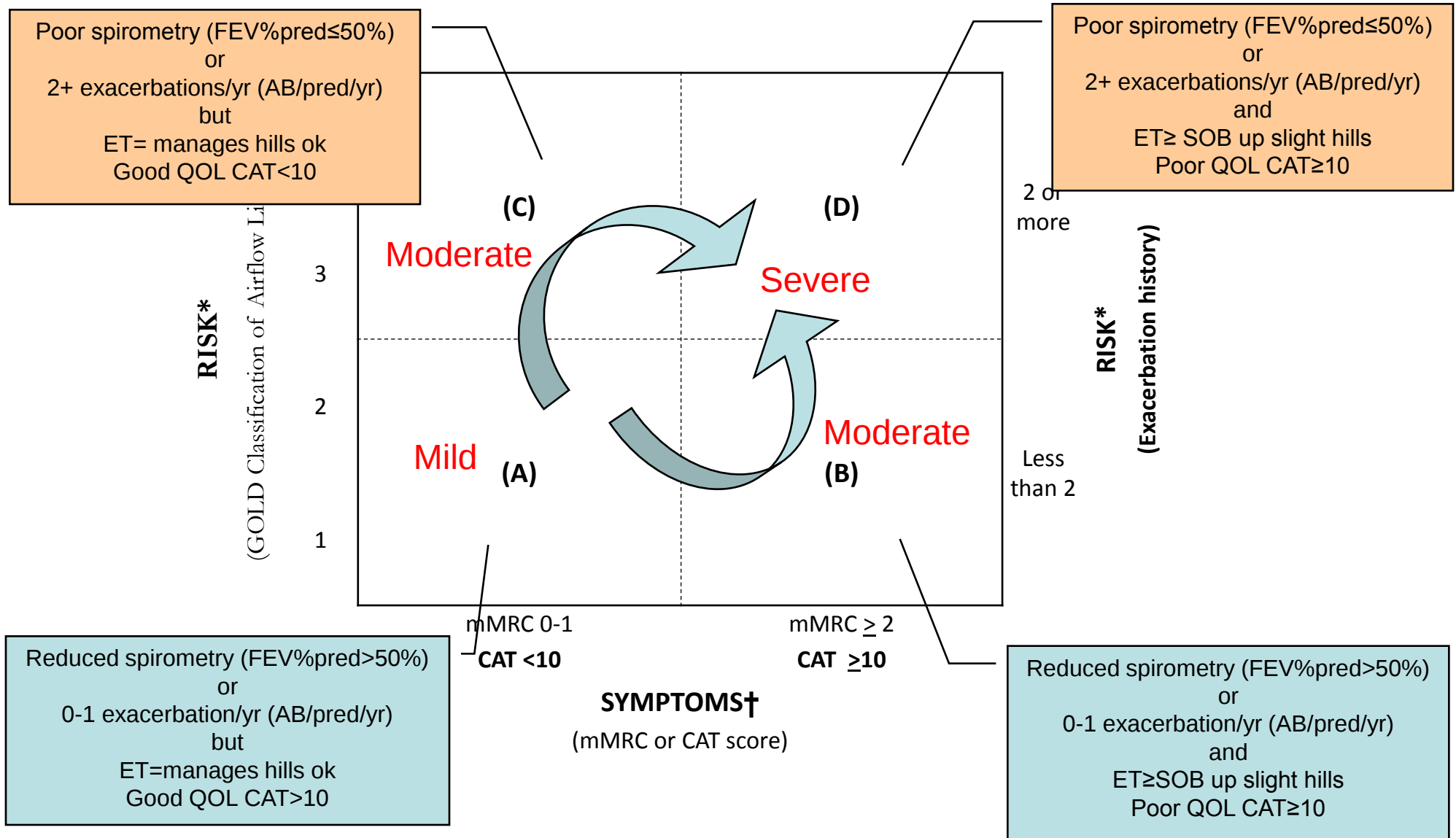
New GOLD-defined patient groups



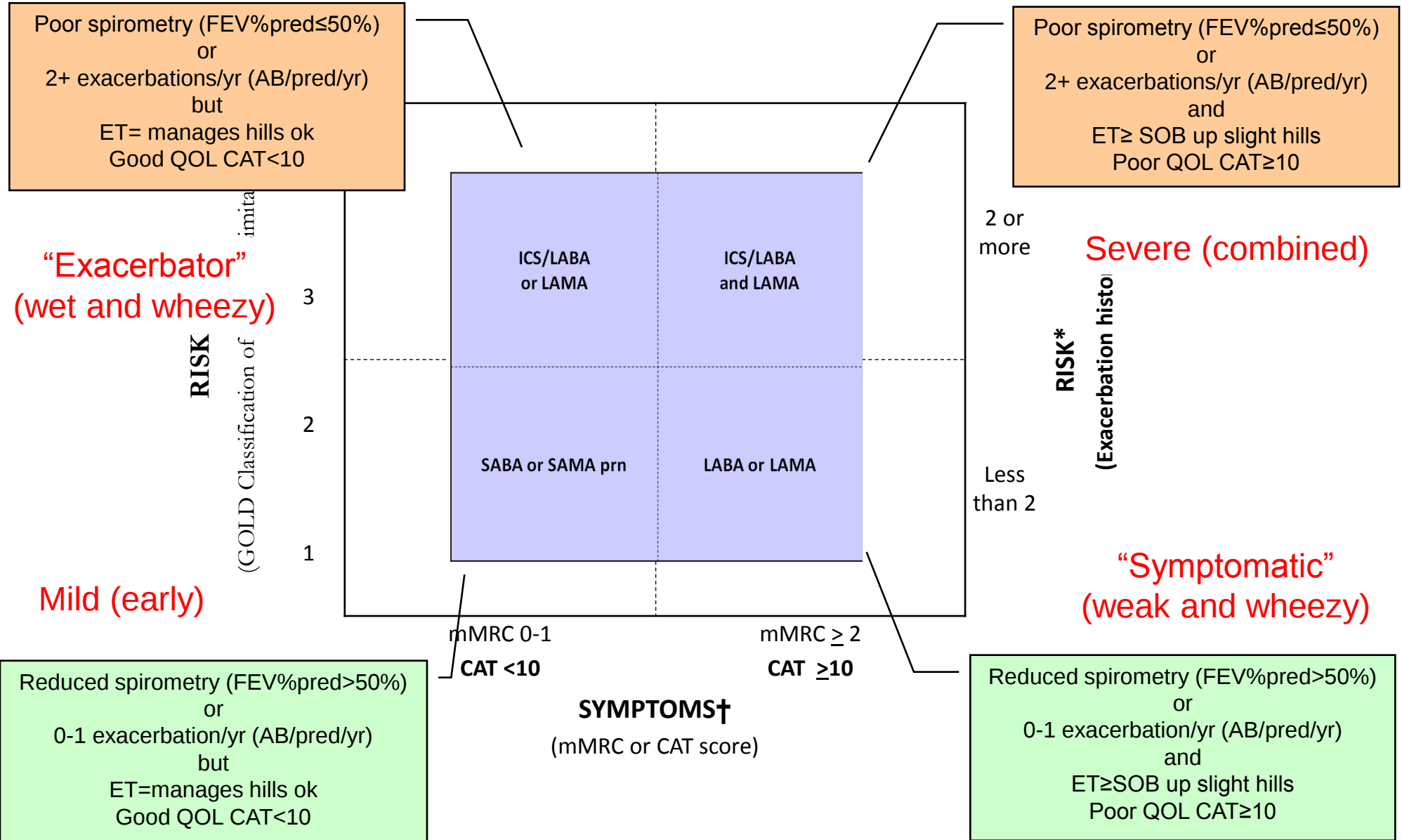
New GOLD-defined patient groups



New GOLD-defined patient groups



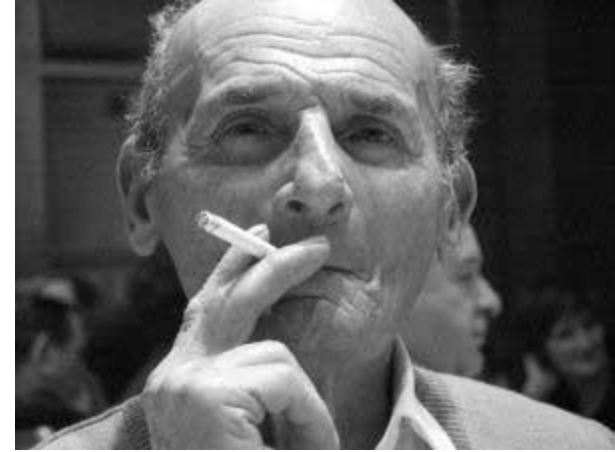
New GOLD-defined patient groups



Summary table of new recommendations

Disease Severity		Phenotypic features	Treatment
A. Mild (early)	S E X	Low Sx score - mMRC 0-1, CAT<10 and Fair Spirometry - FEV ₁ GOLD 1-2, and Low exacerbation rate - 0-1/yr	SABA or SAMA (prn)
B. Moderate – symptomatic “Weak and Wheezy”	S E X	High Sx score - mMRC 2+, CAT≥10 and Fair Spirometry - FEV ₁ GOLD 1-2, or Low exacerbation rate - 0-1/yr	LABA or LAMA
C. Moderate – exacerbator “Wet and Wheezy”	S E X	Low Sx score - mMRC 0-1, CAT<10 and Poor Spirometry - FEV ₁ GOLD 3-4, or High exacerbation rate - 2+/yr	ICS/LABA or LAMA
D. Severe (advanced) “Wet, Weak and Wheezy”	S E X	High Sx score - mMRC 2+, CAT≥10 and Poor Spirometry - FEV ₁ GOLD 3-4, and High exacerbation rate - 2+/yr	ICS/LABA and LAMA
Exacerbation = symptoms of increased cough, SOB ± sputum that required a course of ABs ± prednisone Spirometry FEV ₁ /FVC<70% with FEV ₁ ≥ 50% predicted (GOLD1-2) or FEV ₁ <50% predicted (GOLD3-4)			

Case presentation



Male 63 yo

- PC: 3 days of cough and sputum, mild shortness of breath
- HPc: Previously well

Case presentation

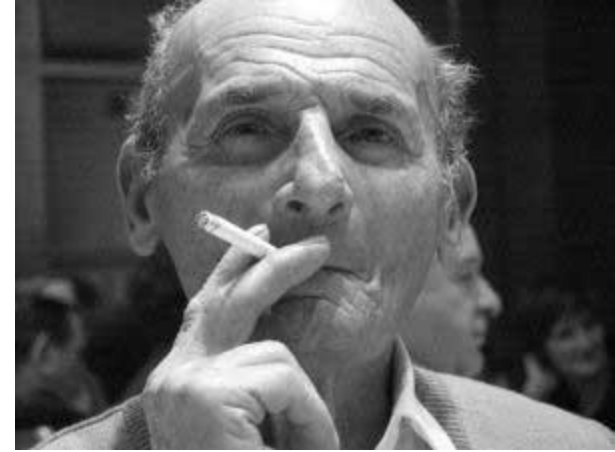


Male 63 yo

- PC: 3 days of cough and sputum, mild shortness of breath
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- PHx: Peptic ulcer 5 yrs ago
3 LRTI over the last 5 years
Benign colon polyps

Case presentation

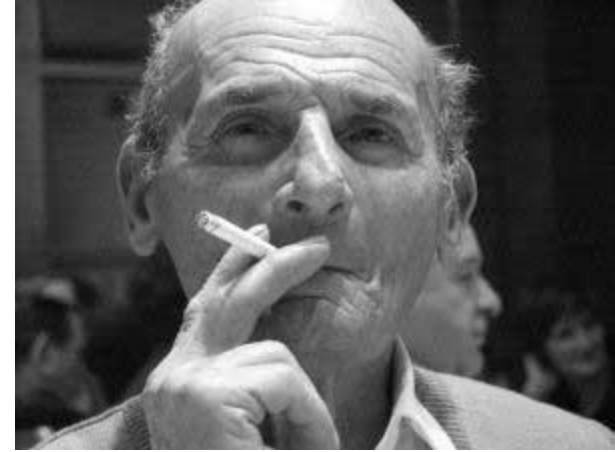
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- PC: 3 days of cough and sputum, mild shortness of breath
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- PHx: Peptic ulcer 5 yrs ago
3 LRTI over the last 5 years, last 3/12 ago
Benign colon polyps
- SHx Lives with his wife, retired builder, property developer, smoker with a 30 pk yr history

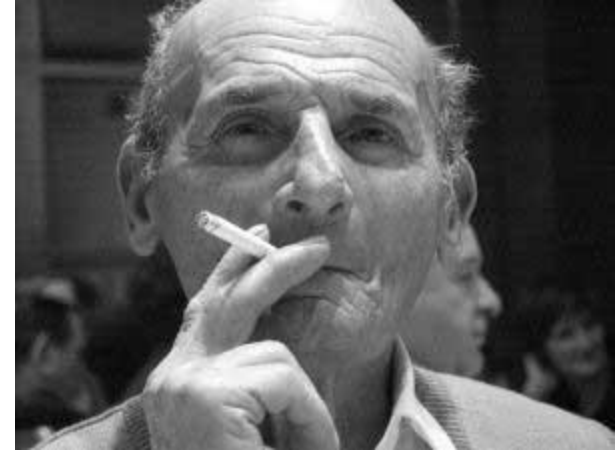
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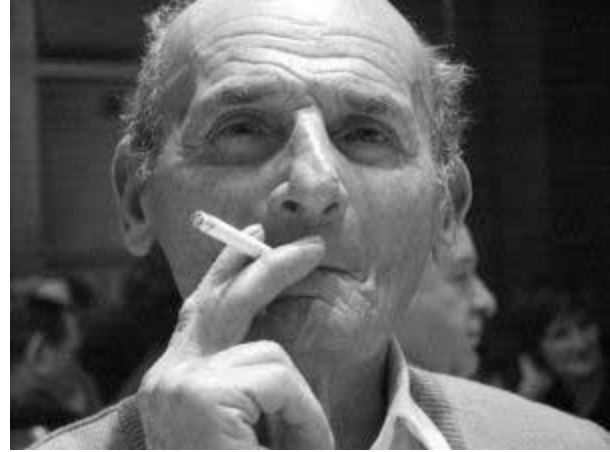
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Case presentation



- Occ Hx: No dust/asbestos exposure
- Exam Afebrile and productive cough
 Chest – scattered wheeze and crackles

Case presentation



- Occ Hx: No dust/asbestos exposure
- Exam Afebrile and productive cough
 Chest – scattered wheeze and crackles
- Diagnosed with LRTI and treated with antibiotics

Role of Spirometry

Symptom score

Expiratory flow

Xacerbation risk

Diagnosis, Assess & Management of COPD

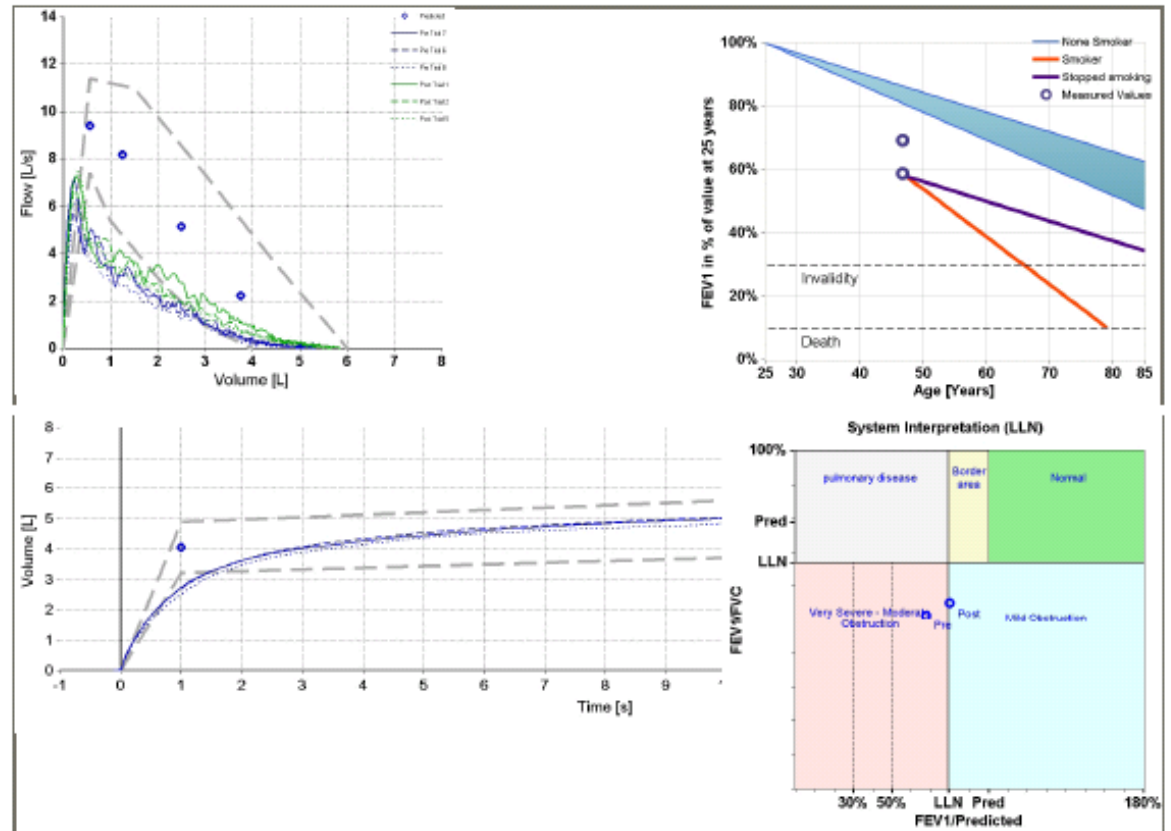
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Clinical cases – at risk patients

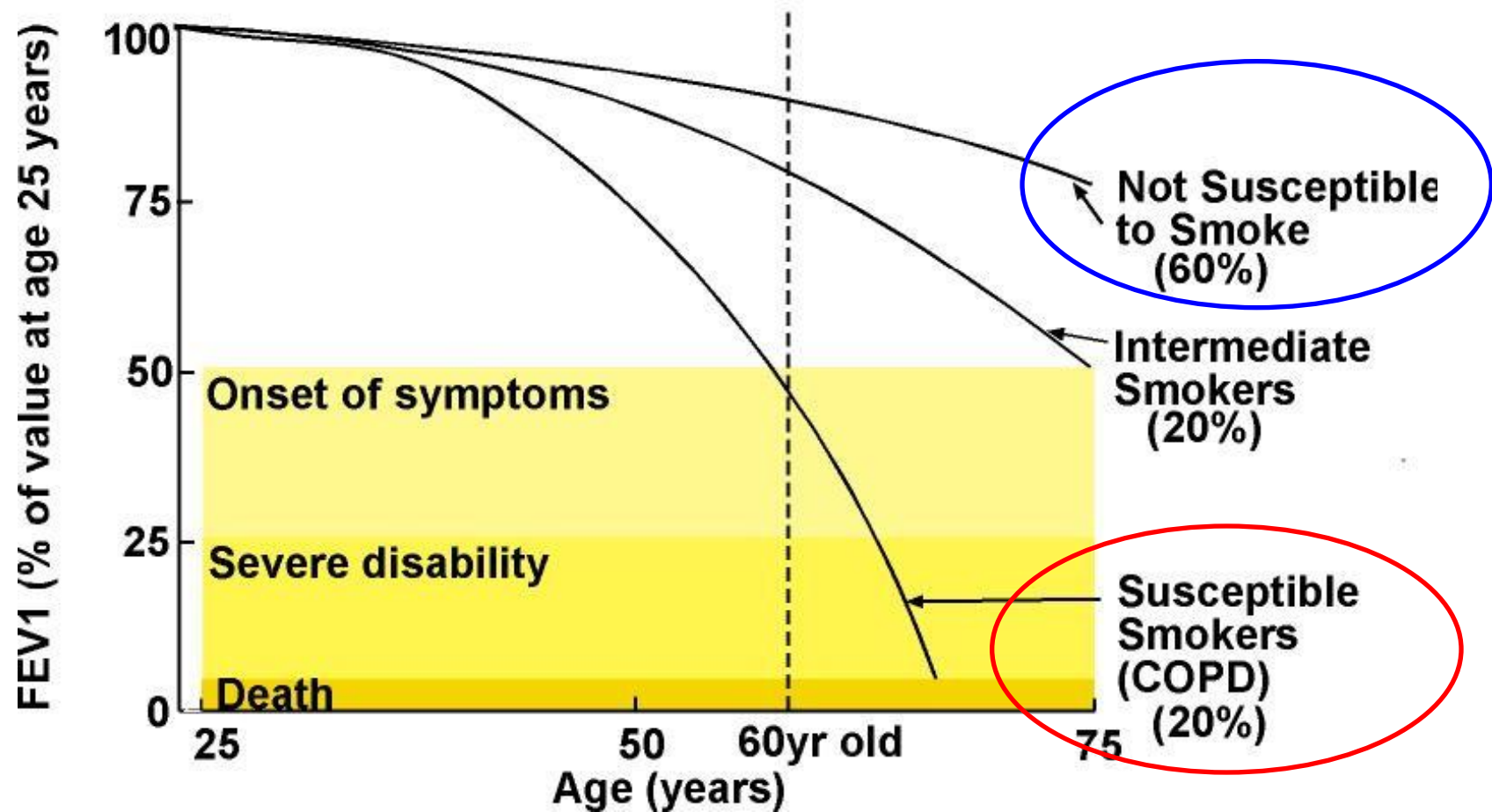
- Patient >40 years old with
 - respiratory symptoms of LRTI **and/or**
 - Past smoking history or equivalent dust/occupational Hx
- Requires assessment to
 - Identify the presence of COPD (spirometry)
 - Identify other undisclosed symptoms relevant to QOL
 - Quantify risk of disease progression/exacerbations
 - Facilitate directed therapy and lifestyle changes



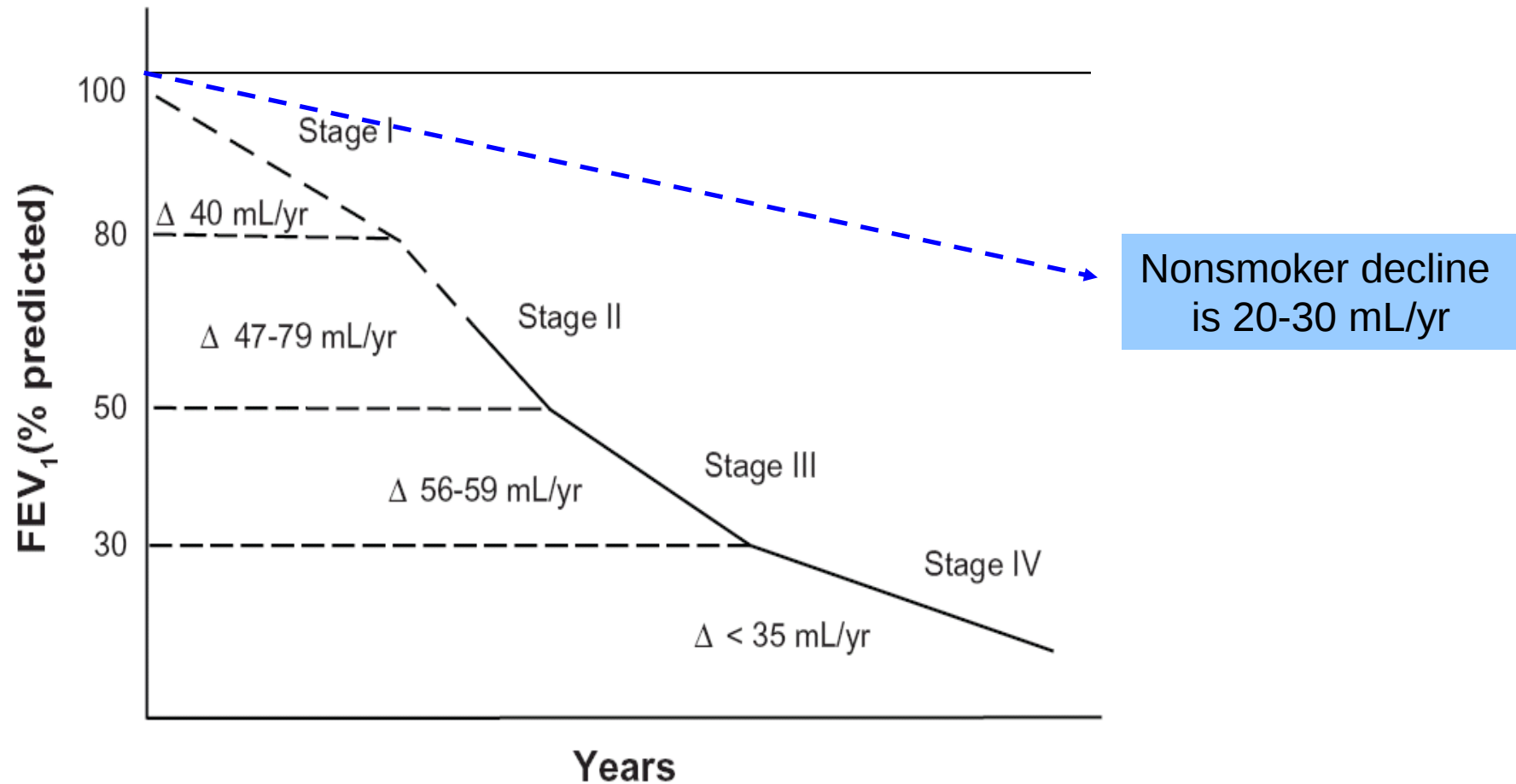
Spirometry and lung age



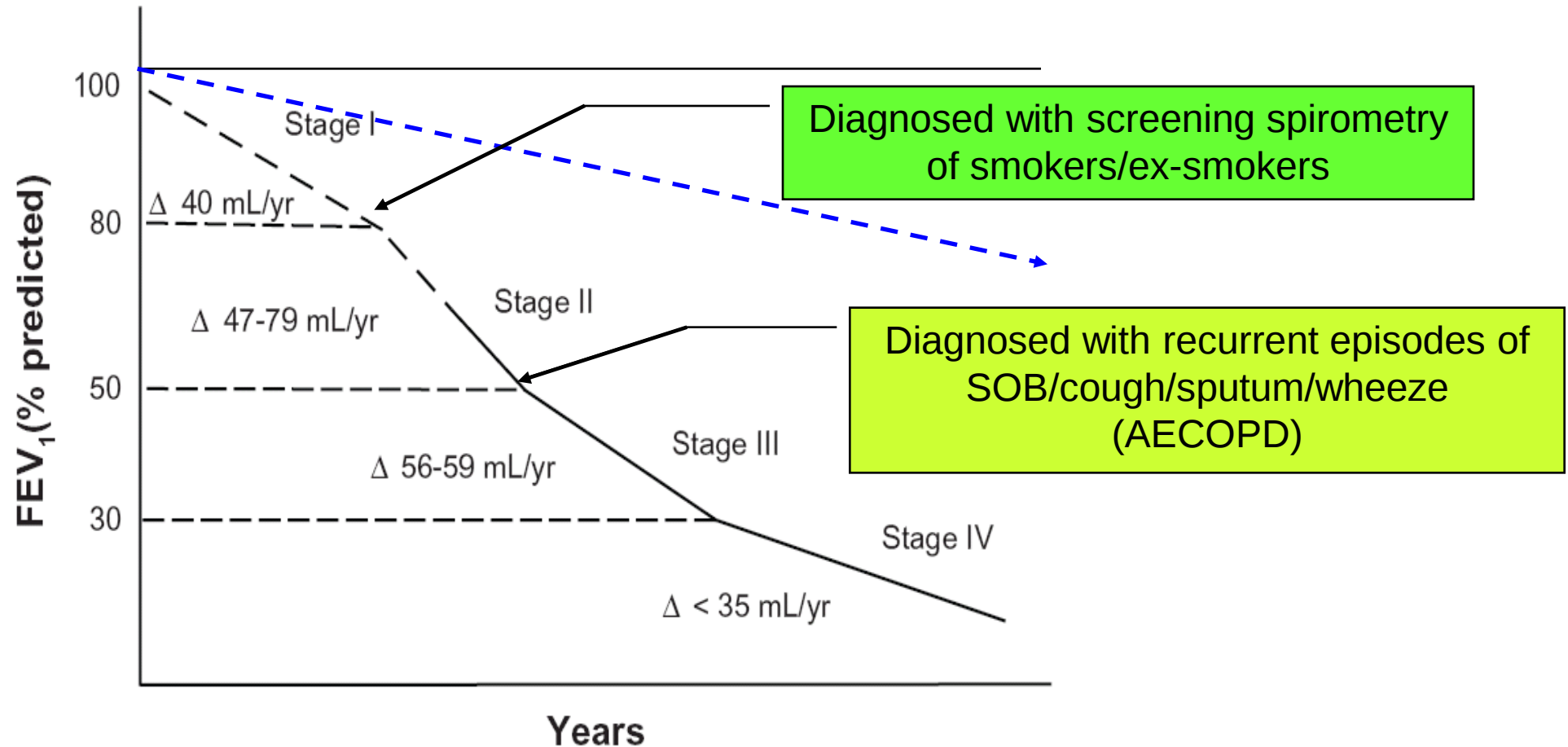
Decline of Lung Function: variable susceptibility



Decline in lung function with COPD severity



Decline in lung function with COPD severity



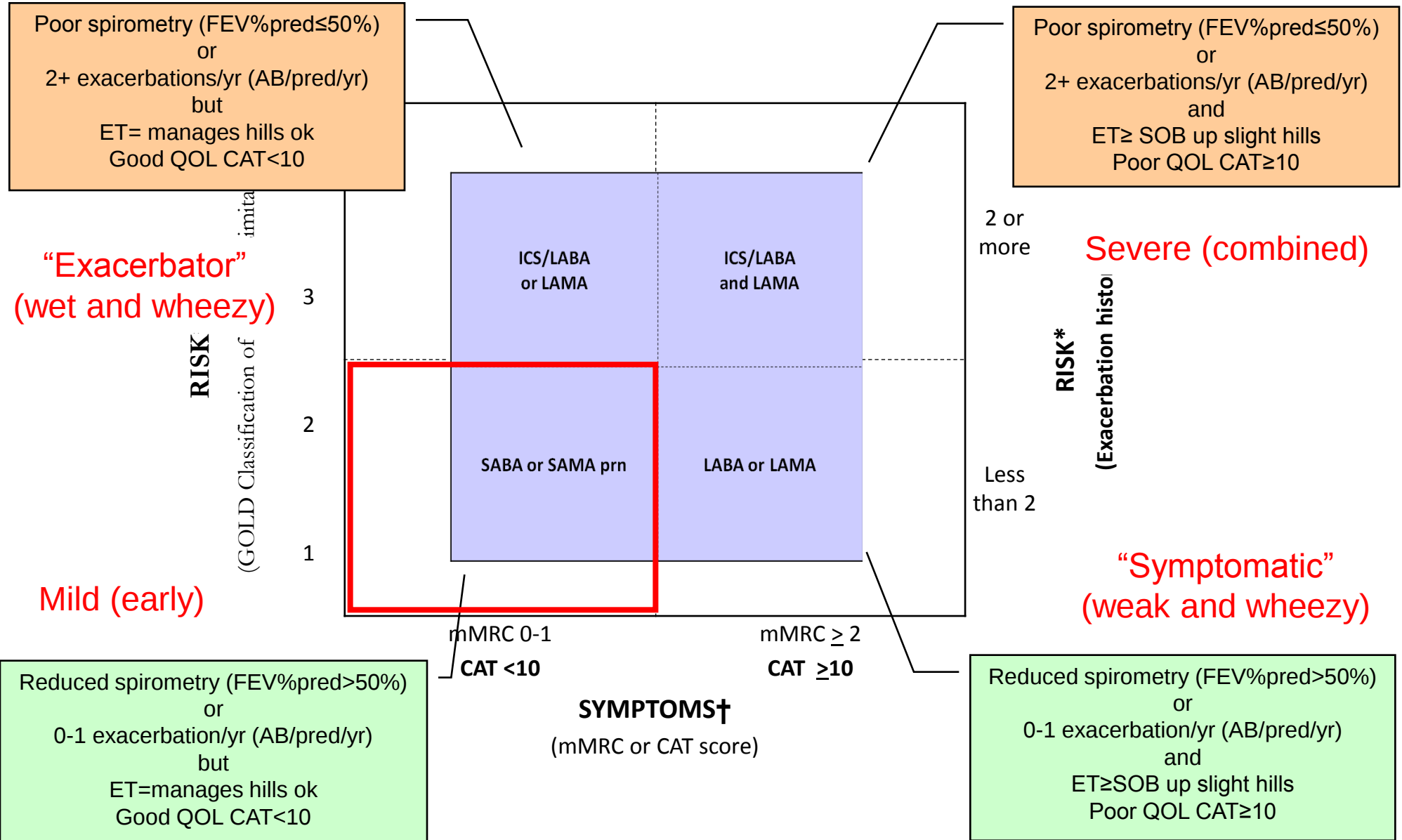
Case presentation

- Occ Hx: No dust/asbestos exposure
- Exam Afebrile and productive cough
 Chest – scattered wheeze and crackles
- Invest Spirometry: FEV1=2.4 (60%), FEV/FVC=60%

Diagnosed with “asthma” and treated with antibiotics and inhaler (SABA prn).



New GOLD-defined patient groups



Summary table of new recommendations

Disease Severity		Phenotypic features	Treatment
A. Mild (early)	S E X	Low Sx score - mMRC 0-1, CAT<10 and Fair Spirometry - FEV ₁ GOLD 1-2, and Low exacerbation rate - 0-1/yr	SABA or SAMA (prn)
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Diagnosed with asthma and treated with
antibiotics and inhalers.....

but breathlessness persisted for 6 weeks



Case Presentation

- Occ Hx: No dust/asbestos exposure
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- Invest Spirometry: $FEV_1=2.4$ (60%), $FEV/FVC=60\%$

Diagnosed with asthma and treated with antibiotics and inhalers.....

but breathlessness persisted for 6 weeks

Repeat spirometry was unchanged, progressive SOBOE for 3 years and now diagnosed with COPD and put on LABA and ICS



Case Presentation

- Occ Hx: No dust/asbestos exposure
- Exam Afebrile and productive cough
Chest – scattered wheeze and crackles
- Invest Spirometry: FEV1=2.4 (60%), FEV/FVC=60%

Diagnosed with asthma and treated with antibiotics and inhalers.....

but breathlessness persisted for 6 weeks

DAM – Yes SEX - No



Management of COPD – the aims

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

Role of Exacerbation History

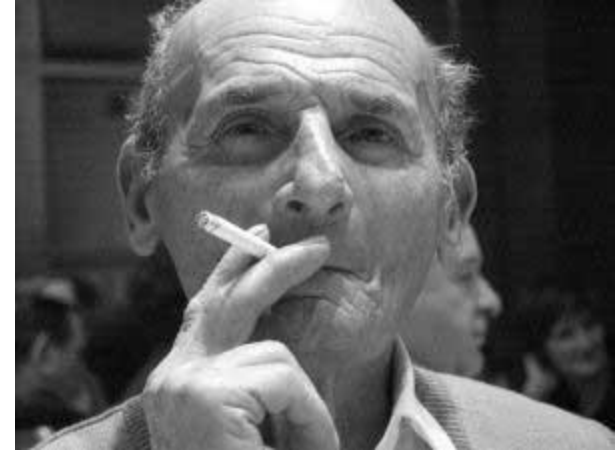
Symptom score

Expiratory flow

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Risk factors for future exacerbations

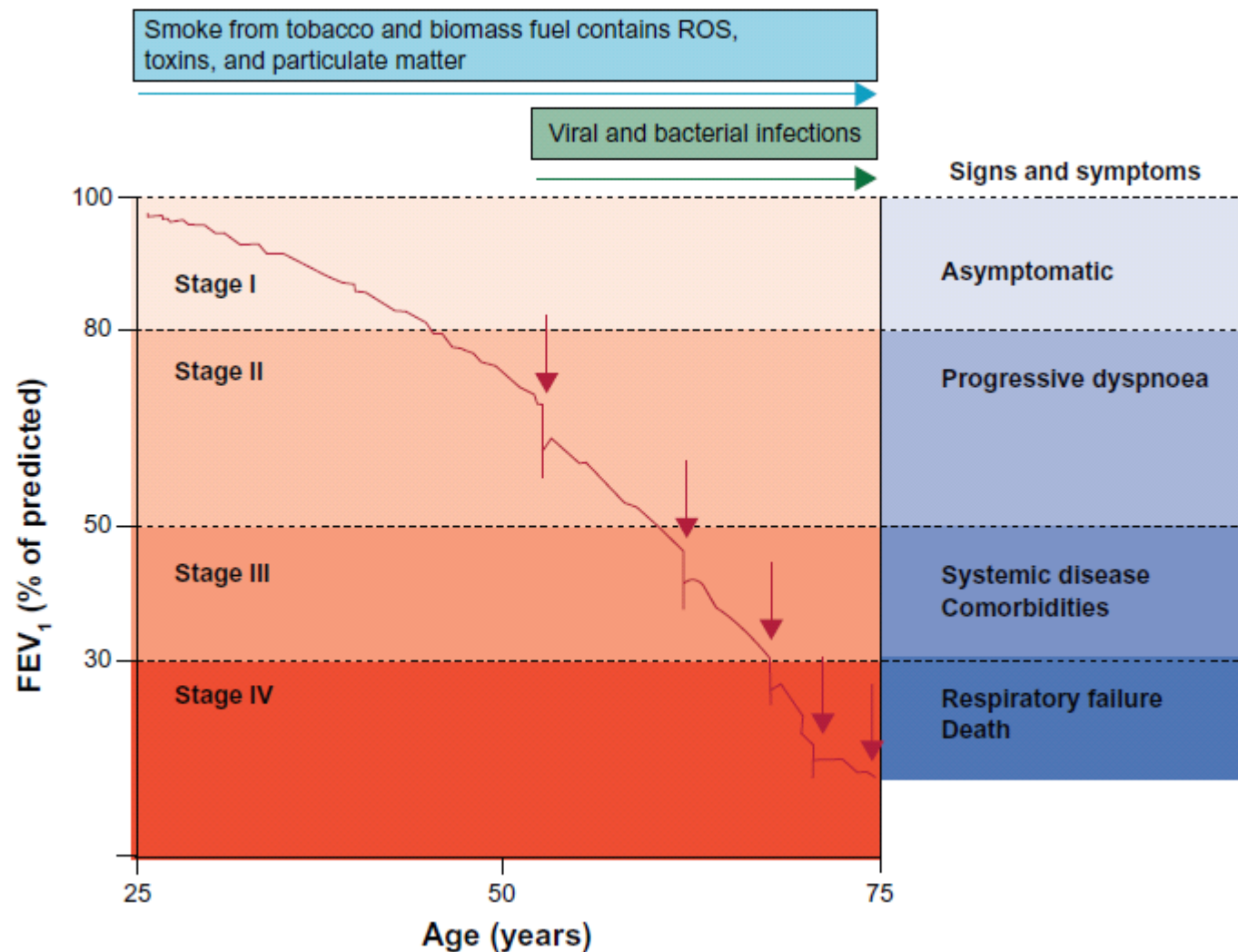
- Past history of exacerbations (<1 /yr and ≥ 1 /yr)
- Poor lung function (GOLD 3 and 4)
- mMRC score >2 or CAT score >10
- Low DLCO or emphysema on CT

“Exacerbation of COPD” = “Lung Attack”

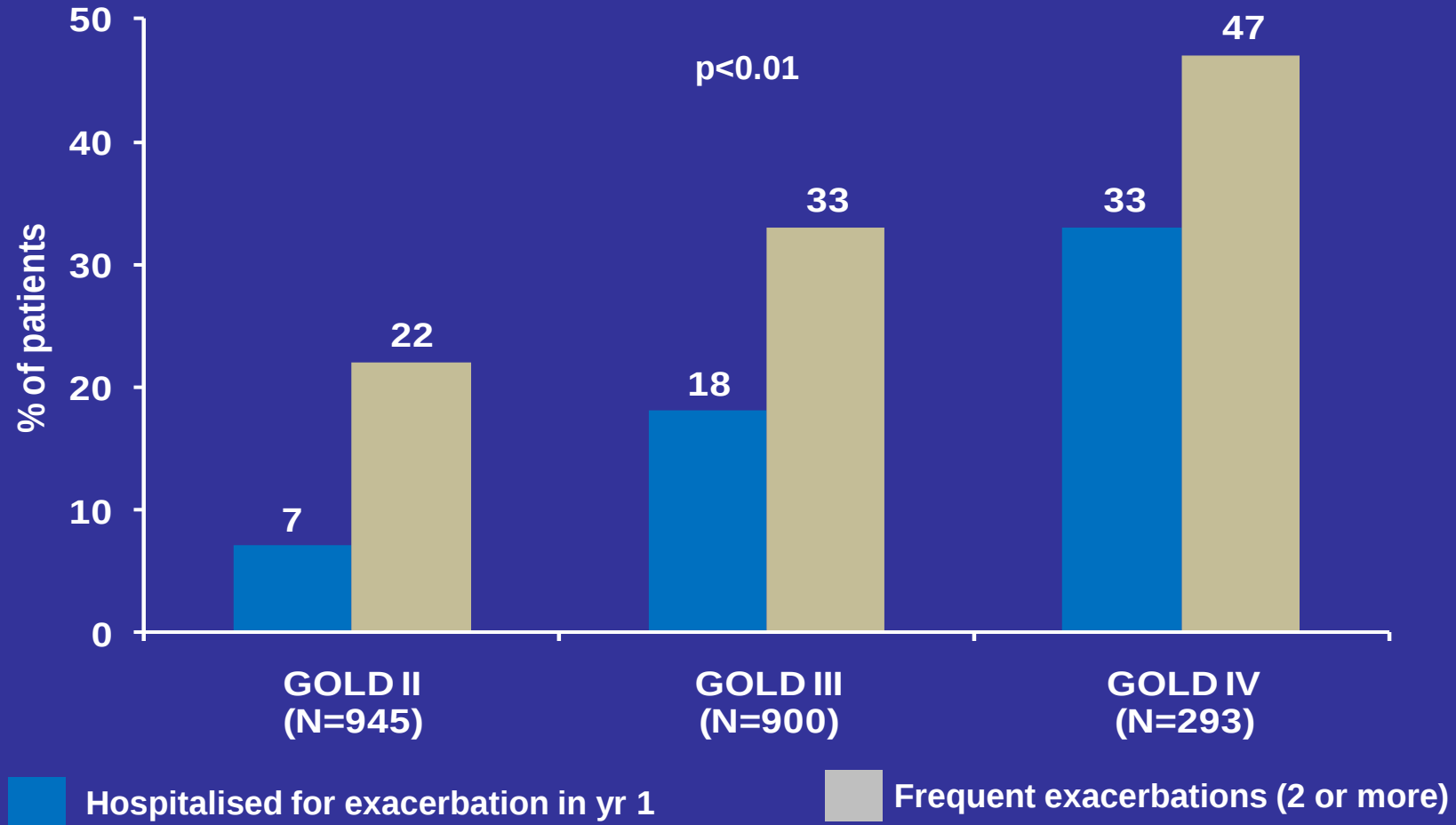
Hospitalisation for AECOPD

- Outcome same as for heart attack
 - 8% inpatient mortality
 - 25% mortality in the next 1 year
- Identifies a high risk group regardless of spirometry result (COPD severity)

Development and progression of COPD – FEV₁ vs symptoms

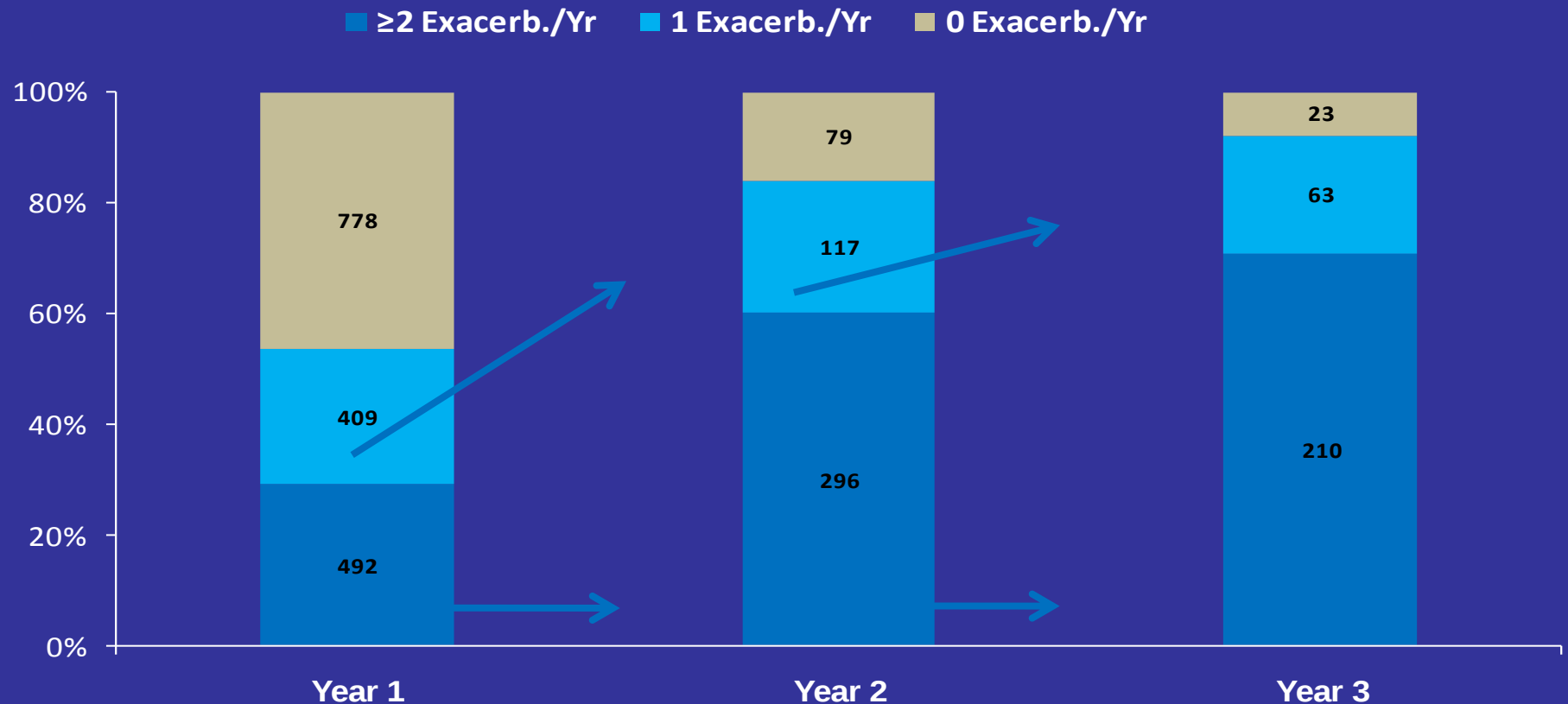


The 'frequent exacerbator phenotype': Frequency/severity by GOLD Category (1)

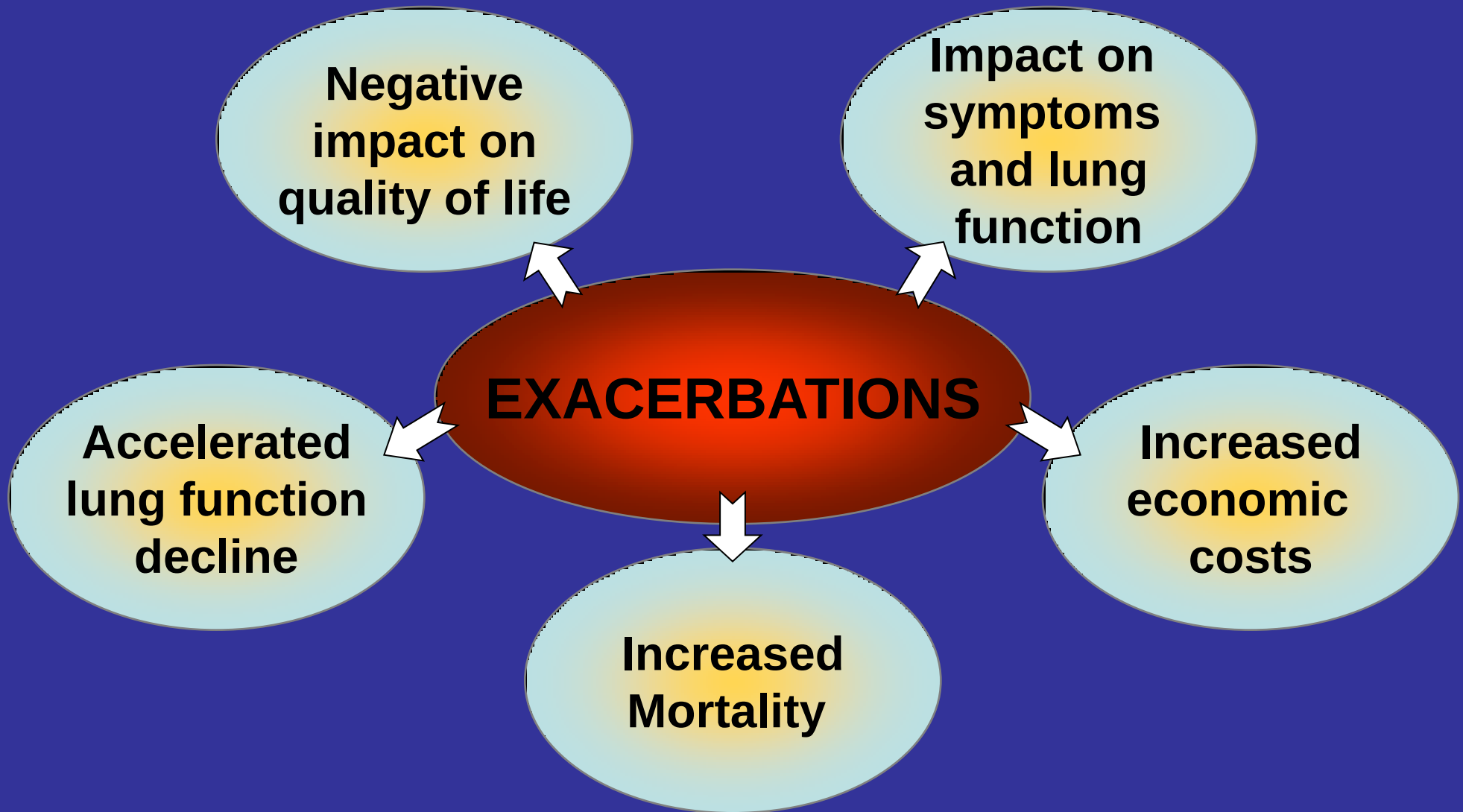


Frequent exacerbators represent stable COPD phenotype - independent of severity

- Proportion of subjects experiencing ≥ 2 exacerbations/year increases year-on-year
- Stable population provides potential to understand the cause(s) of the phenotype



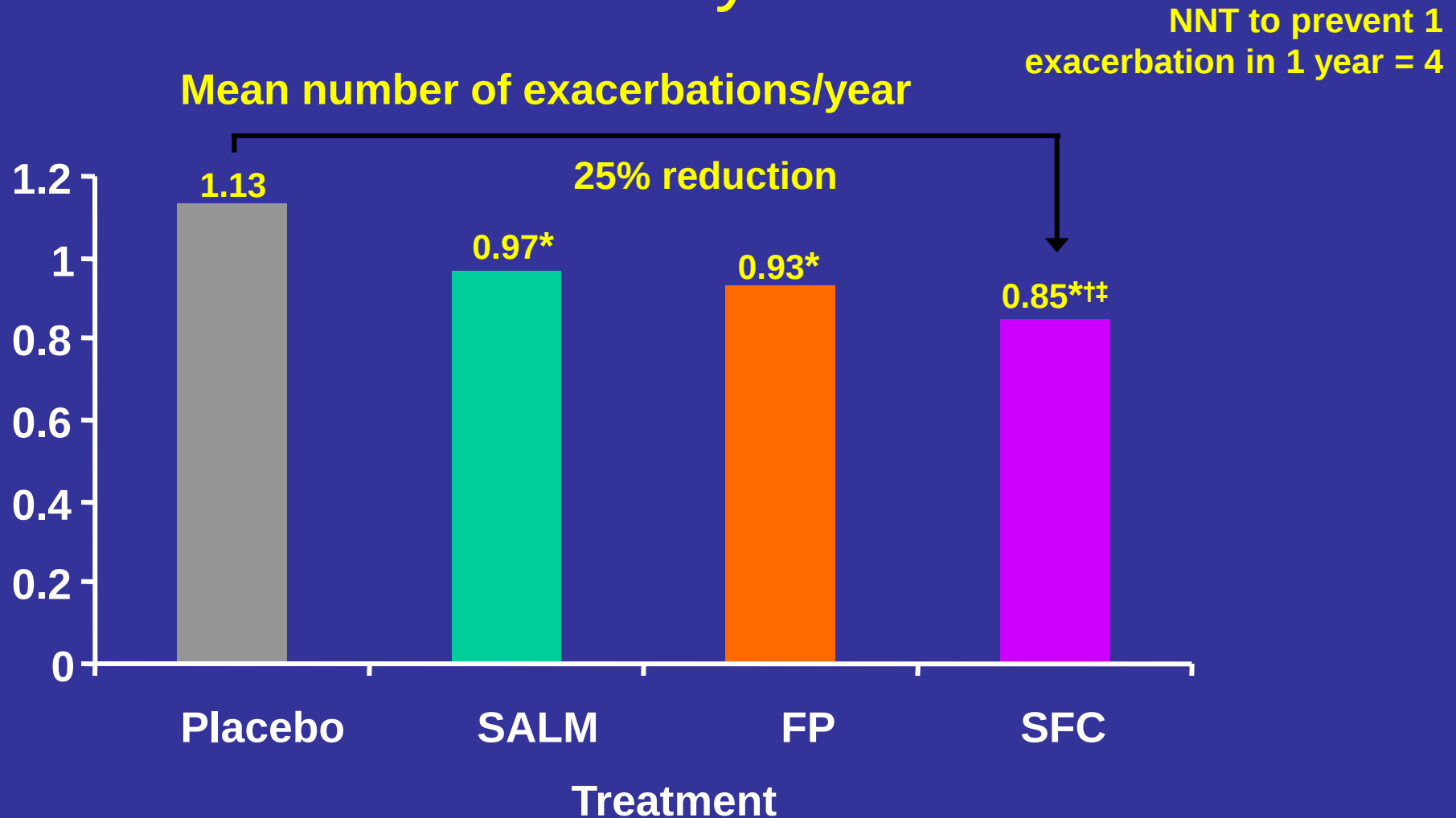
Consequences of COPD exacerbations



When to add the steroids

- ICS are needed when patients suffer recurrent exacerbations characterised by productive cough and SOB.
- ICS with LABA are superior to ICS alone and shown to improve lung function, quality of life and survival as do LAMA (TORCH/UPLIFT study).
- Oral steroids for 3-10 days are useful for exacerbations characterised by SOB with productive cough.

Rate of moderate and severe exacerbations over three years

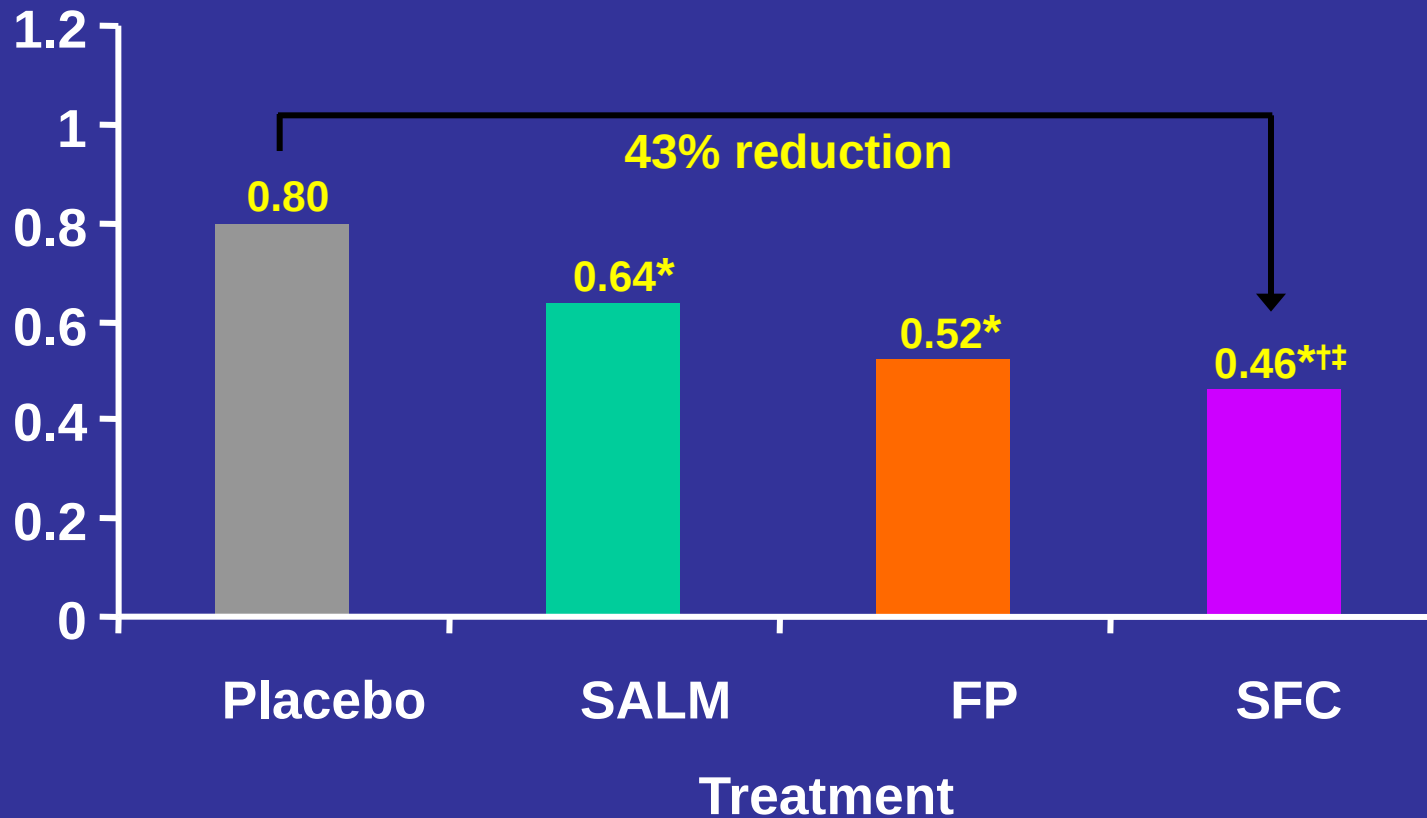


*p < 0.001 vs placebo; †p = 0.002 vs SALM; ‡p = 0.024 vs FP

Calverley *et al.* NEJM 2007

Rate of exacerbations requiring systemic corticosteroids over three years

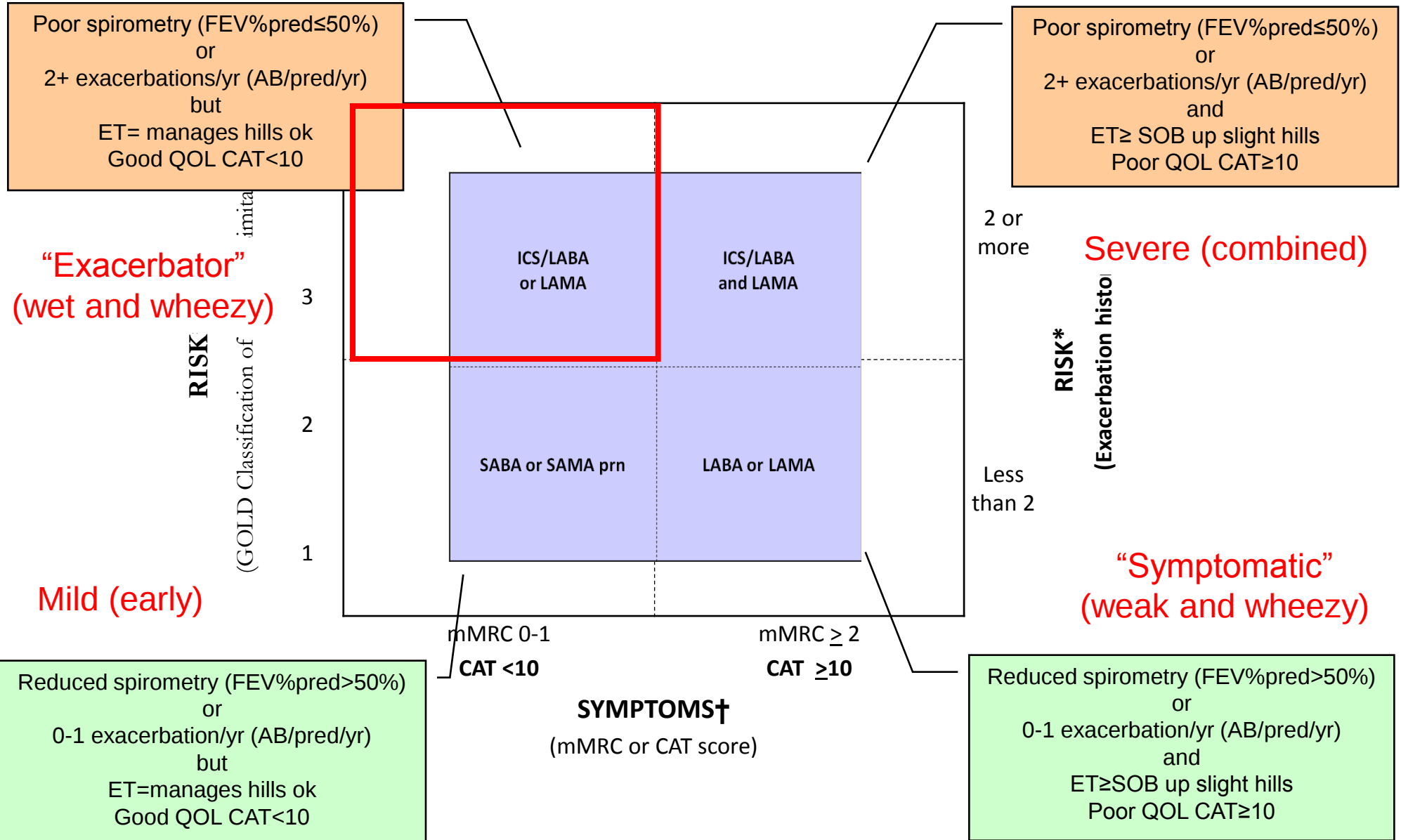
Mean number of exacerbations/year



*p < 0.001 vs placebo; †p < 0.001 vs SALM; ‡p = 0.017 vs FP

Calverley *et al.* NEJM 2007

New GOLD-defined patient groups



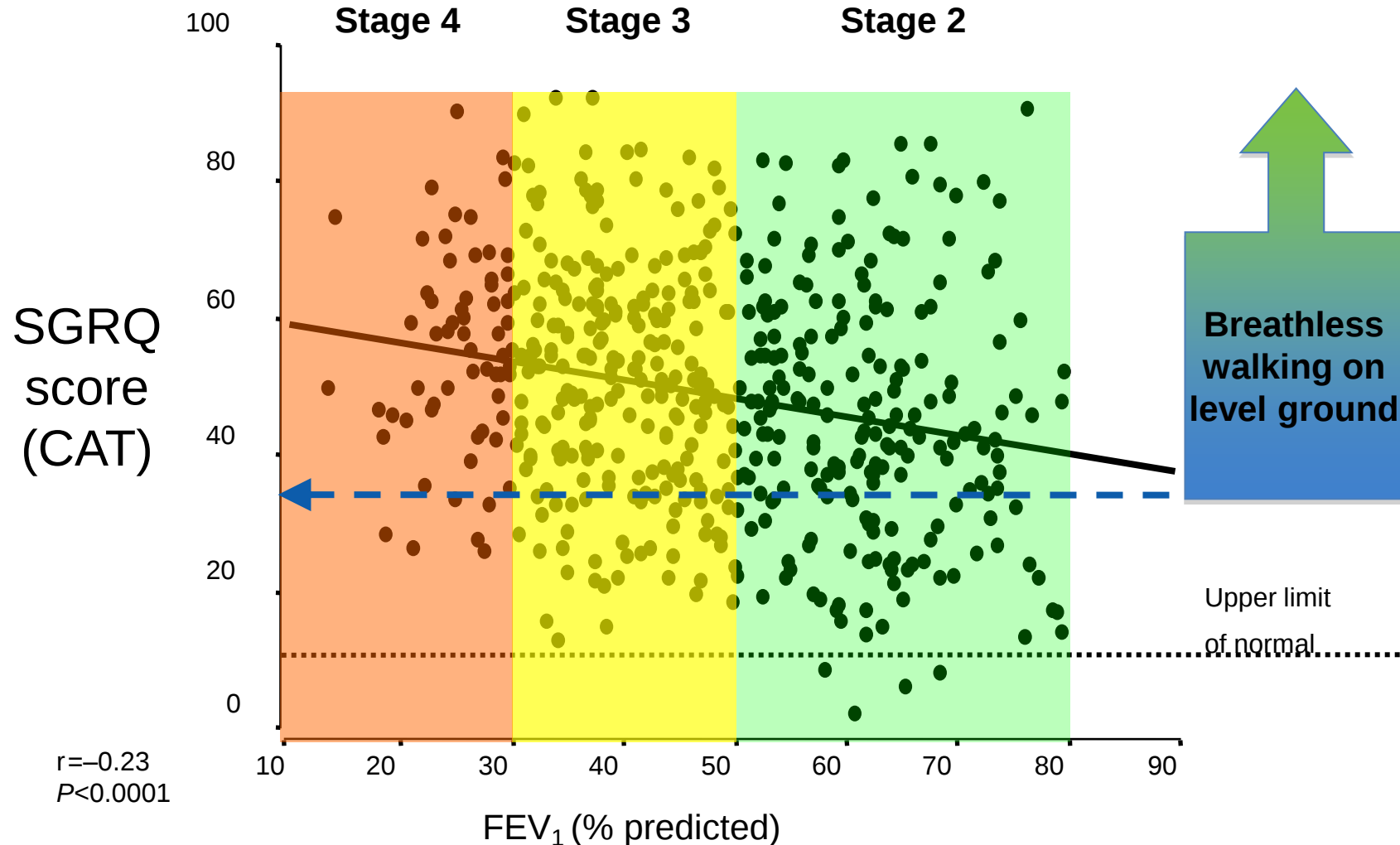
Role of the “Symptom Score”

Symptom score

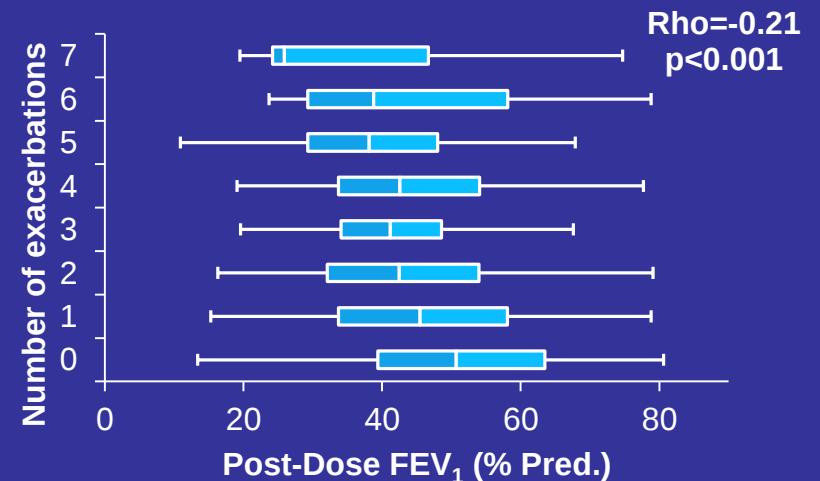
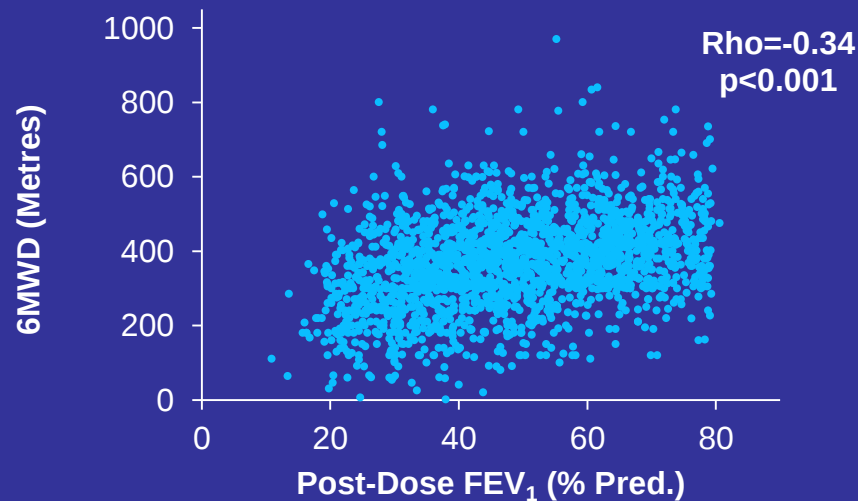
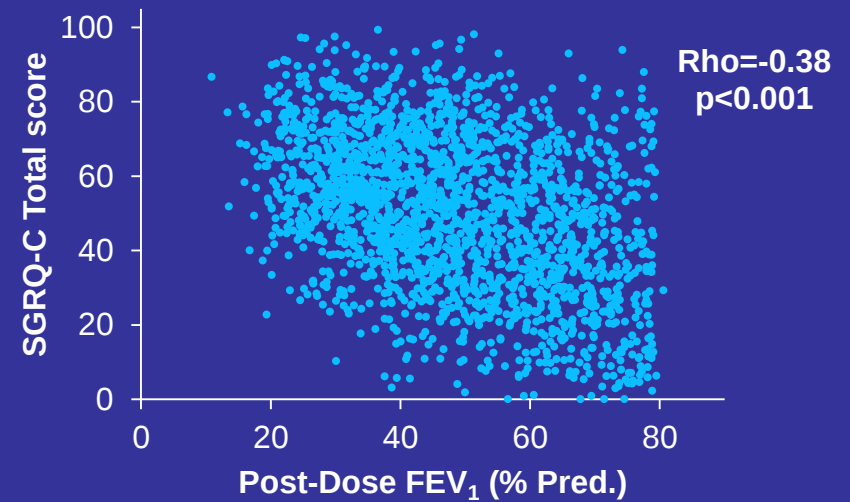
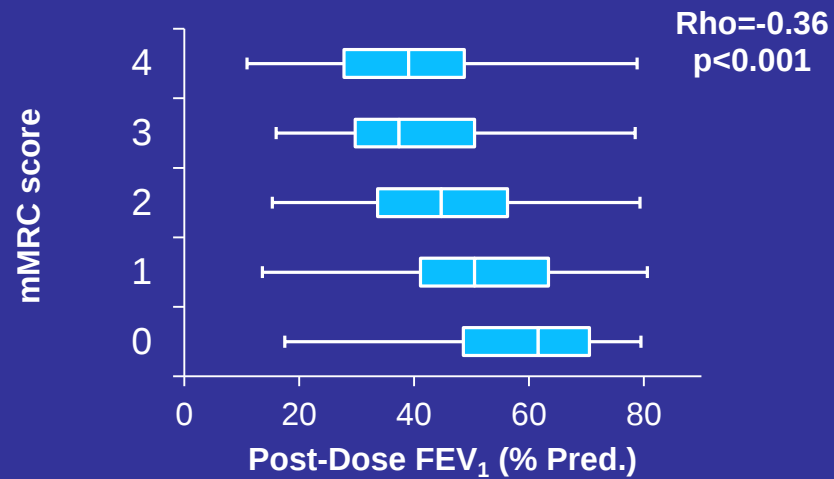
Expiratory flow

Xacerbation risk

No correlation between QOL and FEV₁ severity



ECLIPSE showed weak correlation between disease outcome parameters & FEV₁



Treatment options in COPD – a symptom based approach

- Spirometry – document severity of airways obstruction (confirm diagnosis, end organ damage)
- Establish
 - symptom profile (CAT) or mMRC breathlessness score (when “well”)
 - tendency to LRTI, ABs course, prednisone course, AECOPD, hospitalisation for acute exacerbations.

Modified MRC Breathlessness Score

Grade	Description of Breathlessness
-------	-------------------------------

0	I only get breathless with strenuous exercise.
---	--

1	I get short of breath when hurrying on level ground or walking up a slight hill.
---	--

2	On level ground, I walk slower than people of the same age because of breathlessness, or have to stop for breath when walking at my own pace.
---	---

3	I stop for breath after walking about 100 yards or after a few minutes on level ground.
---	---

4	I am too breathless to leave the house or I am breathless when dressing.
---	--

The CAT questionnaire (**download from - www.catestonline.co.uk**)

Cough		
I never cough	0 1 2 3 4 5	I cough all the time
Phlegm		
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	My chest is full of phlegm (mucus)
Tight		
My chest does not feel tight at all	0 1 2 3 4 5	My chest feels very tight
SOB		
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless
Activity		
I am not limited doing any activities at home	0 1 2 3 4 5	I am very limited doing activities at home
Confidence		
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition
Sleep		
I sleep soundly	0 1 2 3 4 5	I don't sleep soundly because of my lung condition
Energy		
I have lots of energy	0 1 2 3 4 5	I have no energy at all

A symptom based approach – CAT

COPD **Self** Assessment Test

Score/40

- mild 0-10
- mod 10-15
- severe 15-25
- very severe 25-40

Basis on which to establish

- overall disability
- specific disabilities and
- response to treatments

The CAT questionnaire (**download from - www.catestonline.co.uk**)

The CAT questionnaire consists of eight horizontal bars, each representing a symptom. Each bar has a scale from 0 to 5. A red bracket on the left side of the first four bars (Cough, Phlegm, Tight, SOB) is labeled 'WET' in red. A red bracket on the left side of the last four bars (Activity, Confidence, Sleep, Energy) is labeled 'WEAK' in red. The questions are as follows:

Symptom	Question 1 (Left)	Scale (0-5)	Question 2 (Right)
Cough	I never cough	0 1 2 3 4 5	I cough all the time
Phlegm	I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	My chest is full of phlegm (mucus)
Tight	My chest does not feel tight	0 1 2 3 4 5	My chest feels very tight
SOB	When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless
Activity	I am not limited doing any activities at home	0 1 2 3 4 5	I am very limited doing activities at home
Confidence	I am confident leaving my home despite my lung condition	0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition
Sleep	I sleep soundly	0 1 2 3 4 5	I don't sleep soundly because of my lung condition
Energy	I have lots of energy	0 1 2 3 4 5	I have no energy at all

A symptom based approach – CAT

COPD Self Assessment Test

Score/40

- mild 0-10
- mod 10-15
- severe 15-25
- very severe 25-40

Basis on which to establish

- overall disability
- specific disabilities and
- response to treatments

Mr Smith's history – CAT Score 1

- Cough – no morning or night-time cough, coughs with colds and chest infections only
- Phlegm - no morning or night-time phlegm, phlegm with colds and chest infections only
- Chest tightness –feels chest tightness with walking up hills or one flight of stairs, or with colds or chest infections.
- Exertional breathlessness – stops for breath after 200m and after climbing 8 steps at home

Mr Smith's history – CAT Score 2

- Limited with home activities – can mow the lawn on the flat but takes longer, gardening with effort
- Confident leaving home – hesitant to walk to the local shops now, can only walk 200 m on the flat
- Sleep – sleeps on 2-3 pillows to help breathing, not generally woken by breathlessness or cough, up to toilet 2-3 times to pass urine
- Energy levels – a bit frustrated as only leaves house for “trips in the car”, no longer playing golf, feels tired after outings to see friends or family.

CAT Score – patient data

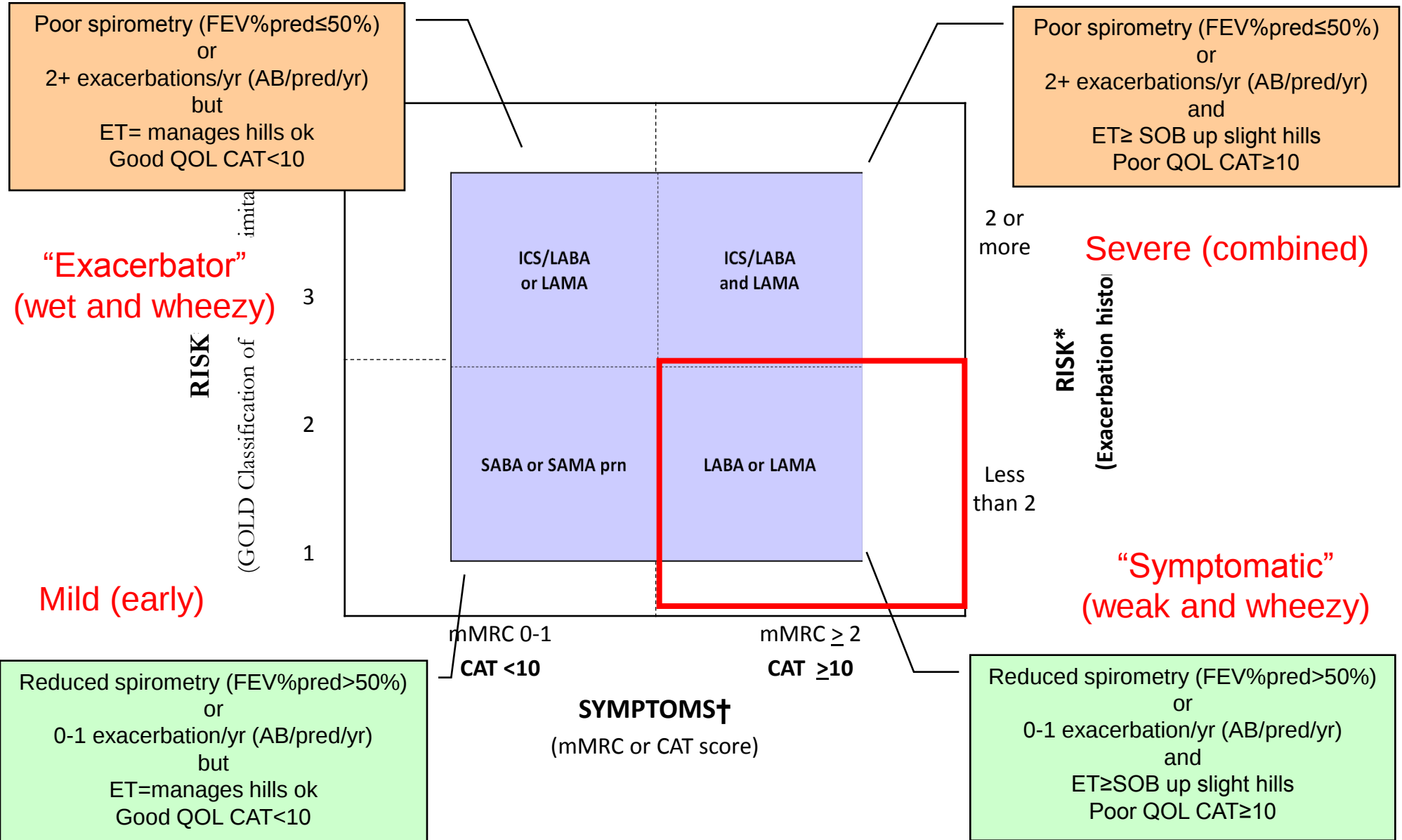
I never cough	0 ☒ 2 3 4 5	I cough all the time	1
I have no phlegm (mucus) in my chest at all	0 ☒ 2 3 4 5	My chest is completely full of phlegm (mucus)	1
My chest does not feel tight at all	0 1 ☒ 3 4 5	My chest feels very tight	2
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 ☒ 5	When I walk up a hill or one flight of stairs I am very breathless	4
I am not limited doing any activities at home	0 1 2 ☒ 4 5	I am very limited doing activities at home	3
I am confident leaving my home despite my lung condition	0 1 2 3 ☒ 5	I am not at all confident leaving my home because of my lung condition	4
I sleep soundly	0 1 ☒ 3 4 5	I don't sleep soundly because of my lung condition	2
I have lots of energy	0 1 2 ☒ 4 5	I have no energy at all	3
Scoring range 0-40		Total score	20

CAT Score/40

- mild 0-10
- mod 10-15
- severe 15-25
- very severe 25-40

Severe

New GOLD-defined patient groups



Diagnosis, Assess & Manage COPD

Diagnose

Assess

Manage

- Manage – reduce risk and reduce symptoms

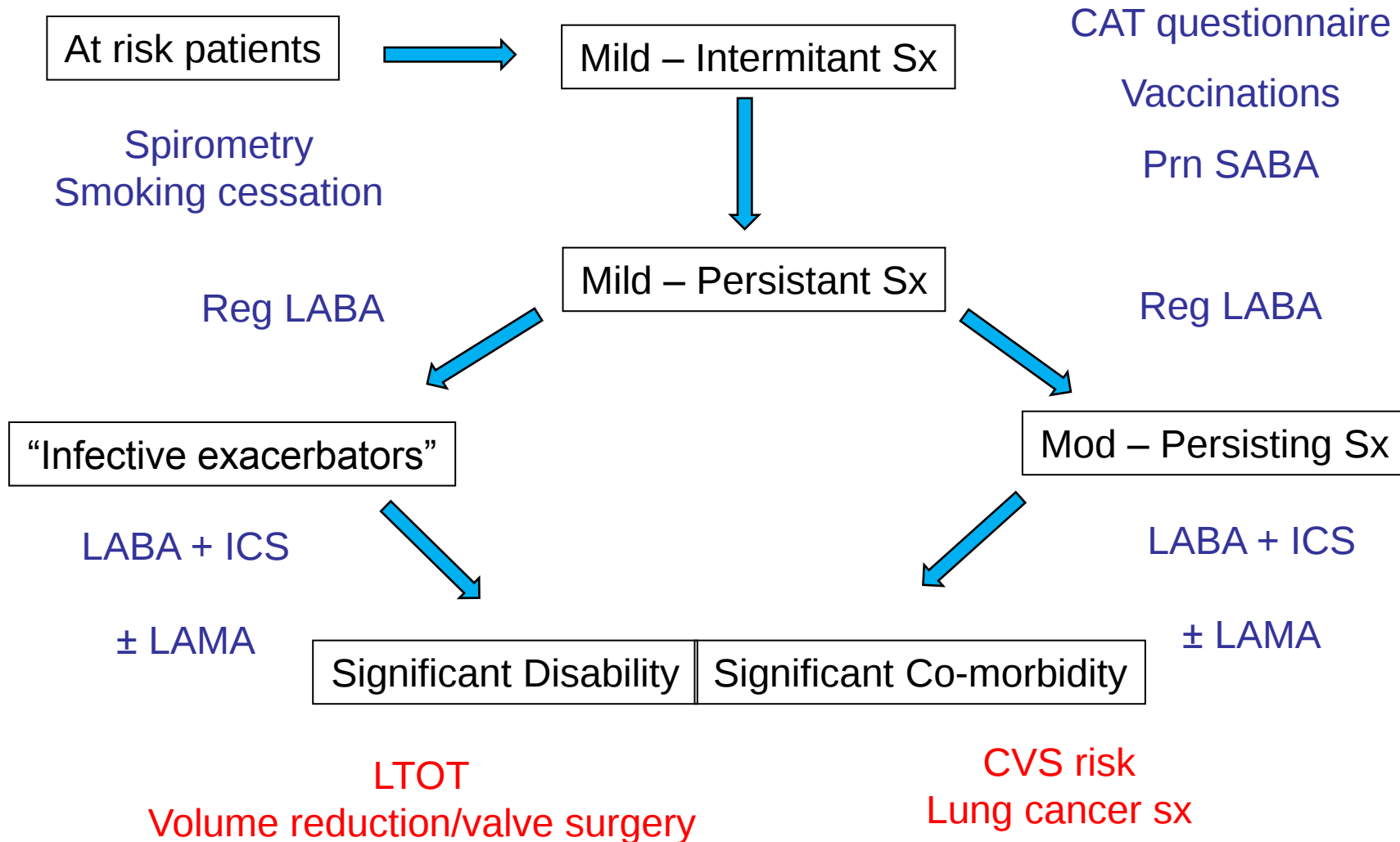
expiratory flow (spirometry, PEEP)

Symptom score

Expiratory flow

Xacerbation risk

Management of COPD - summary



A symptom based approach

- Smoking and aero-pollutant (dust) avoidance
- Yearly Flu vaccination, 5 yearly pneumococcal vaccination and regular exercise
- Exertional SOB- prn bronchodilators (SABA)
- Fatigue + poor ET – reg bronchodilators (LABA and LAMA (*FEV1<60% predicted for Tiotropium))
- LRTI/bronchitis/AECOPD – Inhaled corticosteroids with LABA or LAMA (*FEV1<60% predicted)
- 2+ Hospitalisations/yr – triple therapy

A symptom based approach

HEED study

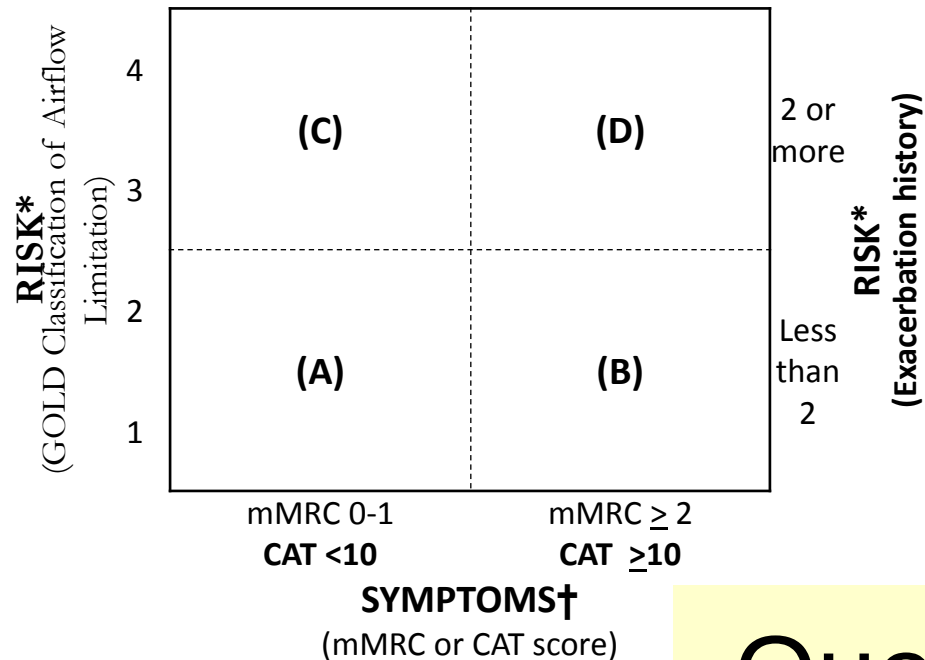
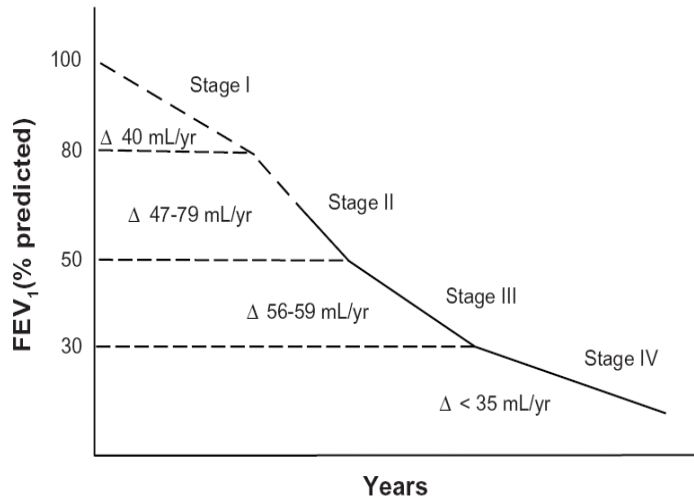
- Lung function alone is a poor predictor of symptoms
- Symptoms of COPD should be assessed regularly in patients with COPD (self administered CAT questionnaire, www.catestonline.co.uk)
- Reduced exercise tolerance was seen in 70% with mild disease (%predFEV1>80%) and 74% with moderate disease (%predFEV1 50-80%).

Treatment options in COPD – a symptom based approach

- Spirometry – document severity of airways obstruction (confirm diagnosis, end organ damage)
- Establish – symptom profile (CAT) , tendency to LRTI, AECOPD, hospitalisation for acute exacerbations (direct inhaler treatment).
- Consider COPD a CVS risk factor
- Consider COPD a precursor to lung cancer

Summary table of new recommendations

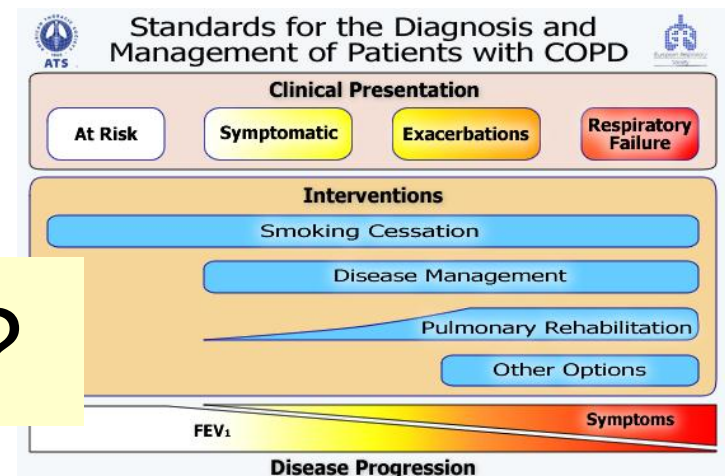
Disease Severity		Phenotypic features	Treatment
A. Mild (early)	S E X	Low Sx score - mMRC 0-1, CAT<10 and Fair Spirometry - FEV ₁ GOLD 1-2, and Low exacerbation rate - 0-1/yr	SABA or SAMA (prn)
B. Moderate – symptomatic “Weak and Wheezy”	S E X	High Sx score - mMRC 2+, CAT≥10 and Fair Spirometry - FEV ₁ GOLD 1-2, or Low exacerbation rate - 0-1/yr	LABA or LAMA
C. Moderate – exacerbator “Wet and Wheezy”	S E X	Low Sx score - mMRC 0-1, CAT<10 and Poor Spirometry - FEV ₁ GOLD 3-4, or High exacerbation rate - 2+/yr	ICS/LABA or LAMA
D. Severe (advanced) “Wet, Weak and Wheezy”	S E X	High Sx score - mMRC 2+, CAT≥10 and Poor Spirometry - FEV ₁ GOLD 3-4, and High exacerbation rate - 2+/yr	ICS/LABA and LAMA
Exacerbation = symptoms of increased cough, SOB ± sputum that required a course of ABs ± prednisone Spirometry FEV ₁ /FVC<70% with FEV ₁ ≥ 50% predicted (GOLD1-2) or FEV ₁ <50% predicted (GOLD3-4)			



I never cough	0 1 2 3 4 5	I cough all the time	1
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	My chest is completely full of phlegm (mucus)	1
My chest does not feel tight at all	0 1 2 3 4 5	My chest feels very tight	2
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	When I walk up a hill or one flight of stairs I am very breathless	4
I am not limited doing any activities at home	0 1 2 3 4 5	I am very limited doing activities at home	3
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	I am not at all confident leaving my home because of my lung condition	4
I sleep soundly	0 1 2 3 4 5	I don't sleep soundly because of my lung condition	2
I have lots of energy	0 1 2 3 4 5	I have no energy at all	5

Scoring range 0-40

Total score 22



Questions?

Case Presentation



Diagnosed with asthma and treated with antibiotics, inhalers and a short course of prednisone.....

Symptoms of breathlessness improved

Case Presentation

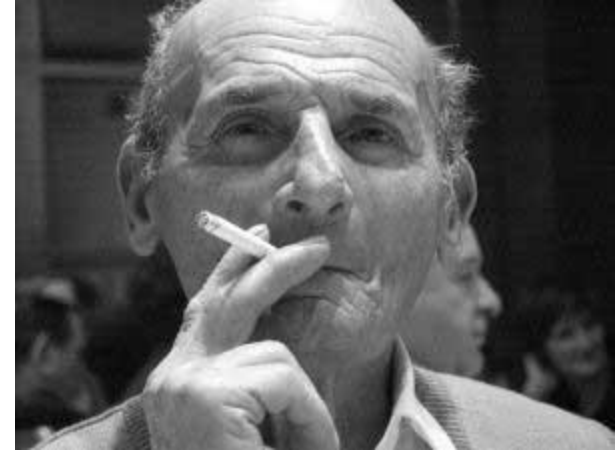


Diagnosed with asthma and treated with antibiotics, inhalers and a short course of prednisone.

Symptoms of breathlessness improved.....

But cough persisted for 6 months

Case Presentation



CXR was normal but **CT confirmed 2.5 cm LUL mass with +nodes**

Bronchoscopy confirmed squamous cell lung cancer

Diagnosed with asthma and treated with
inhalers.....

but cough persisted for 6 months

CXR showed an opacity and **CT**
confirmed 3 cm LUL mass with
+nodes

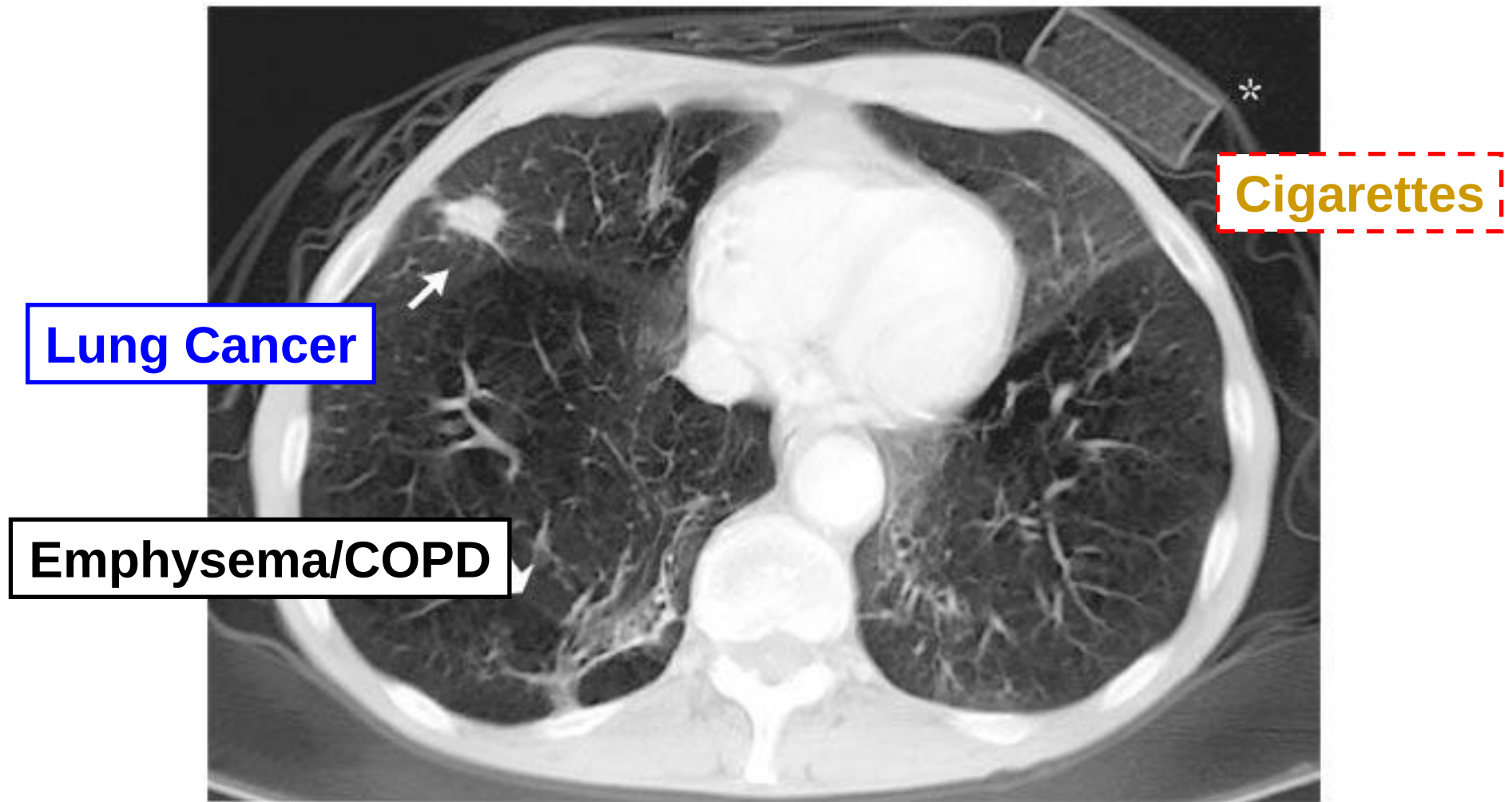
Bronchoscopy confirmed squamous
cell LC



CXR

Low sensitivity for
detecting non-Ca
pulmonary nodules

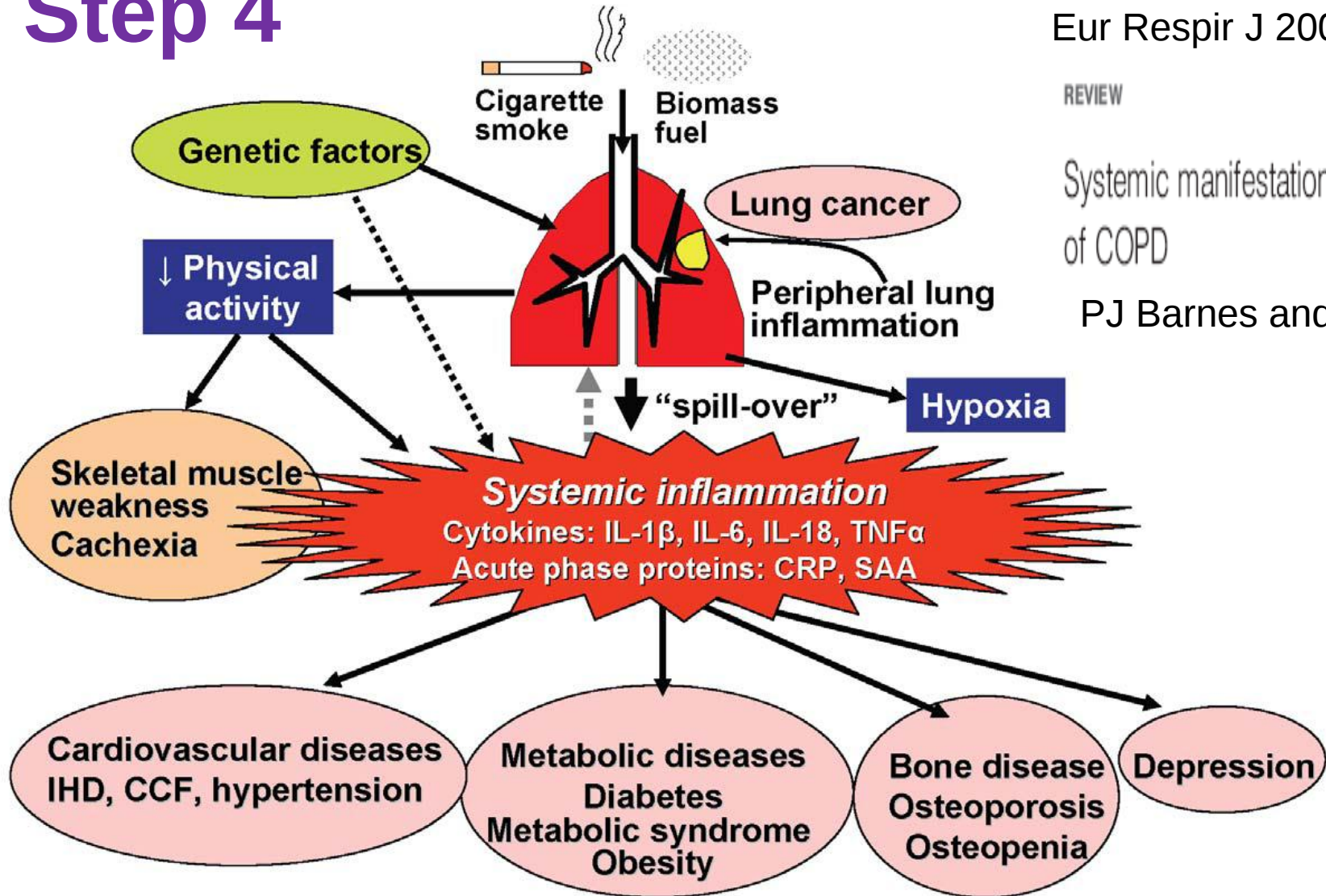
COPD overlap with lung cancer



- Progress: Patient underwent several courses of chemotherapy with small effect
- Died 18 months later
- Reflections: Patients express
 - have feeling of guilt and regret
 - acknowledge they should have given up sooner
 - acceptance they are “to blame” although some identify other “exposures” that might have been relevant

Recent studies report that over 50% of smokers and ex-smokers who get lung cancer did not think they were at risk!

Step 4



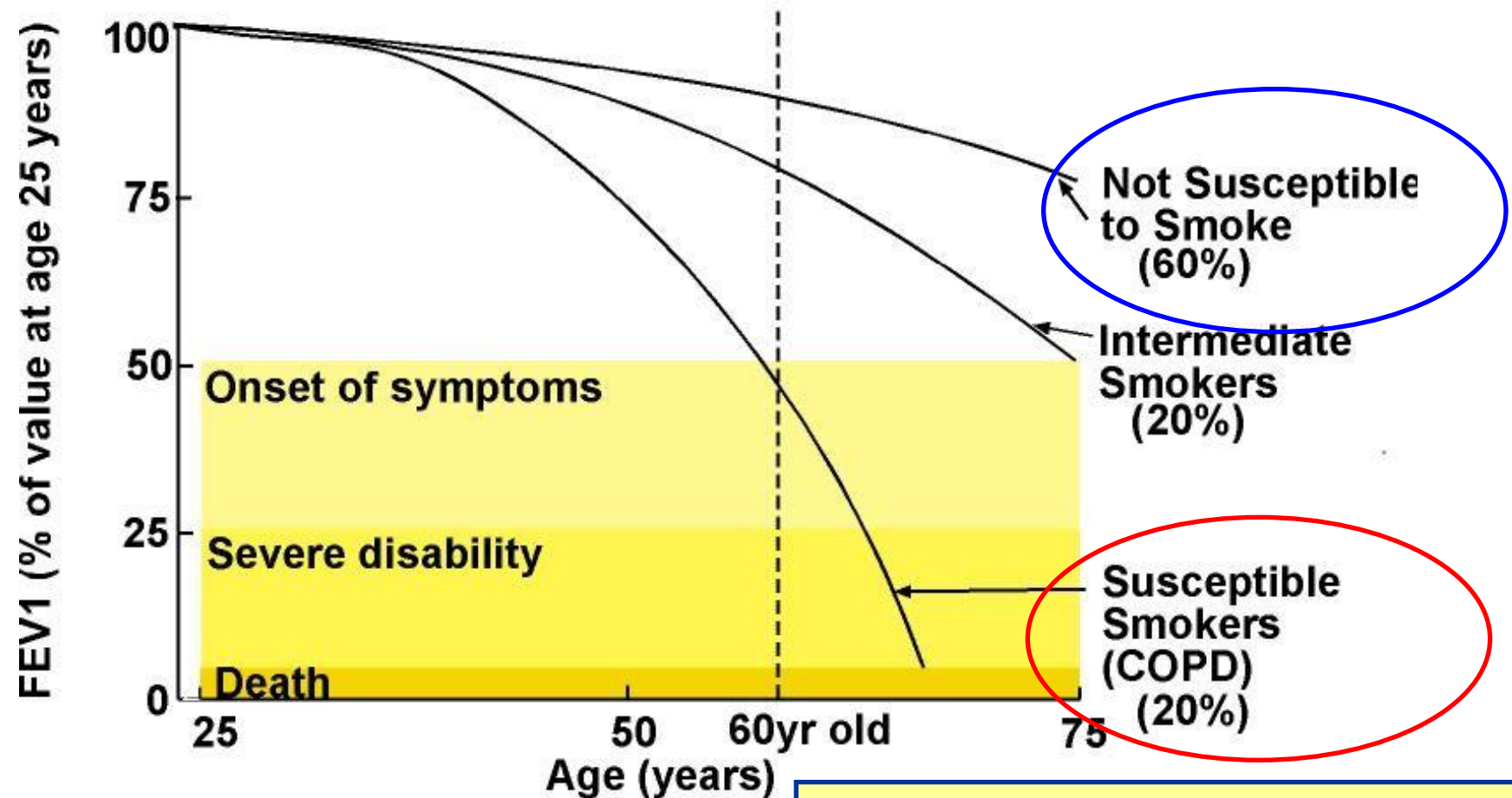
Eur Respir J 2009; 33: 1165-85.

REVIEW

Systemic manifestations and comorbidities
of COPD

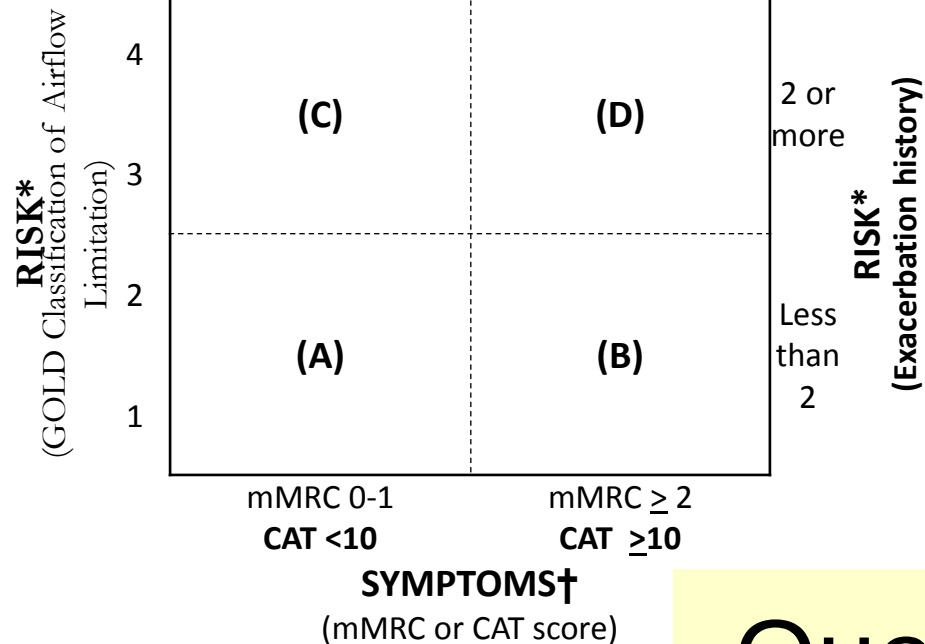
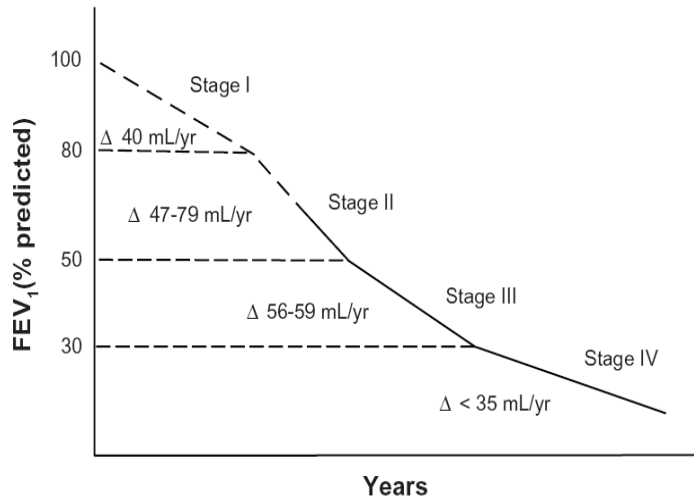
PJ Barnes and BR Celli

Decline of Lung Function: variable susceptibility



↓FEV1: other morbidities apart from COPD

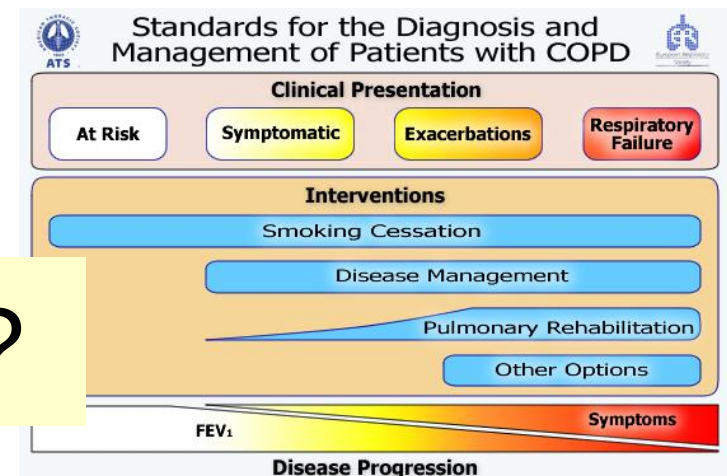
- 5x ↑Lung cancer
- 5x ↑ heart attack
- 2-3x ↑ stroke (Young et al. ERJ 2007)



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Total score 22

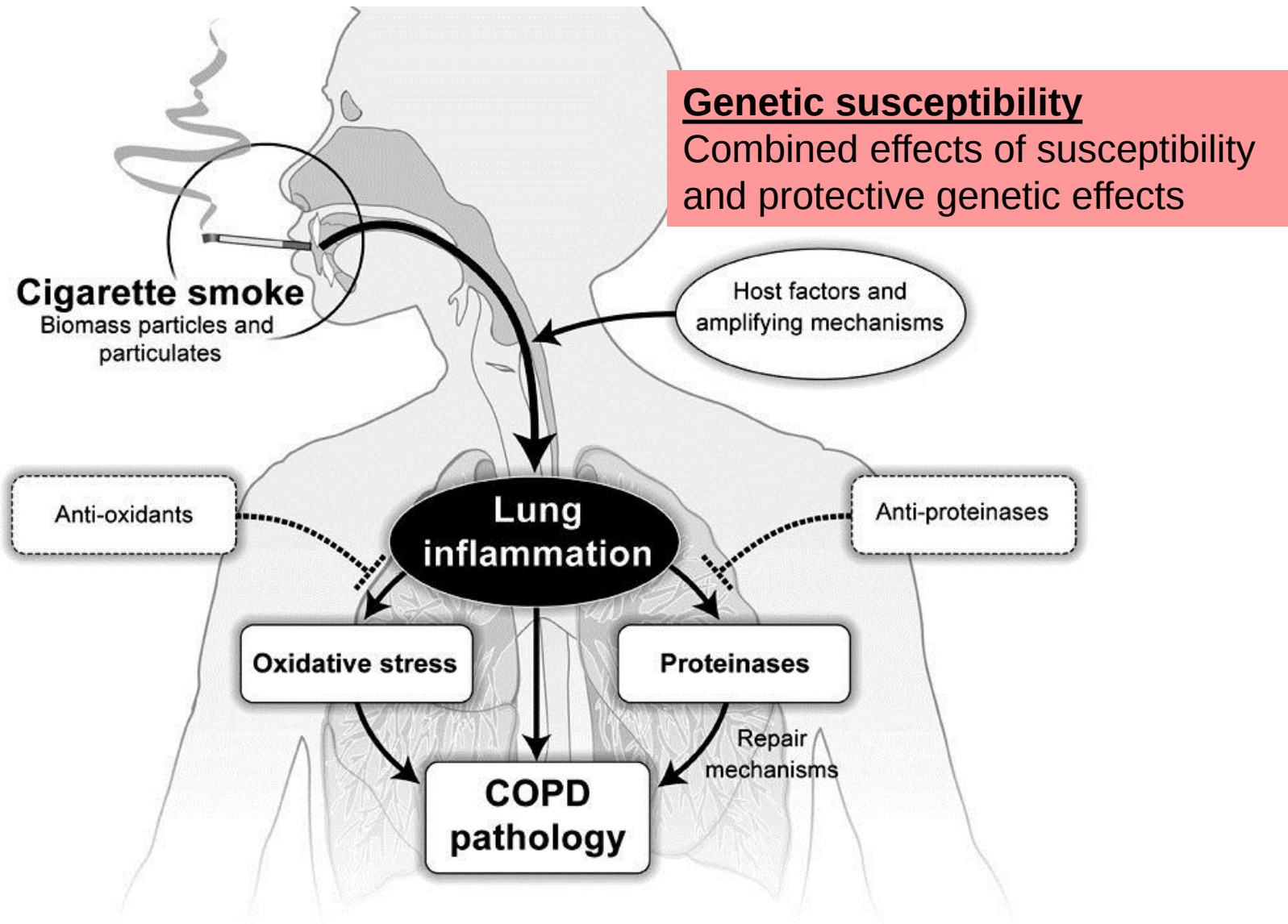


Questions?

What is COPD and why diagnose it

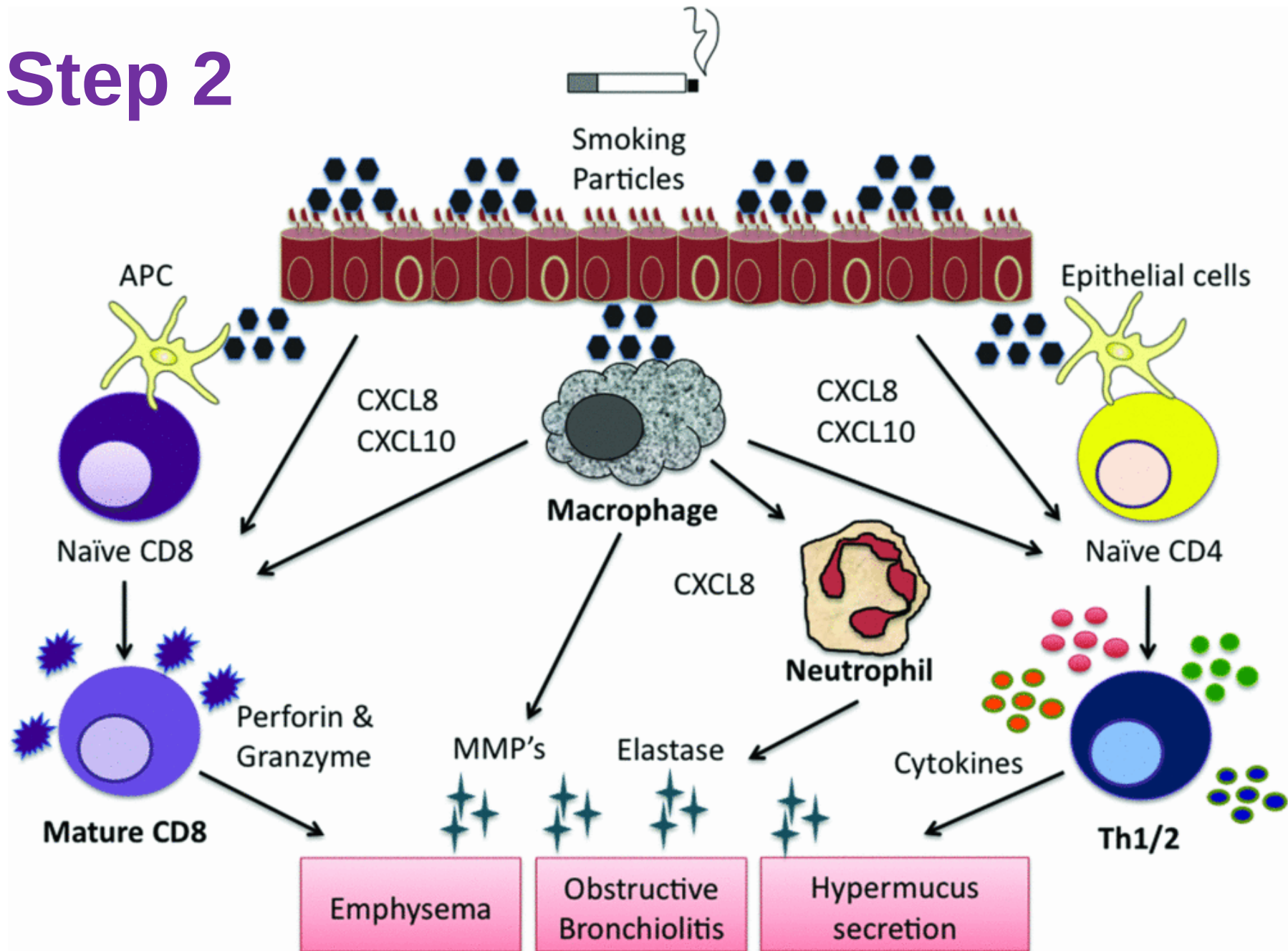
- Results from genetic susceptibility and aero-pollutant (smoking) exposure
- Neutrophilic airway inflammation
- Presents with
 - exertional breathlessness and LRTI (cough, sputum, wheeze and SOB)
 - Fatigue and poor exercise tolerance
- Systemic inflammation and co-morbidities
- Precursor illness to 70-80% of all lung cancer

Step 1



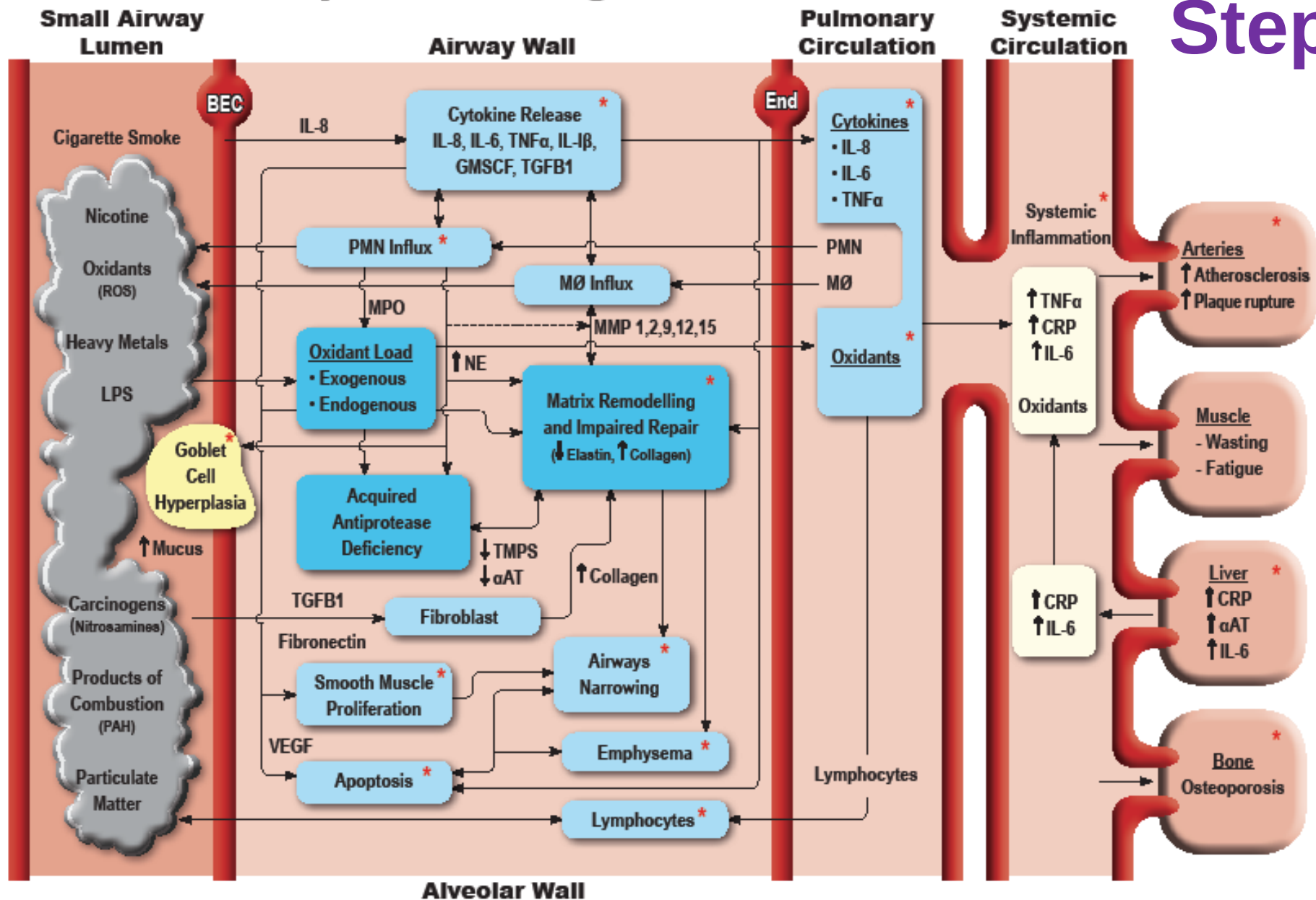
Reprinted with permission from the Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease, Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2009. Available from: <http://www.goldcopd.org>.

Step 2



Proposed Pathogenesis of COPD

Step 3



Young RP, et al. (European Respir Review 2009)

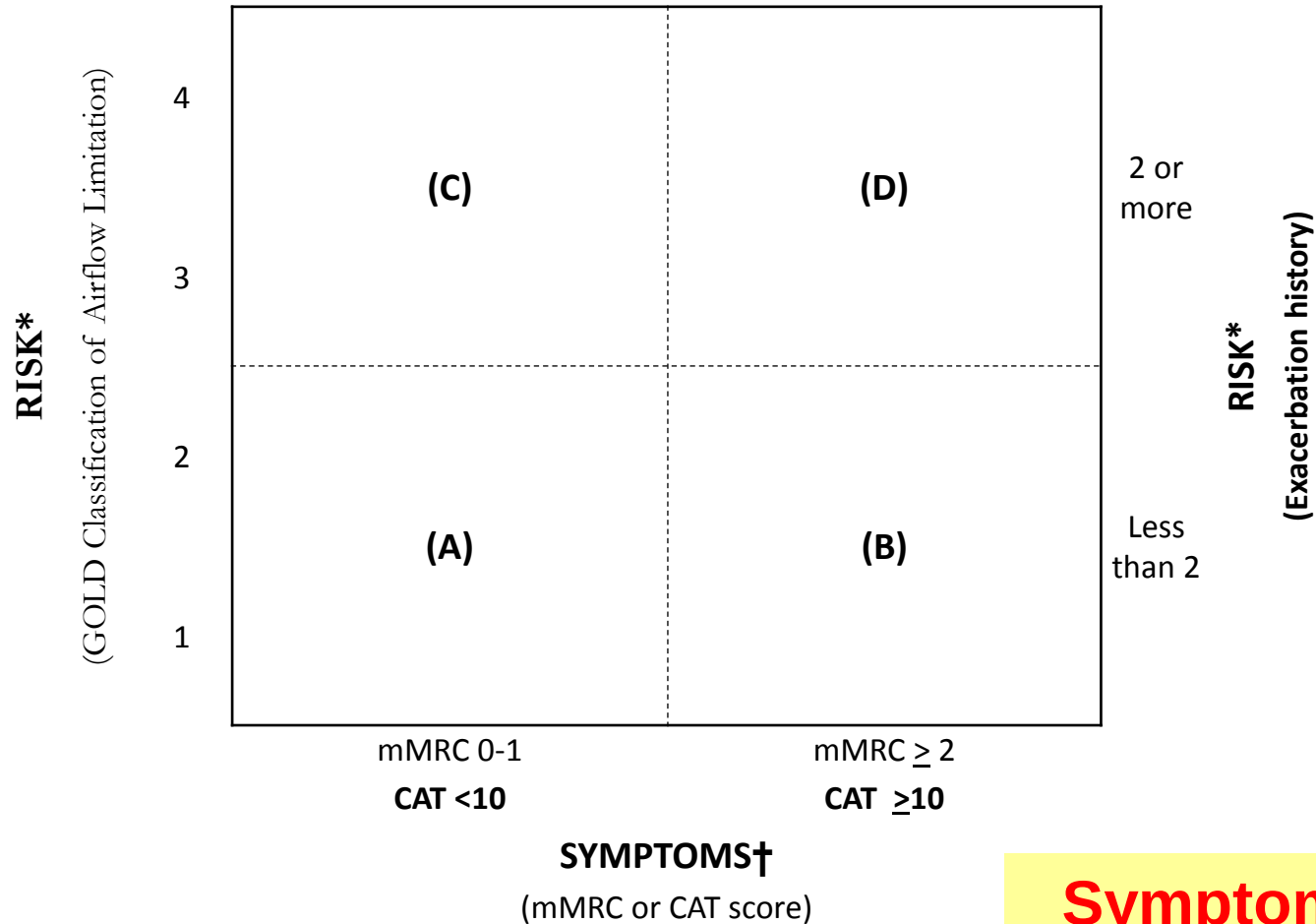
A symptom based approach

Eclipse study

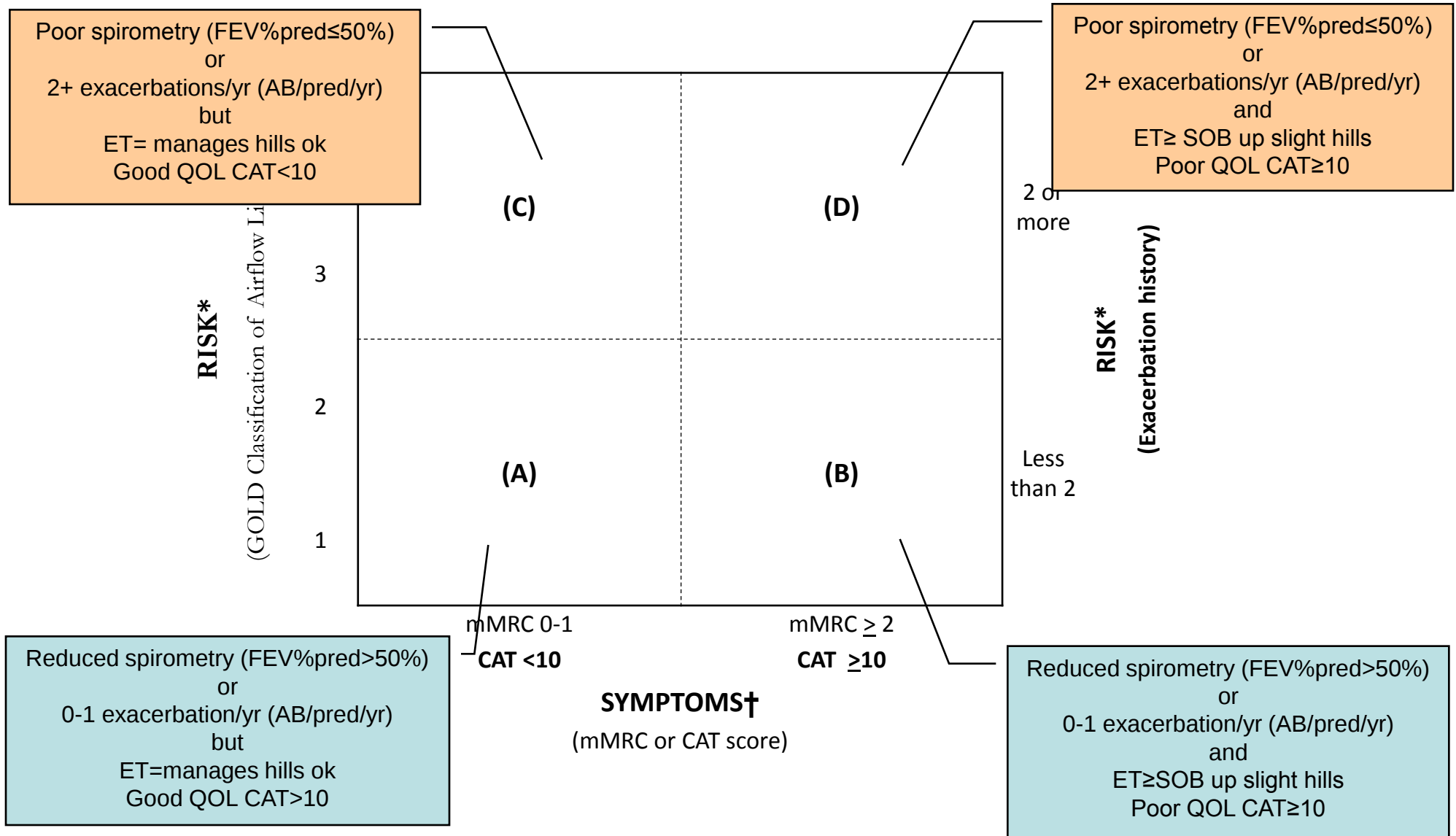
- “Frequent exacerbator*” is a specific type of COPD that requires aggressive treatment with combination therapy (preferably fixed dose ICS and LABA)
- “Frequent exacerbators” may be found in those with moderate COPD (22%) and not just severe disease (30-50%).

* 2+ exacerbations per year

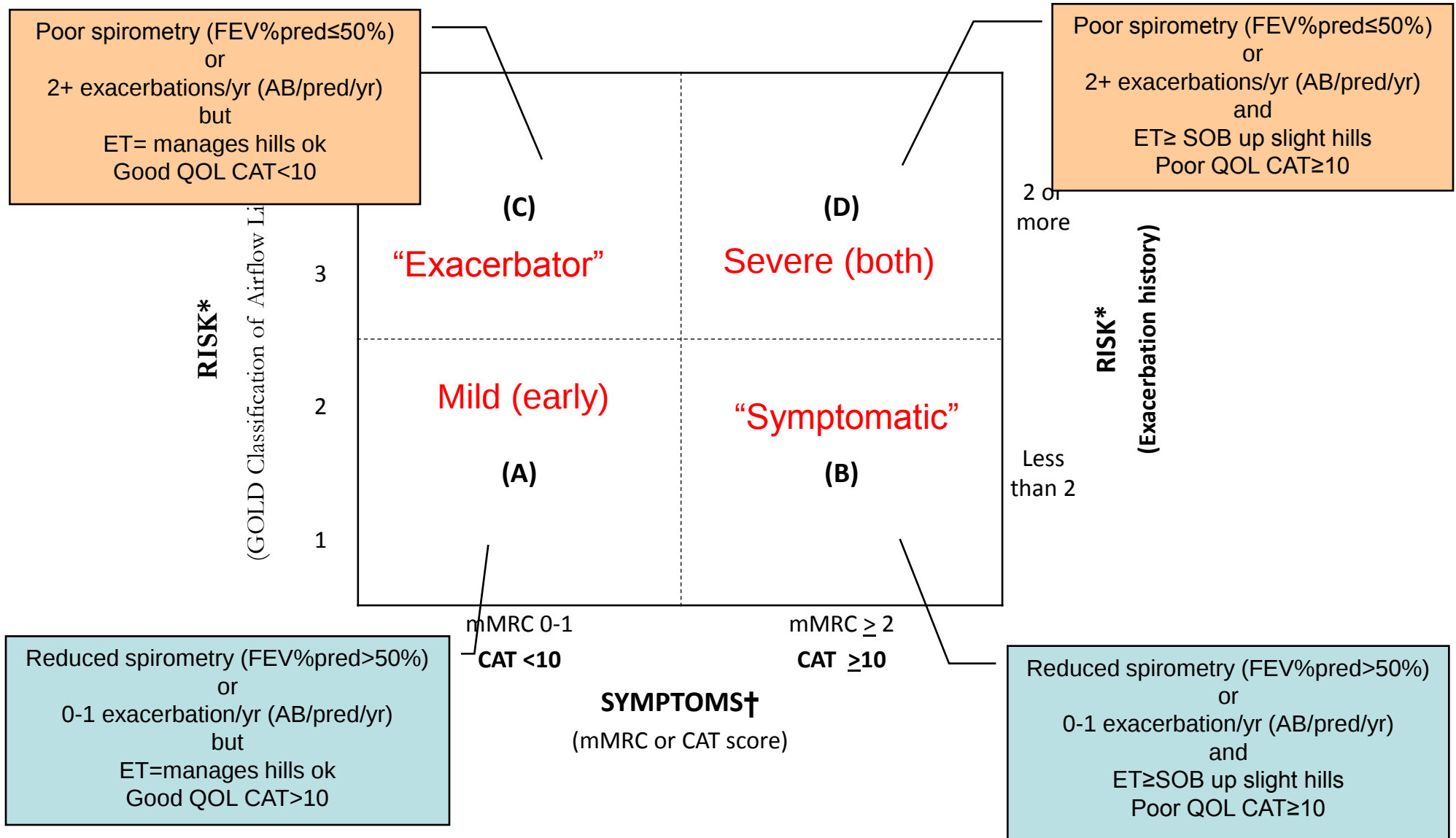
New GOLD patient groups



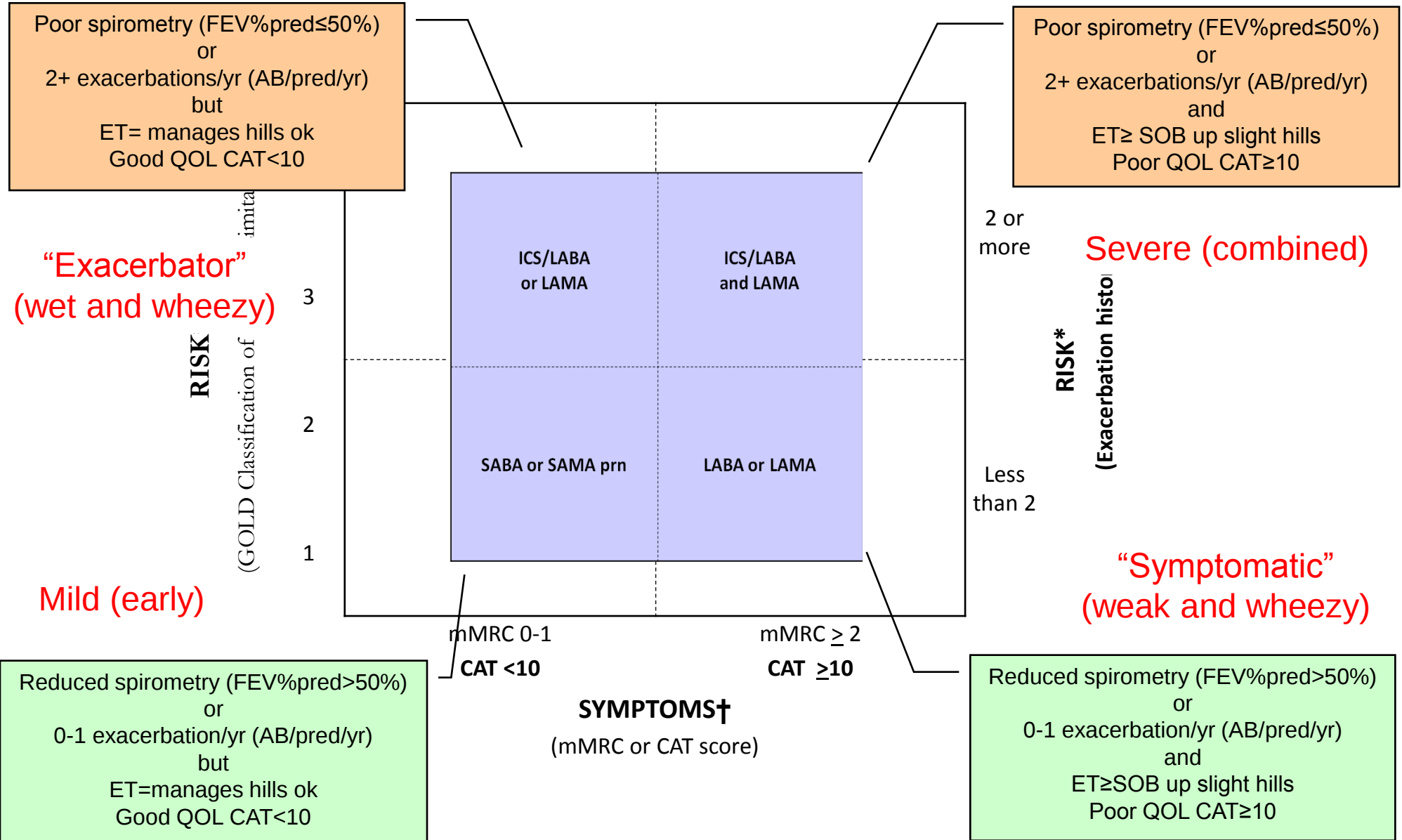
New GOLD-defined patient groups



New GOLD-defined patient groups



New GOLD-defined patient groups



Beyond the airways

- Muscle fatigue, muscle weakness and cachexia (pulmonary rehab and optimised nutrition)
- Cardiovascular disease, stroke, CHF, pulmonary hypertension (aspirin, statin and β -blockers)
- Insulin resistance, metabolic syndrome, obesity (exercise, calorie restriction, weight loss)
- Osteoporosis (bisphosphonates)

Beyond the airways

- Future treatments will look to reduce [dynamic] hyperinflation measured as IC/TLC ratio rather than to use FEV_1 as a measure of outcome.
- Recent studies suggest that statins reduce hyperinflation by reducing inflammation, improving endothelial function and dilating small airways (clinical trial underway).
- Role of cardiovascular drugs in reducing CVS risk during COPD exacerbations

COPD and lung cancer

- COPD increases the risk of lung cancer by 4-6 fold compared to smokers with normal lung function.
- 70-80% of lung cancer has pre-existing COPD
- 20-30% of deaths in COPD are from lung cancer

COPD overlap with lung cancer

