



La coesistenza di BPCO e HF nell'anziano: epidemiologia, diagnosi differenziale nelle riacutizzazioni, adeguatezza terapeutica e stratificazione prognostica

Francesco Perticone

# Heart failure and chronic obstructive pulmonary disease: the challenges facing physicians and health services

- ✓ COPD and HF are common diseases of the elderly, the application of the FEV1/FVC ratio for COPD diagnosis in older persons doesn't take into account the age-associated physiological decline (overdiagnosis of COPD)
- ✓ Overlap in symptoms and signs: exertional breathlessness, nocturnal cough, and paroxysmal nocturnal dyspnoea are common to both conditions.
- ✓ A misdiagnosis and over-rating of COPD severity is likely in patients with HF, this may mimic an obstructive pattern compatible with COPD.

# Prevalence of COPD in patients with HF

First author, year, reference no.	n	HF phenotype	Time point of measurements	Prevalence of COPD <sup>a</sup>	Prevalence of never-smokers in patients with COPD	Beta-blocker use, % (differences in patients with or without COPD)
Iversen, 2008 <sup>14</sup>	532	Mixed	1–3 days after hospitalization for acute HF	35% <sup>b</sup>	20%	29% (no)
	223	HFpEF (LVEF ≥45%)		41% <sup>b</sup>		
	309	HFrEF (LVEF <45%)		31% <sup>b</sup>		
Mascarenhas, 2008 <sup>22</sup>	186	HFrEF (LVEF <45%)	Stable HF, outpatients department	39%	No specification, 49% in the total cohort	87% (no)
Apostolovic, 2011 <sup>13</sup>	174	HFrEF (LVEF <45%)	Stable HF, outpatients department	27.6%	54%	100% (no)
Macchia, 2011 <sup>20</sup>	201	HFrEF (LVEF ≤40%)	Stable, outpatients department	37%	No specification for GOLD-COPD	Not mentioned
Boschetto, 2012 <sup>24</sup>	118	Mixed (mean LVEF 40%)	Stable HF, outpatients department	30%	0%, > 10 pack-years of smoking was an inclusion criterion	83% (no)
Steinacher, 2012 <sup>26</sup>	89	Mixed (3% HFpEF)	Stable, outpatients department	44%	No specification for GOLD-COPD	98% (no)
Brenner, 2013 <sup>4</sup>	272	HFrEF (LVEF <40%)	3–5 days after hospitalization for acute HF	19%		92% (no)
	619	HFrEF (LVEF <40%)	Stable, outpatients department	9	28%	91% (no)
Beghé, 2013 <sup>25</sup>	124	HFpEF	Stable, outpatients department	34%	0%, > 10 pack-years of smoking was an inclusion criterion	83% (no)
Minasian, 2013 <sup>23</sup>	187	HFrEF (LVEF <40%)	Stable, outpatients department	32	5%	92% (no information on differences)
Minasian, 2013 <sup>21</sup>	116	HFrEF (LVEF <40%)	Stable, outpatients department	34	6%	91% (no information on differences)

FEV<sub>1</sub>, forced expiratory volume in 1 s; FVC, forced vital capacity; HF, heart failure; HFpEF heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction.  
<sup>a</sup>COPD prevalence in patients with HF according to the GOLD definition (post-bronchodilator FEV<sub>1</sub>/FVC ratio <0.7).  
<sup>b</sup>Exclusion of GOLD stage I patients (FEV<sub>1</sub>>80% of predicted).

# Co-morbidities in patients with heart failure: an analysis of the European Heart Failure Pilot Survey

**Table 2 Prevalence of co-morbidities in patients with heart failure with reduced ejection fraction and in patients with heart failure with preserved ejection fraction**

	<b>HFrEF (LVEF &lt;40%)</b>	<b>HFpEF (LVEF ≥40%)</b>	<b>P-value</b>
Chronic kidney disease	541 (41)	383 (39)	0.381
Anaemia	349 (28)	306 (30)	0.130
Diabetes	470 (30)	343 (28)	0.191
COPD	255 (16)	173 (14)	0.101
Stroke	166 (11)	129 (10)	0.892
Sleep apnoea	69 (4)	49 (4)	0.578
Hypothyroidism	152 (10)	96 (8)	0.062
Hyperthyroidism	54 (4)	32 (3)	

# Prevalence of airflow obstruction in patients with stable systolic heart failure

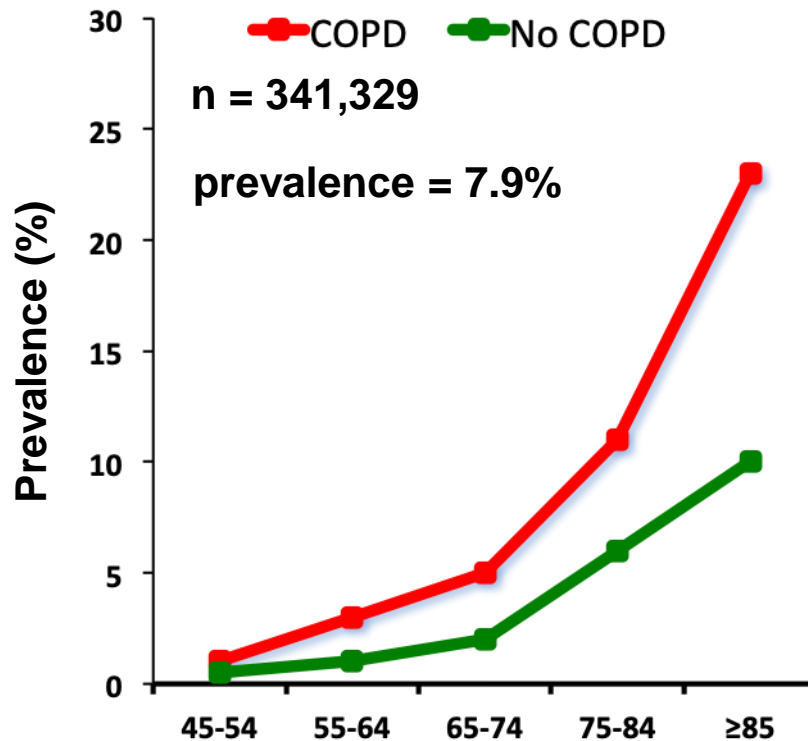
**Table 2 The association between COPD based on spirometry and self-reported COPD**

From: [Prevalence of airflow obstruction in patients with stable systolic heart failure](#)

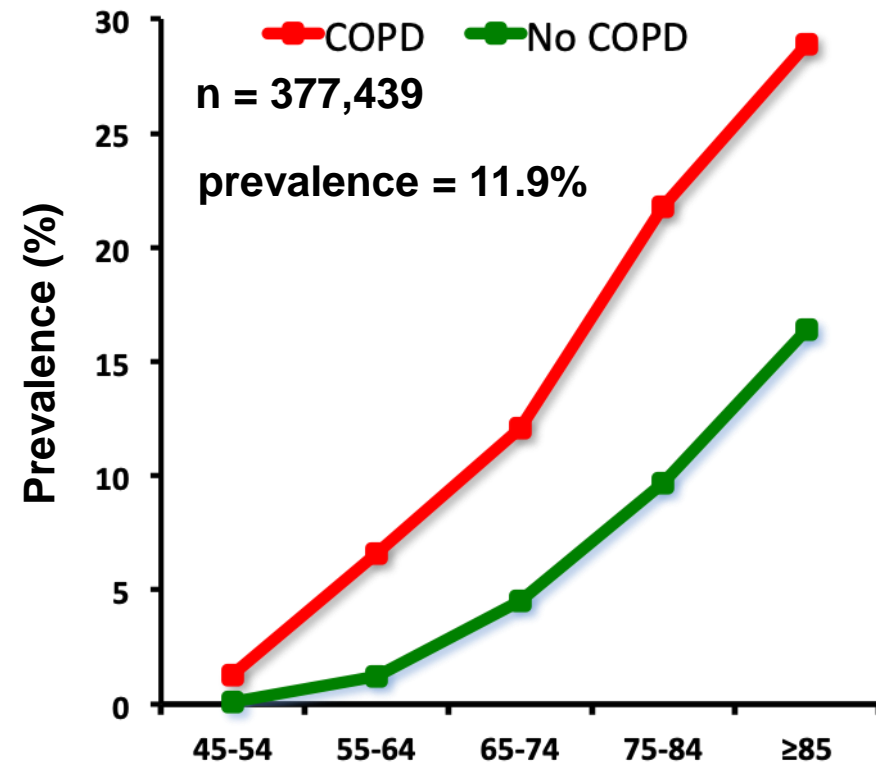
	No obstructive airflow obstruction	Obstructive airflow obstruction			
		GOLD grade of airflow obstruction			
Self-reported COPD		I	II	III	IV
Absent n (%)	333 (65%)	50 (10%)	107 (21%)	20 (4%)	1 (0.2%)
Present n (%)	24 (34%)	1 (1%)	27 (38%)	18 (25%)	1 (1%)

# How common is CHF in COPD?

Italian Health Search Database



Scottish Continuous Morbidity Record





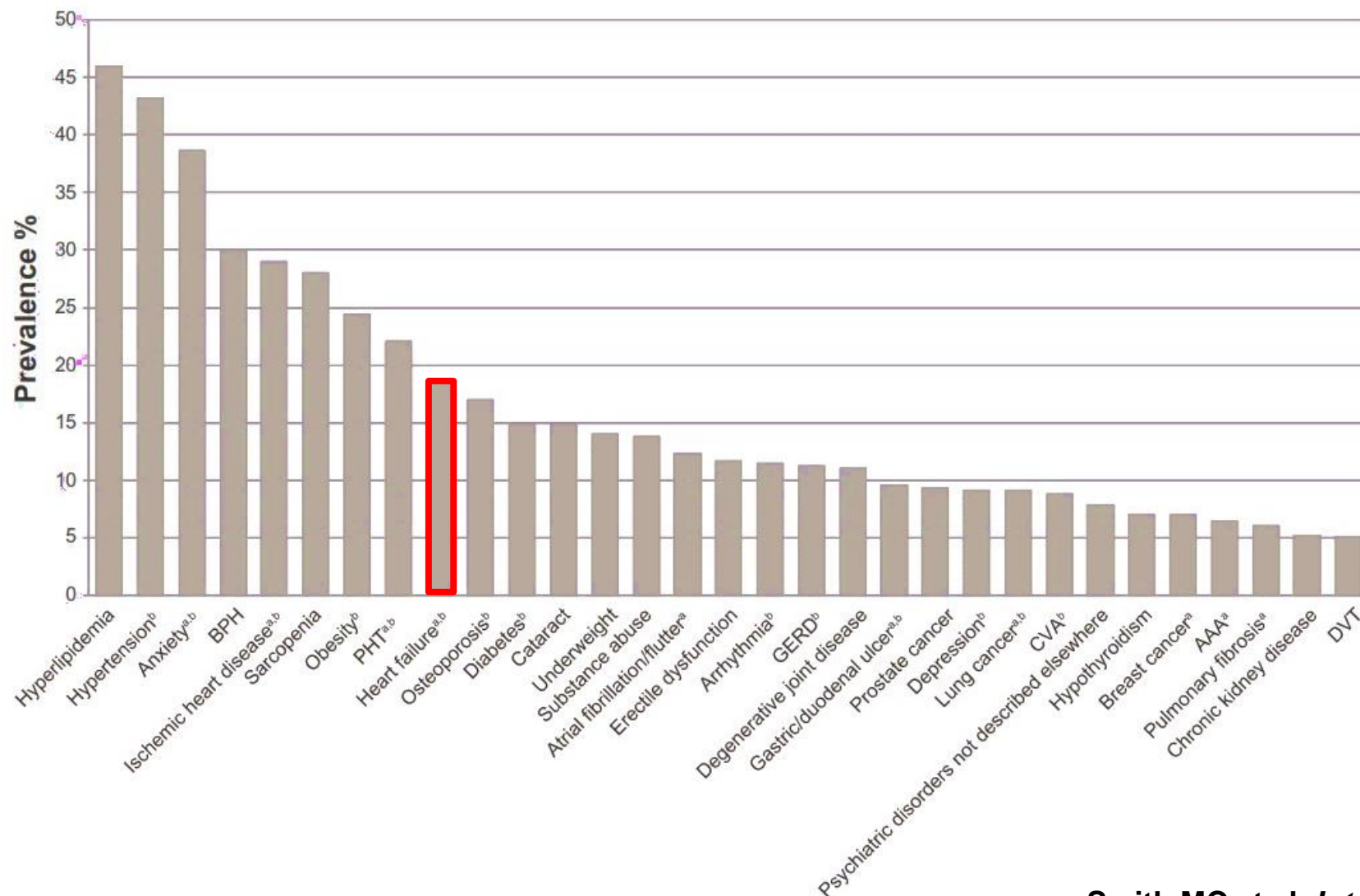
**COPD pts**

**HF = 8-27%**

**CAD = 15-25%**

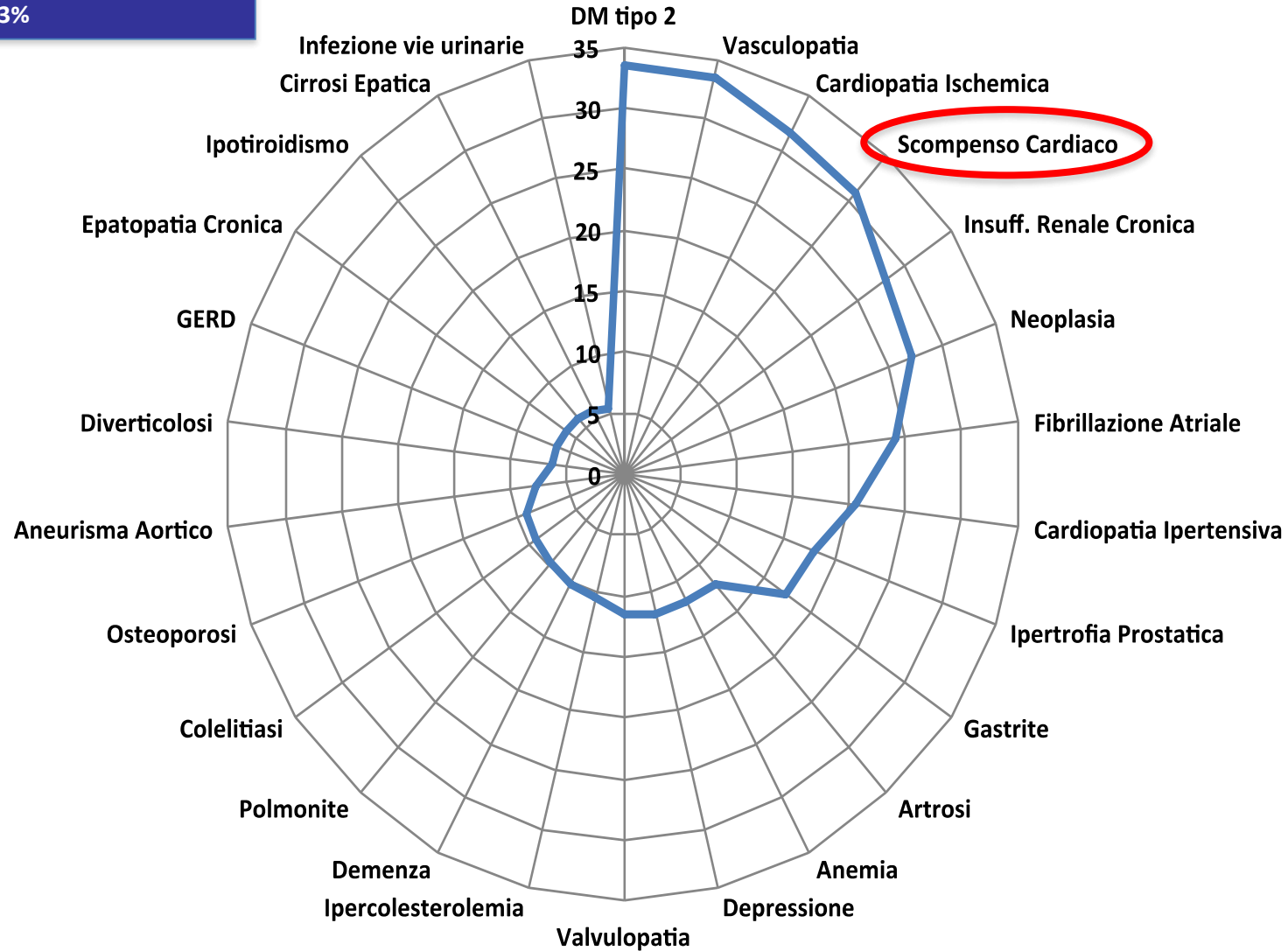
**HF pts**

**COPD = 20-30%**



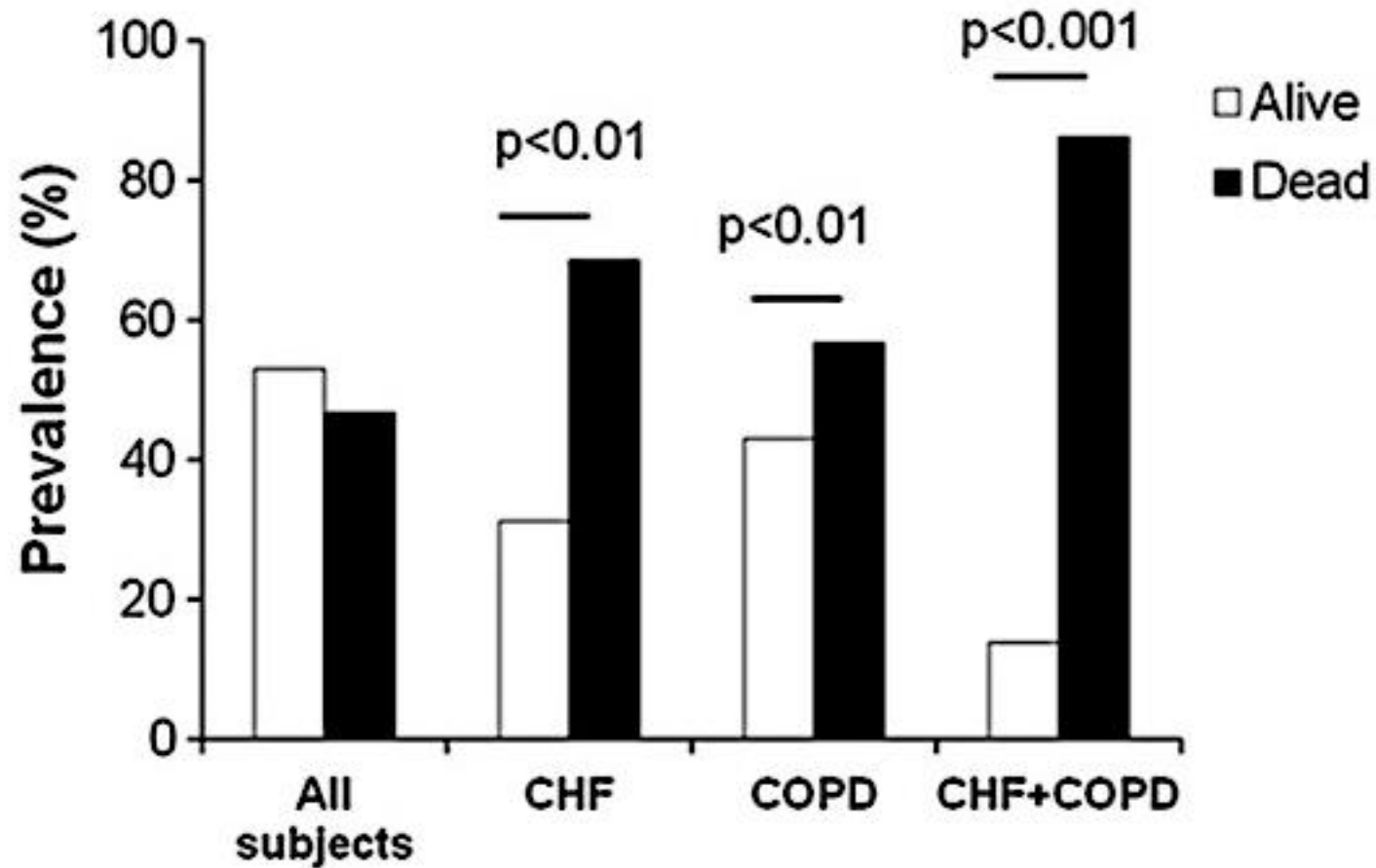
# Il Paziente REPOSI con BPCO

Ipertensione arteriosa essenziale → 79,9%  
Donne 39,7% - Uomini 61,3%

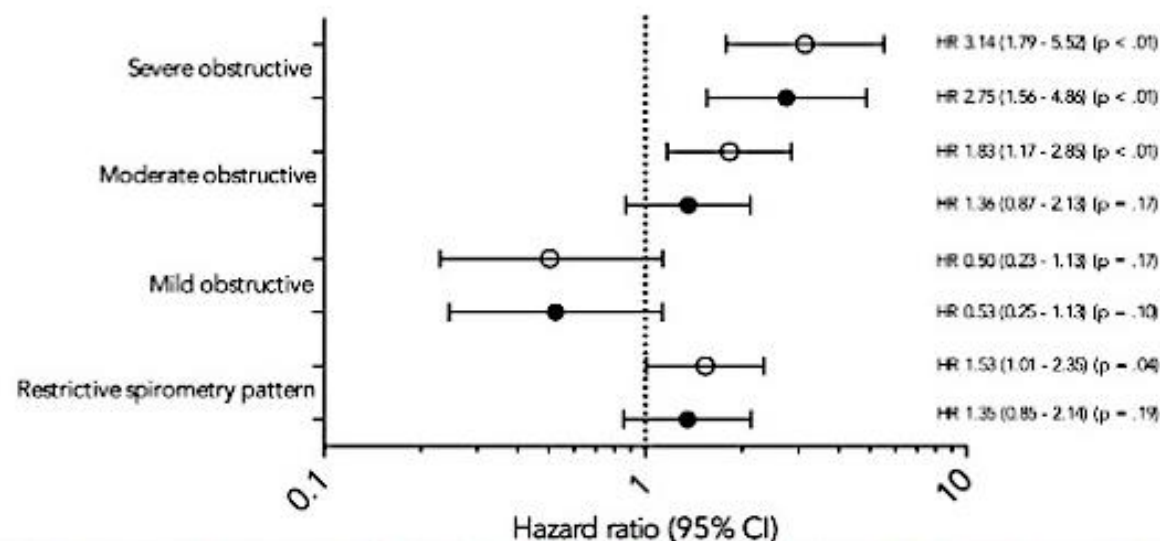
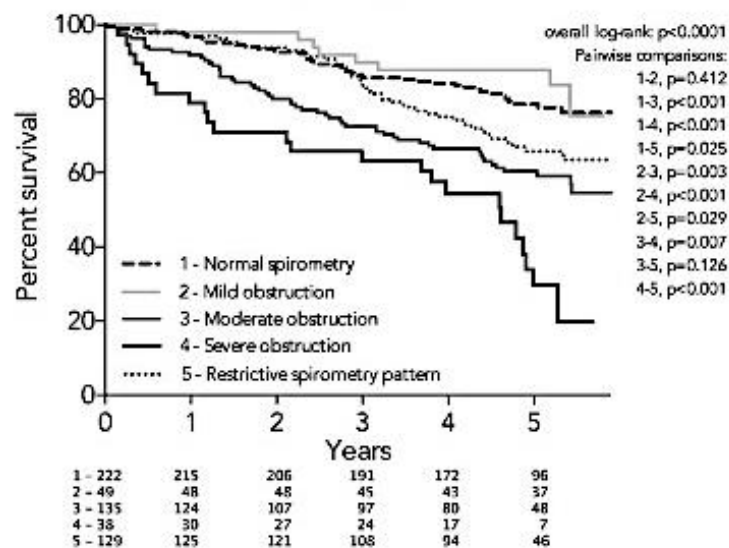




# Long-term mortality in COPD and HF in elderly



# Prognostic significance of lung function in stable HF

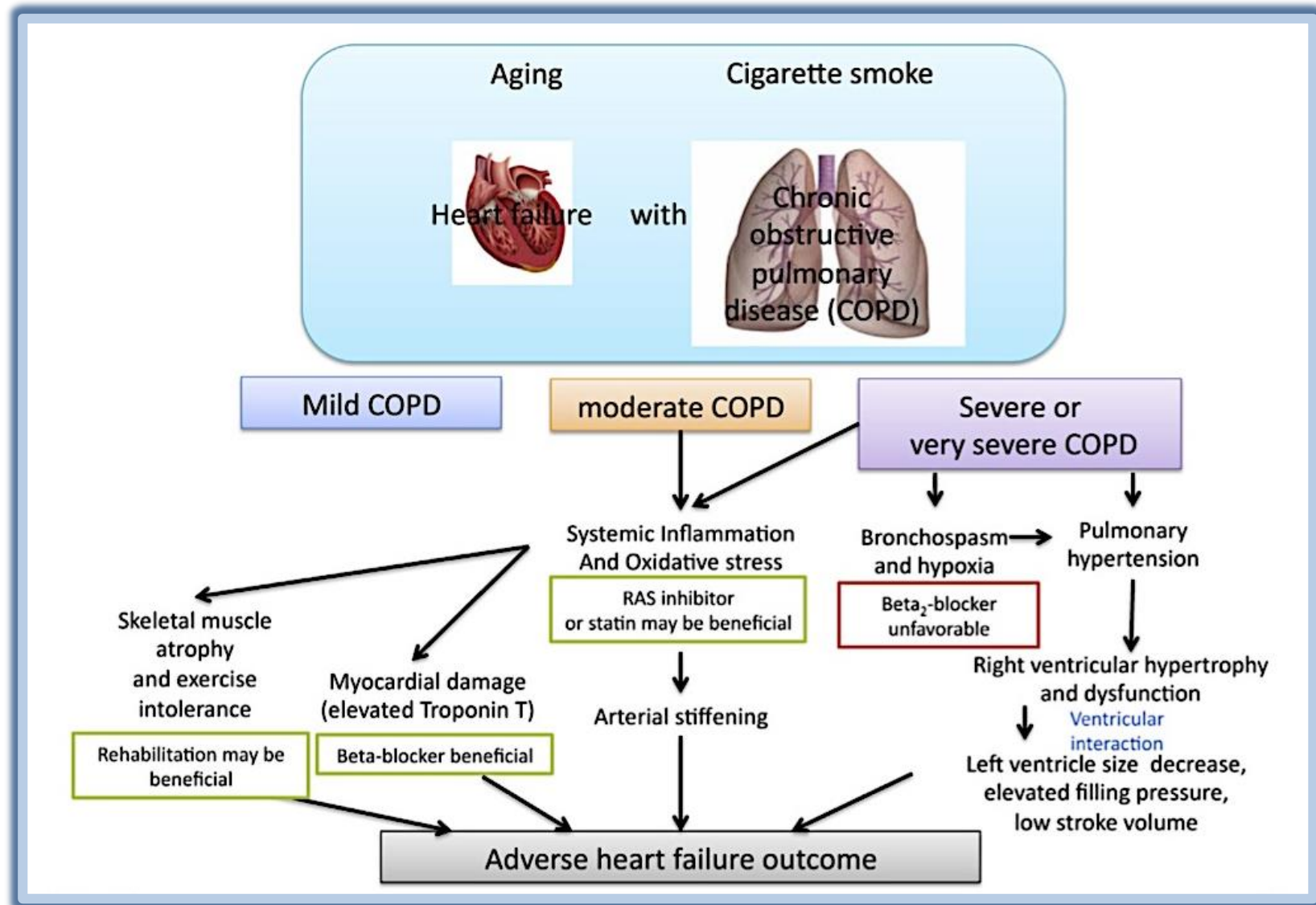


**TABLE 2** Prognostic value of FEV<sub>1</sub> and FVC in HF patients stratified according to lung function using GOLD criteria

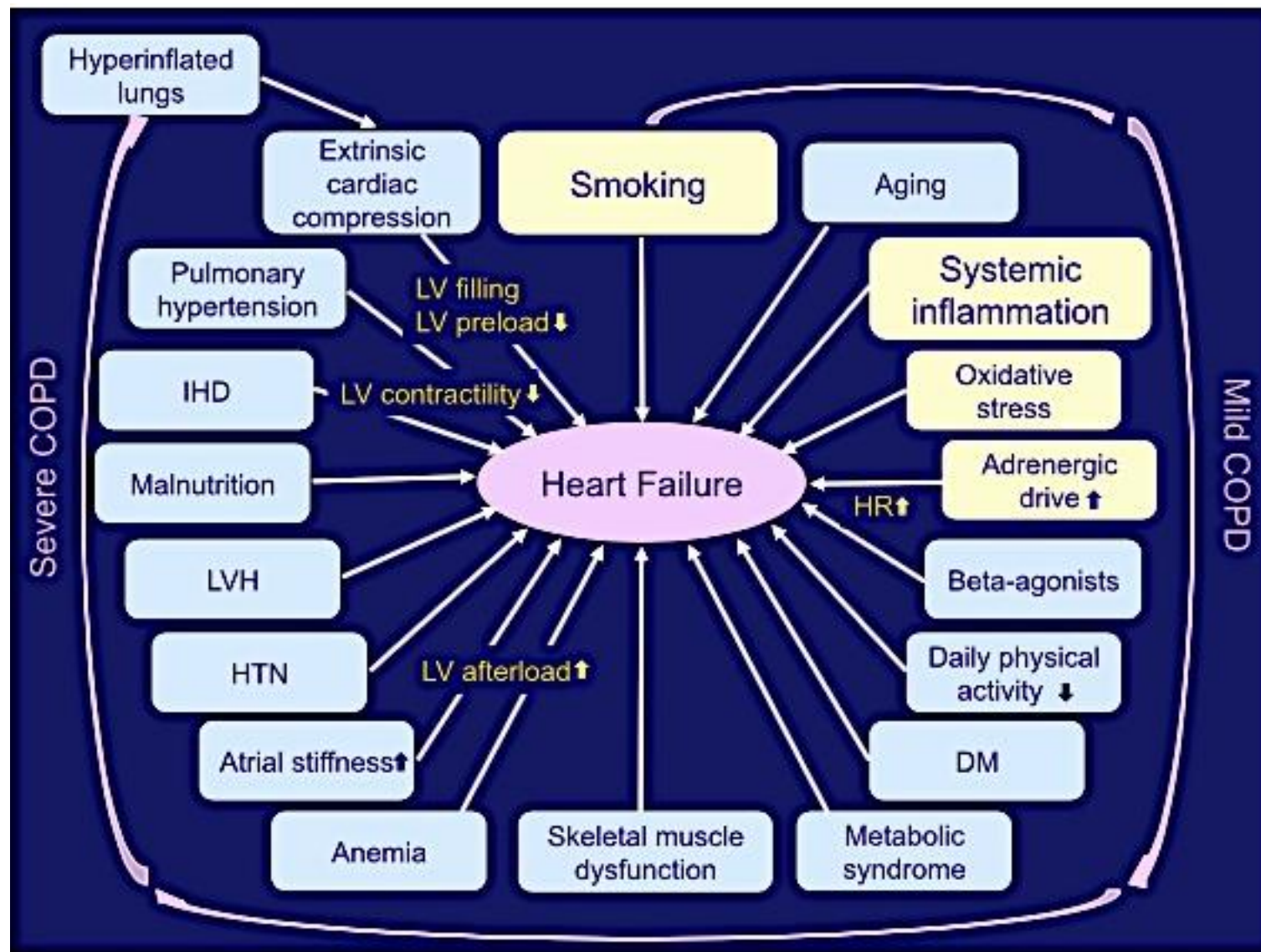
		Univariate HR (95% CI)	P Value	Multivariate HR (95% CI) <sup>a</sup>	P Value
Obstructive airflow limitation, n = 222	FEV <sub>1</sub> % (per 10% decrease)	1.35 (1.18-1.54)	<0.001	1.43 (1.21-1.68)	<0.001
	FVC % (per 10% decrease)	1.29 (1.14-1.46)	<0.001	1.33 (1.13-1.55)	<0.001
Restrictive spirometry pattern, n = 129	FEV <sub>1</sub> % (per 10% decrease)	1.29 (1.00-1.66)	0.050	1.36 (1.03-1.80)	0.031
	FVC % (per 10% decrease)	1.39 (1.08-1.79)	0.011	1.38 (1.01-1.87)	0.041

Abbreviations: CI, confidence interval; FEV<sub>1</sub>, forced expiratory volume at 1 second; FVC, forced vital capacity; GOLD, Global Initiative for Chronic Obstructive Lung Disease; HF, heart failure; HR, hazard ratio.

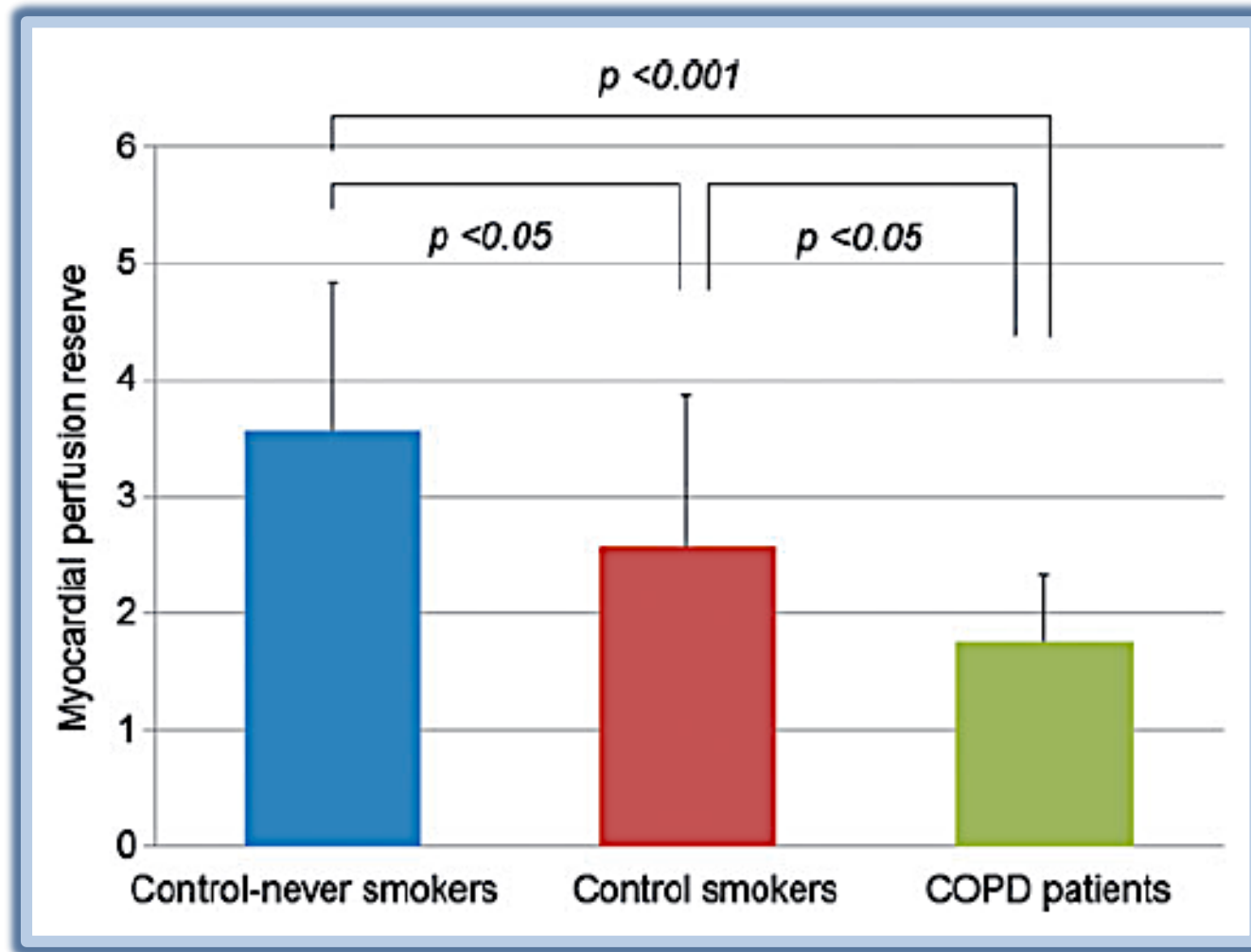
# Pathophysiological relation between COPD and HF



# Influence of COPD on HF development



# Miocardial perfusion reserve in COPD patients



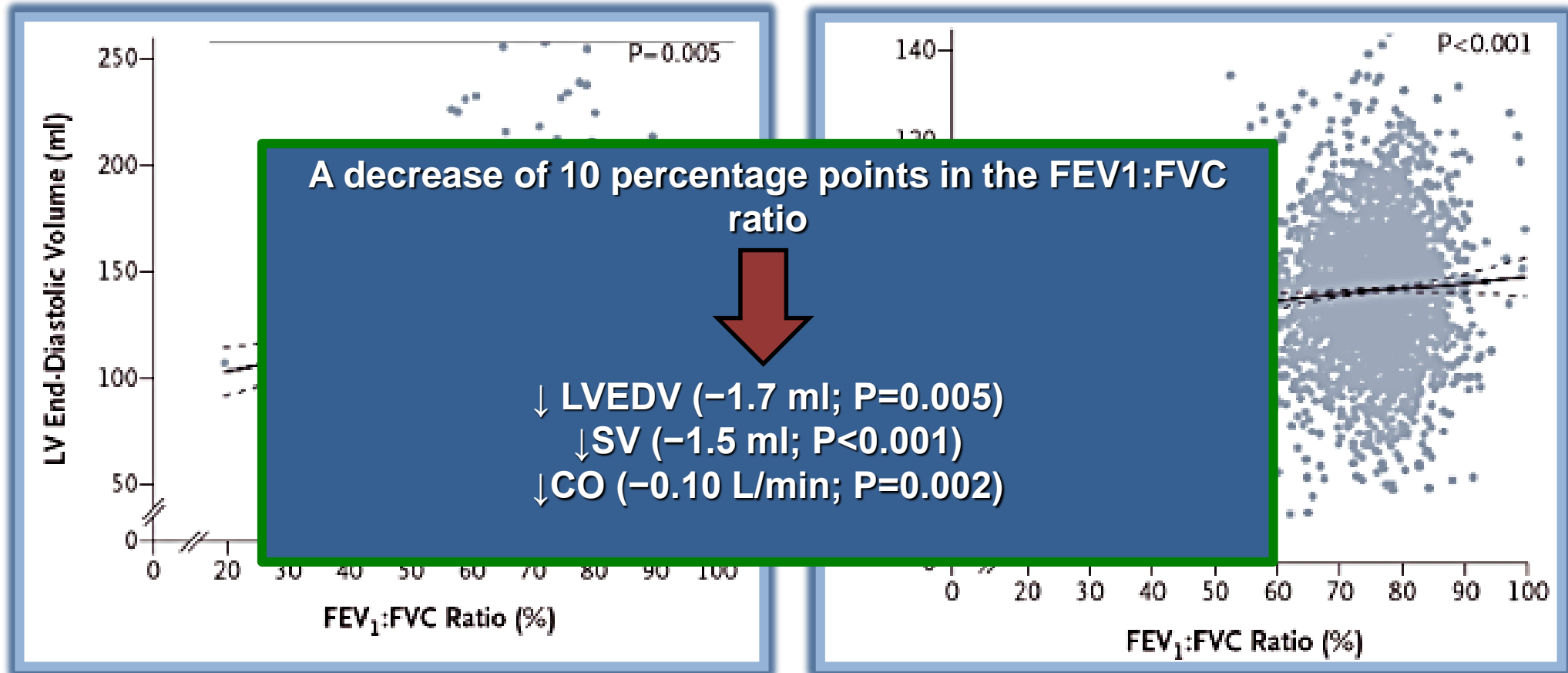


# COPD and aortic stiffness

**Table 1** Demographic characteristics of subject groups

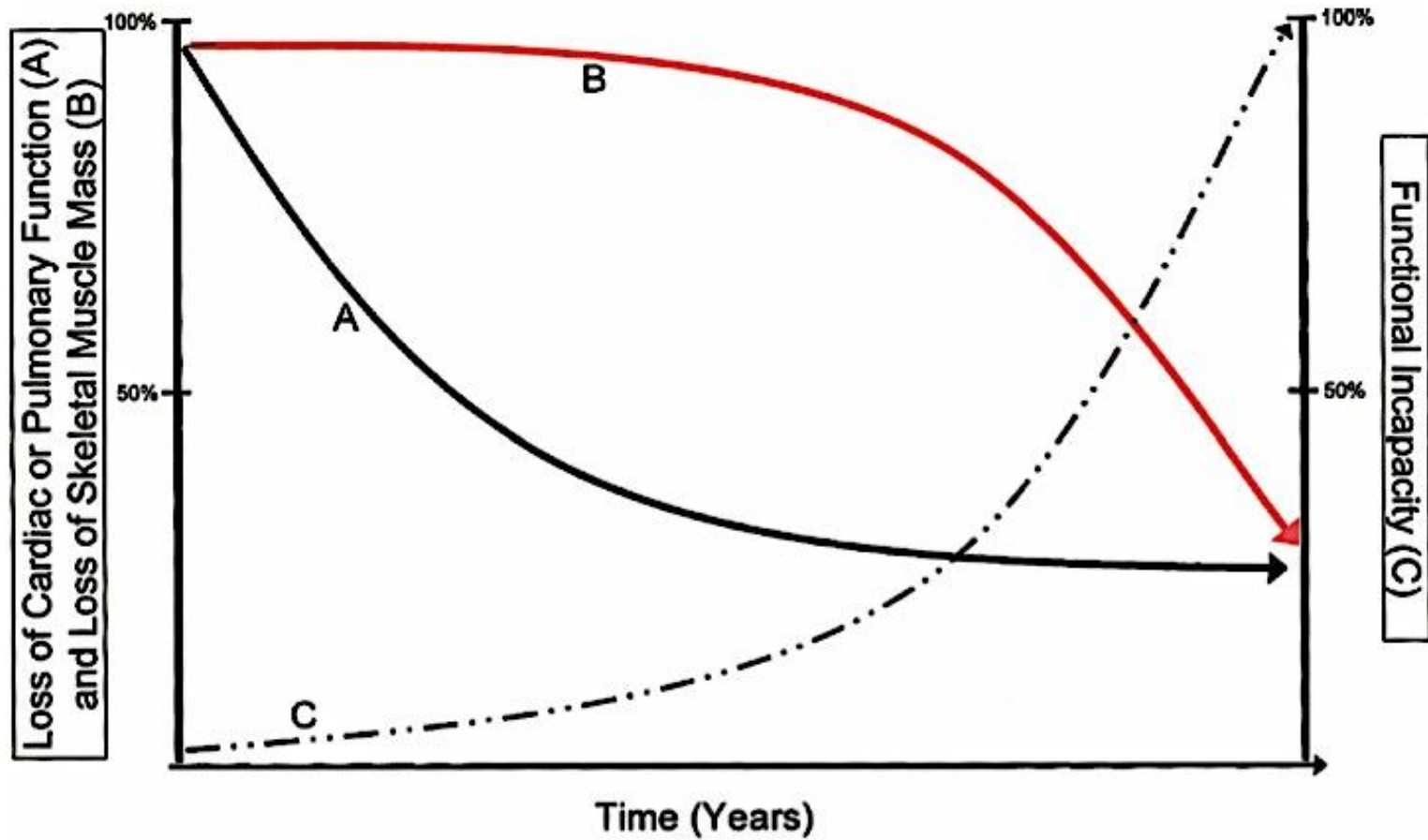
Variable	COPD <i>n</i> = 85	$\alpha_1$ ATD <i>n</i> = 12	Smokers <i>n</i> = 12	Never smokers <i>n</i> = 12
Demographics				
Age (years)	68 ± 8	62 ± 8*	62 ± 6*	69 ± 7
Gender (% male)	67	73	58	83
BMI (kg/m <sup>2</sup> )	25.9 ± 3.9	25.0 ± 3.3	23.1 ± 2.3*	26.6 ± 2.6
Current smoker <i>n</i> (%)	11 (13)***	2 (17)***	12 (100)***	0
Pack years smoked	45 ± 25***	19 ± 11***	37 ± 19***	0
Statin therapy <i>n</i> (%)	26 (31)*	0***	0***	2 (17)
Lung function				
FEV <sub>1</sub> (L)	1.37 ± 0.6***	1.47 ± 0.4***	2.84 ± 0.6	2.88 ± 0.6
FEV <sub>1</sub> % predicted	51 ± 20***	45 ± 16***	95 ± 17	100 ± 15
GOLD stage II/III (%)	77	83	–	–
Perc 15 score (HU)	– 890 ± 54***	– 942 ± 18***	– 818 ± 23	– 806 ± 36
Hemodynamic measurements				
SBP (mmHg)	137 ± 18	132 ± 11	134 ± 16	131 ± 8
DBP (mmHg)	79 ± 7	84 ± 8	84 ± 7	79 ± 7
Heart rate (bpm)	71 ± 18	76 ± 10	67 ± 16	66 ± 10
Aortic pulse wave velocity (m/s)	9.9 ± 2.6*	9.5 ± 1.8*	7.8 ± 1.8	7.9 ± 1.7

# Relationship between FEV1: forced vital capacity ratio and LVED and stroke volumes

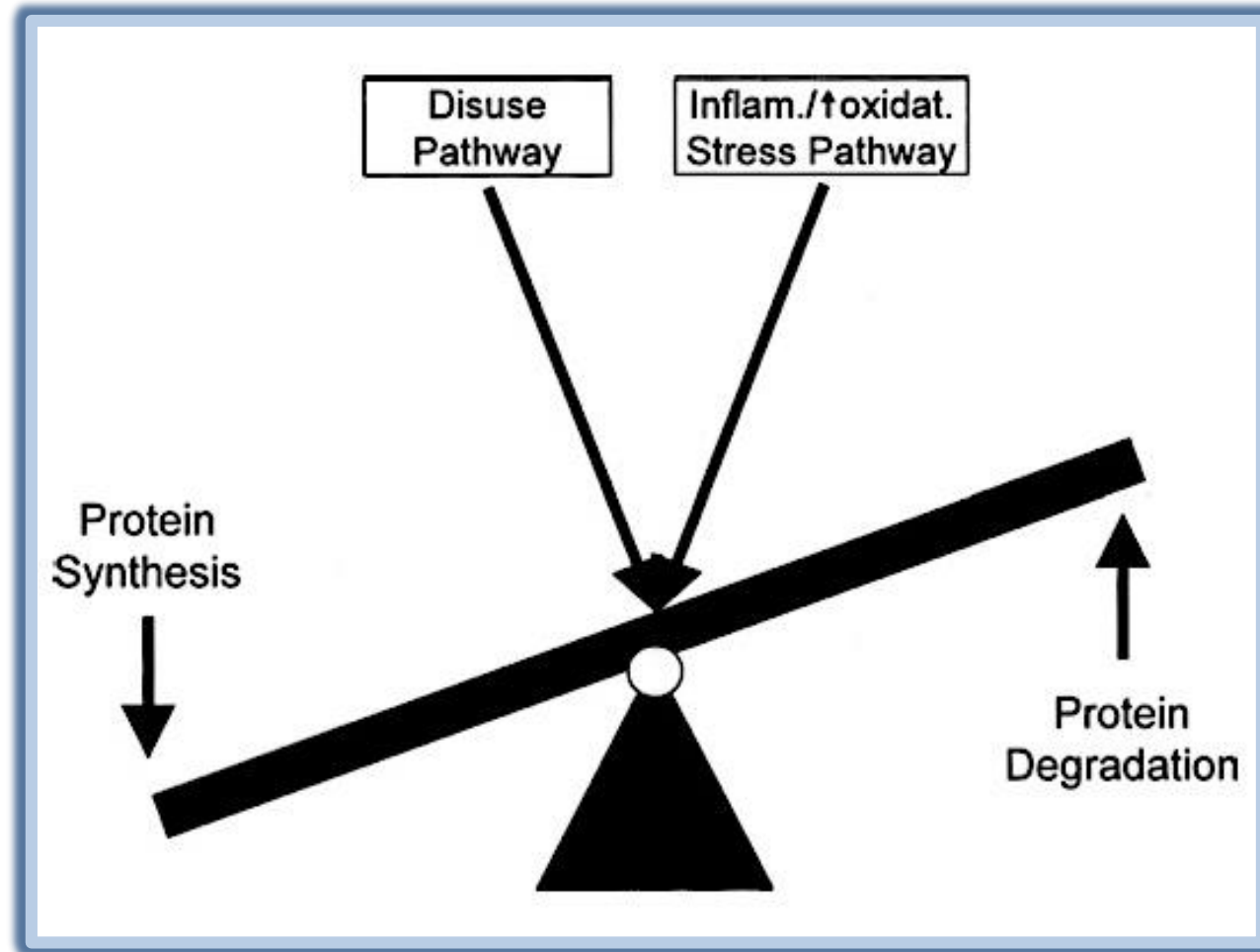


Adjusted for age, race, BSA, N<sup>o</sup> pack-years of smoking, DM, BMI, HT, SBP, DBP, CRP, fibrinogen, etc.

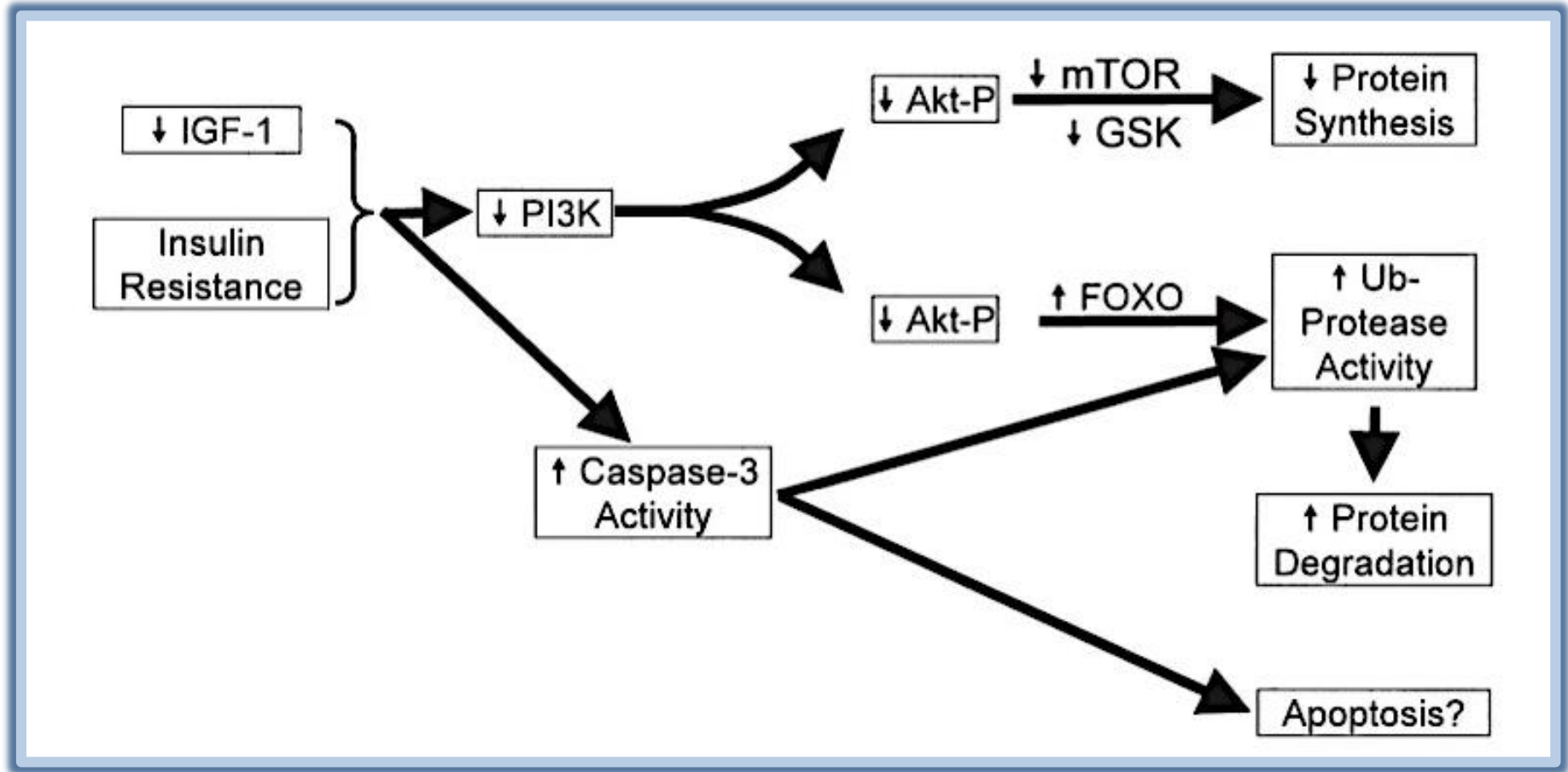
# Progression of HF and COPD



# Mechanisms of skeletal muscle atrophy in patients with HF or COPD



# Signaling pathways of disuse and inflammation



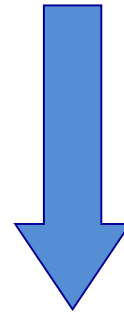


# HF misconosciuto in pazienti con BPCO stabile

**405 pazienti, età media 73 anni (M 55%),  
seguiti da MMG per BPCO, senza precedente  
diagnosi di Scompenso Cardiaco**

**Valutazione diagnosi  
di SC secondo ESC  
(sintomi + EcoCG)**

**Rivalutazione della diagnosi  
di BPCO secondo GOLD**



**33 (8%)  
solo SC**

**50 (12%)  
SC + BPCO**

**194 (48%)  
solo BPCO**

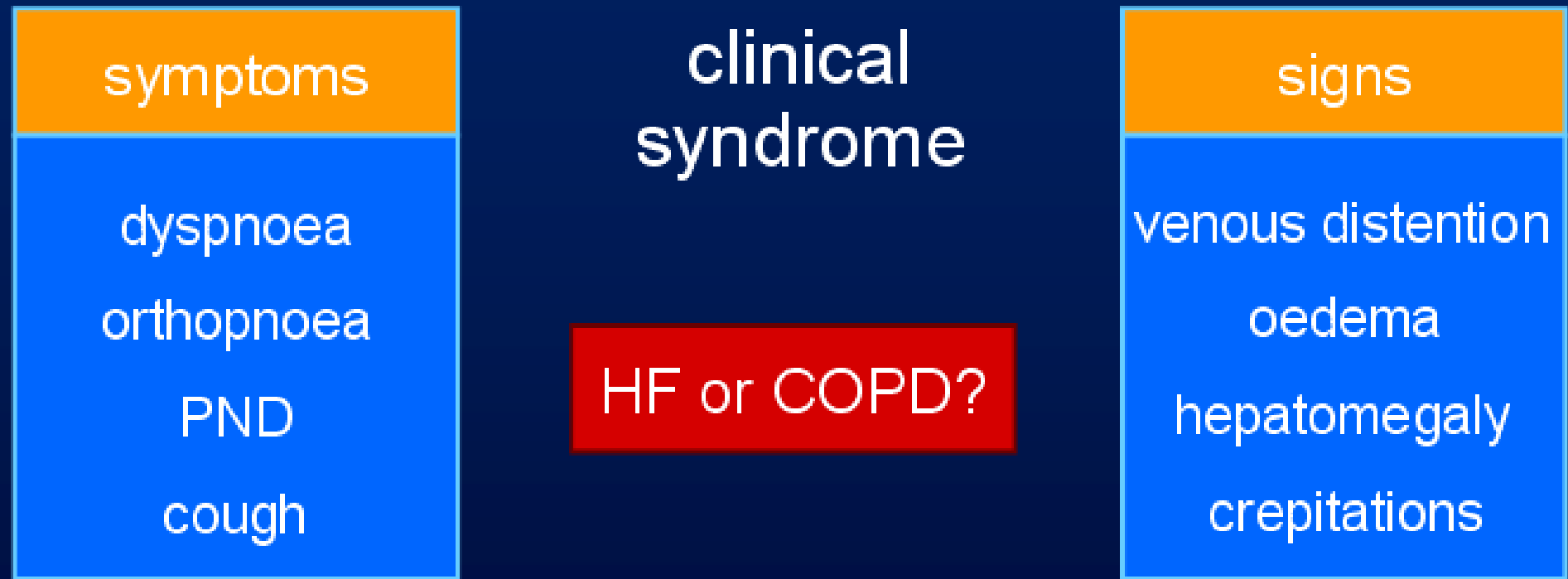
**128 (32%)  
né SC né BPCO  
(asma, bronchiectasie,  
alveolite, EP, ecc.)**

**83 (20.5%)  
SC misconosciuto  $\pm$  BPCO**

Rutten FH et al. Eur Heart J 2005;26:1887-1894 (NL)

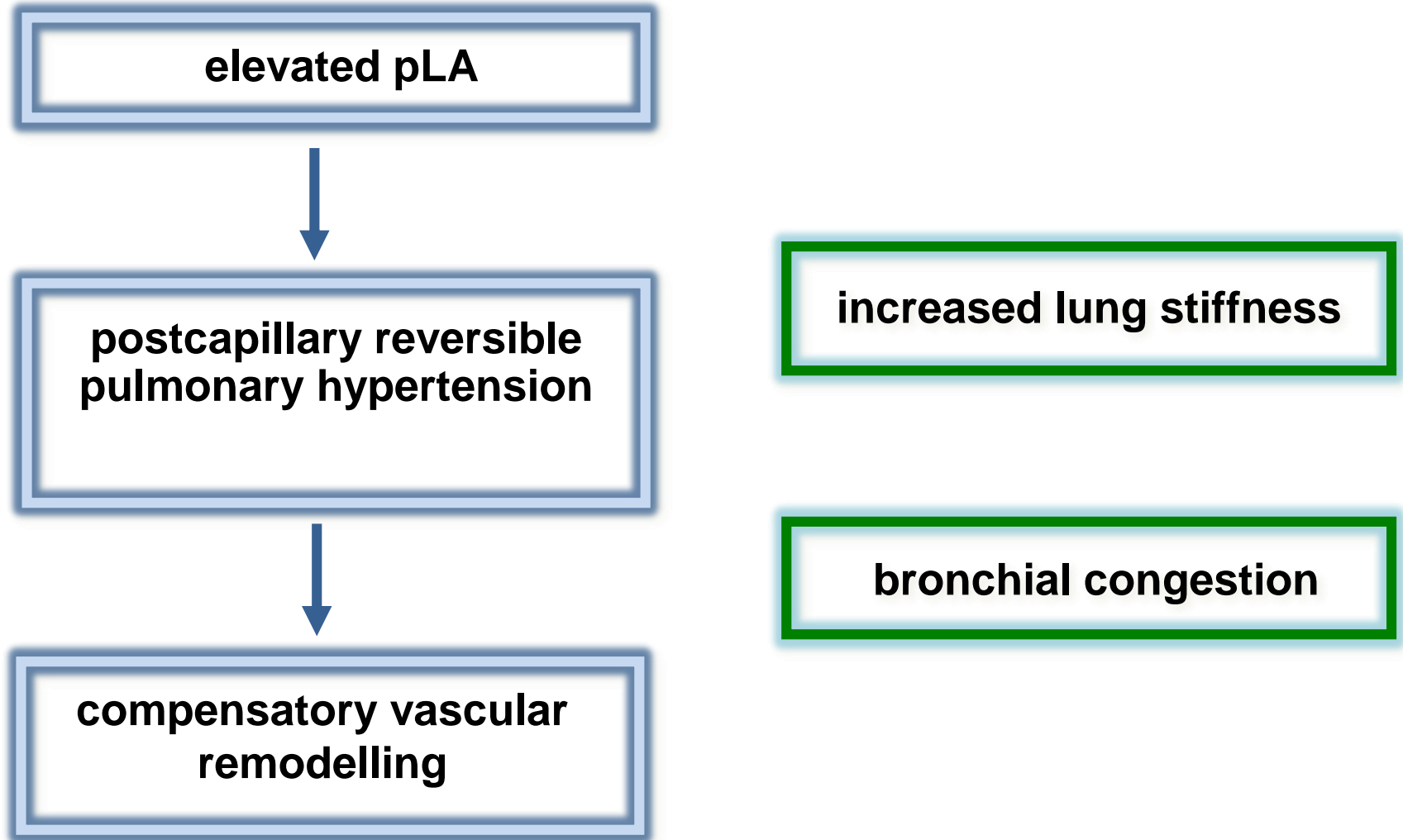
**Conclusion** Unrecognized heart failure is very common in elderly patients with stable chronic obstructive pulmonary disease. Closer co-operation among general practitioners, pulmonologists, and cardiologists is necessary to improve detection and adequate treatment of heart failure in this large patient population

# Why is diagnosis difficult?

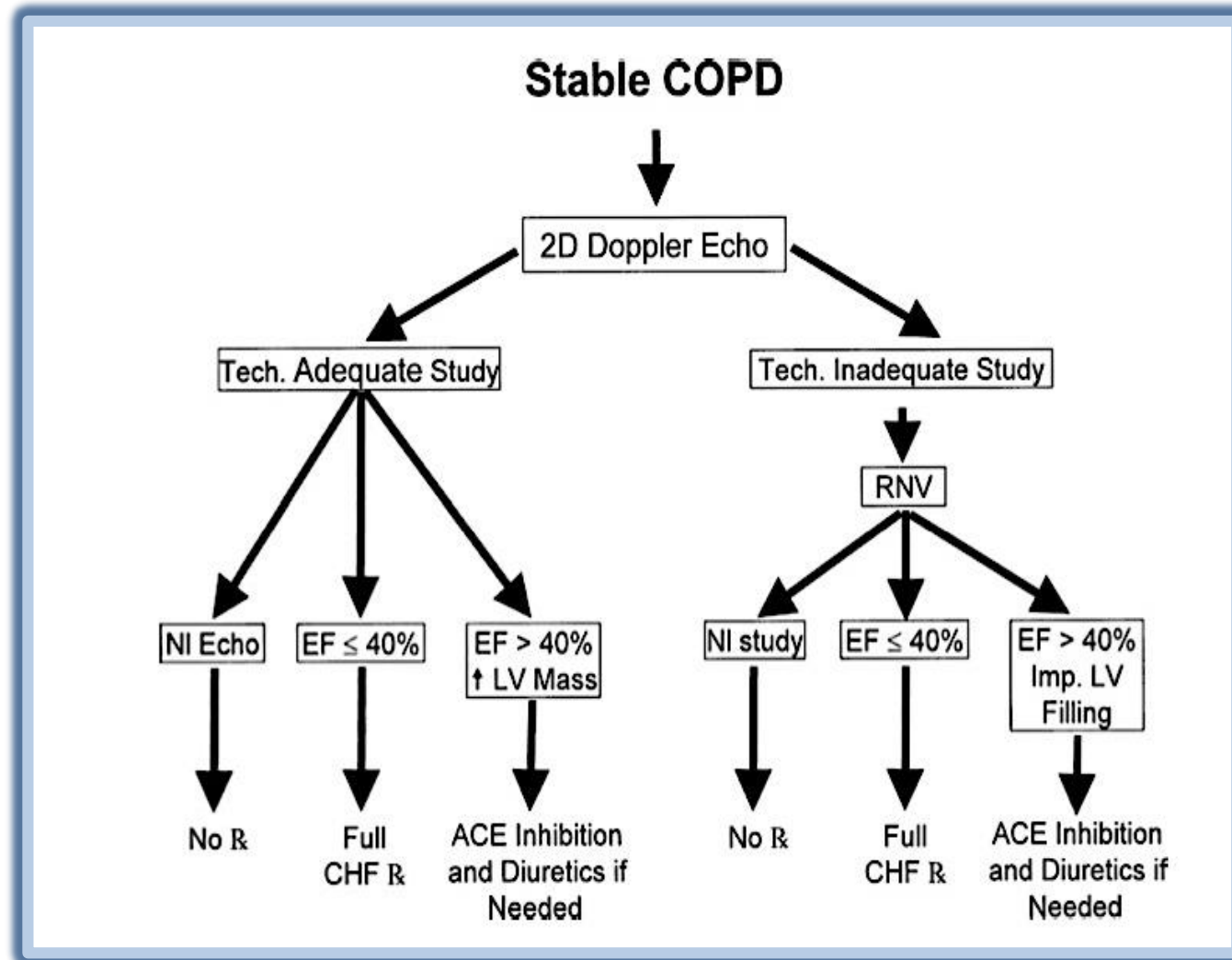


no qualitative features of dyspnoea are unique to heart failure

# Dyspnea in chronic HF



# Evaluation of HF in stable COPD patients



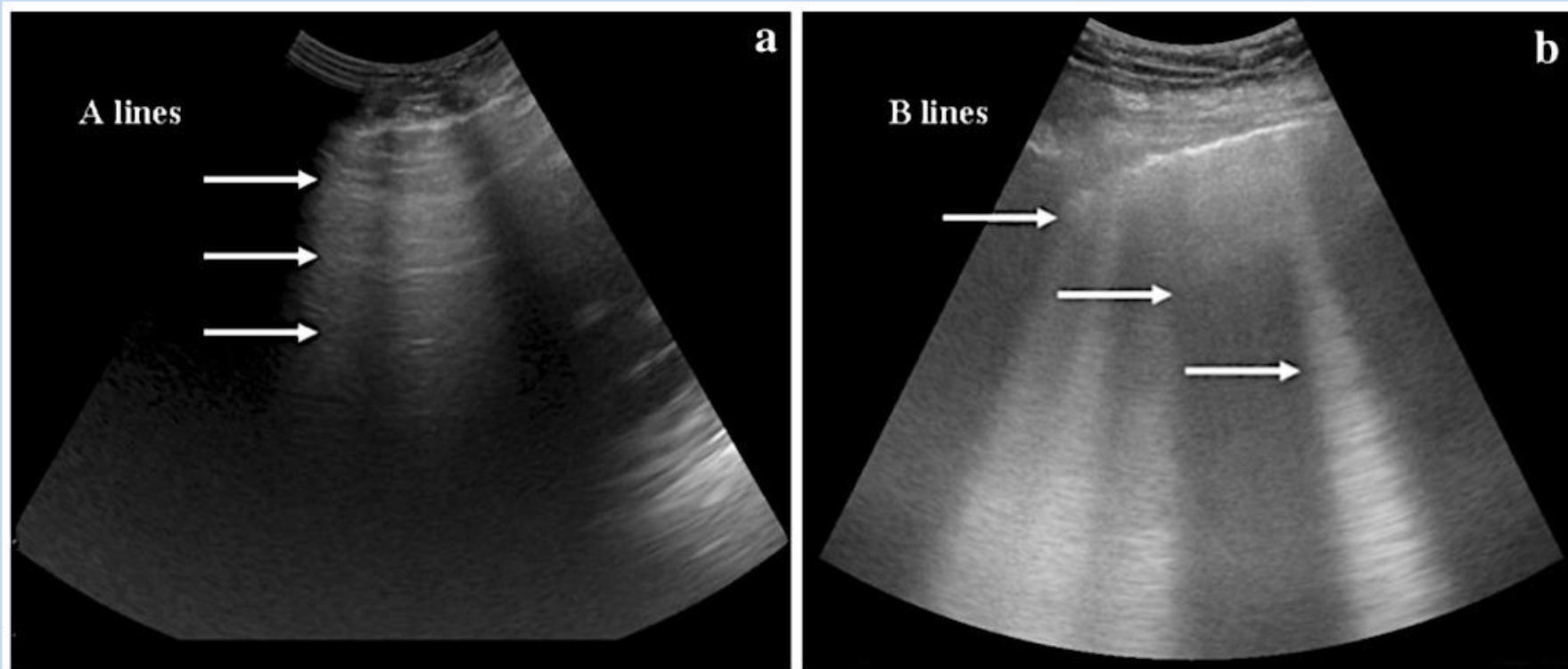
ORIGINAL ARTICLE

Open Access



# Pre-hospital lung ultrasound for cardiac heart failure and COPD: is it worthwhile?

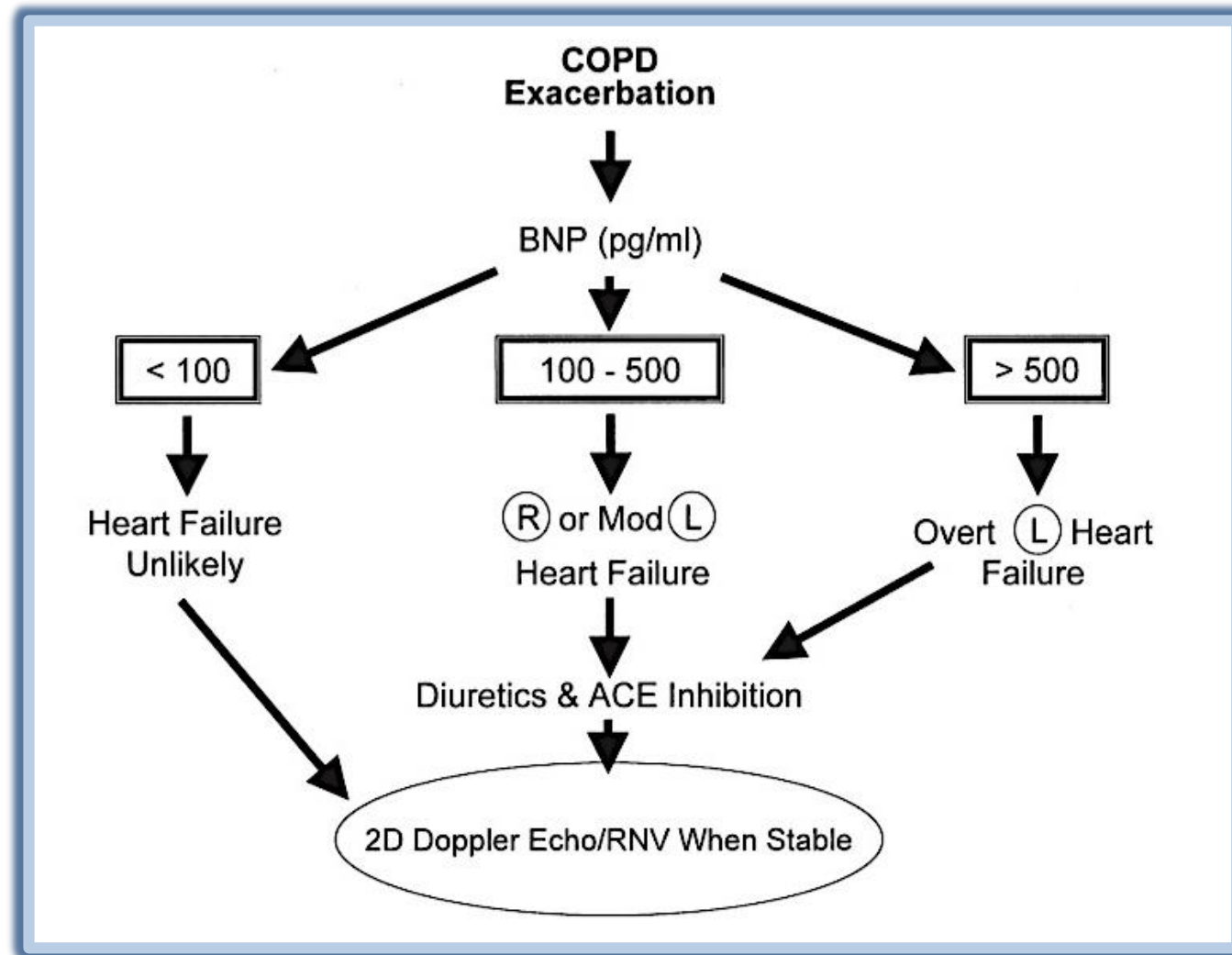
Mirko Zanatta , Piero Benato, Sigilfredo De Battisti, Concetta Pirozzi, Renato Ippolito and Vito Cianci



**Fig. 3** **a** A profile—dry lung; **b** B profile—wet lung

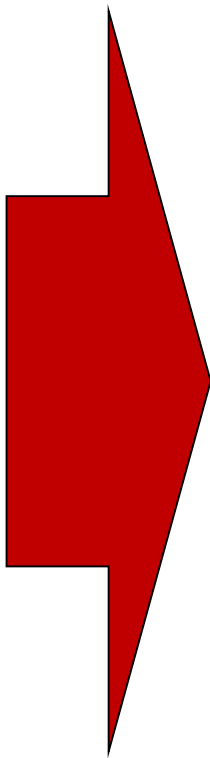


# Evaluation of HF during COPD exacerbation



## 2016 ESC Guidelines treatment of acute and chronic heart failure

The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology

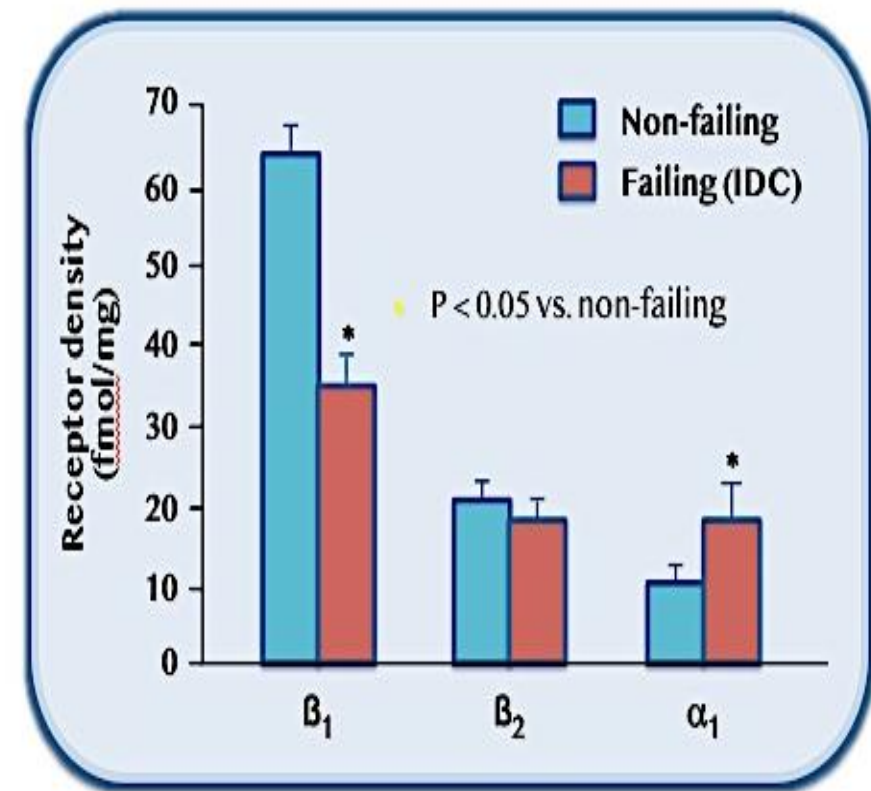
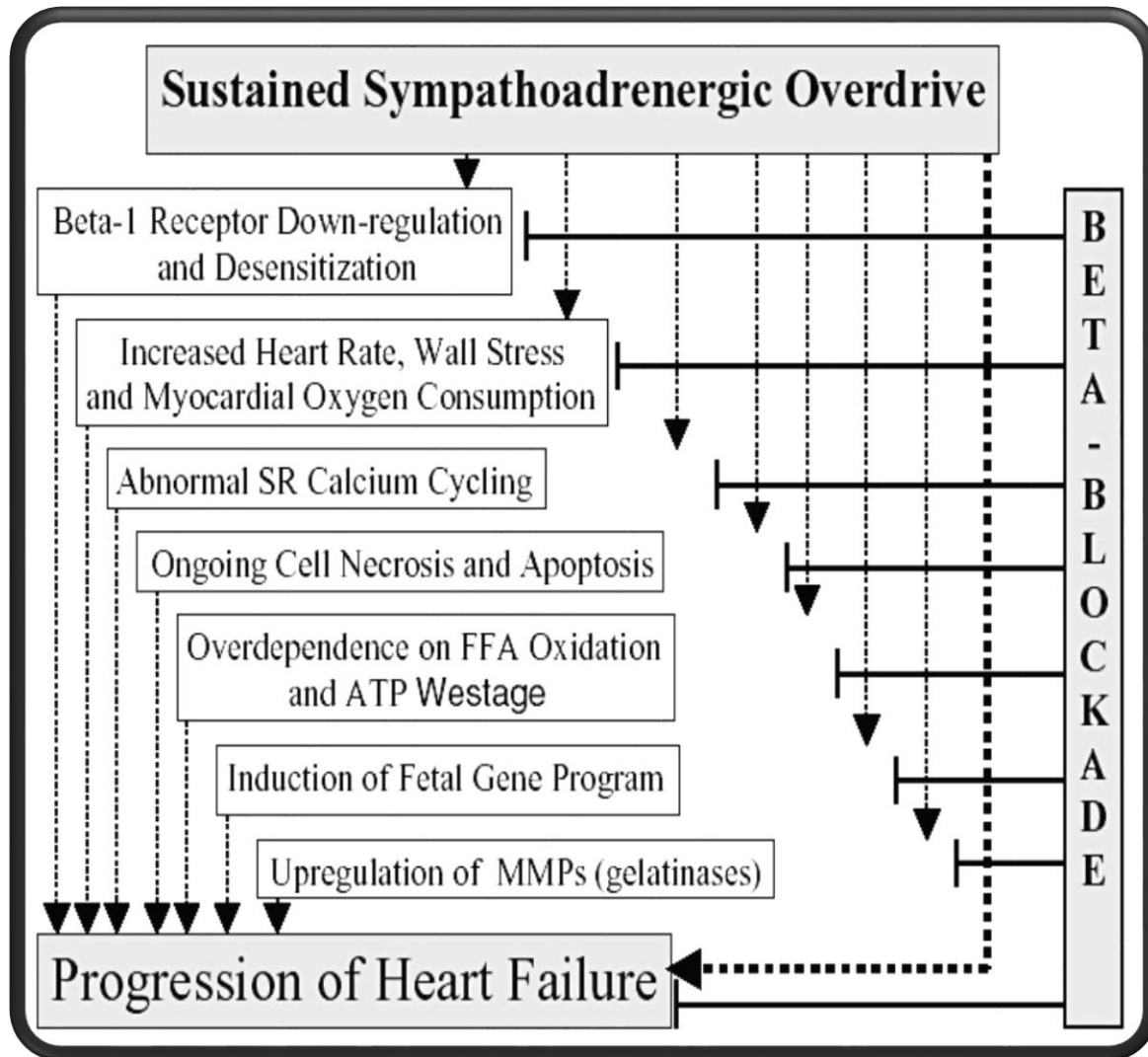


**Table 11.1** Importance of co-morbidities in patients with heart failure

1. interfere with the diagnostic process of HF (e.g. COPD as a potentially confounding cause of dyspnoea). <sup>390,391</sup>
2. aggravate HF symptoms and further impair quality of life. <sup>391,392</sup>
3. contribute to the burden of hospitalizations and mortality, <sup>393</sup> as the main cause of readmissions at 1 and 3 months. <sup>394</sup>
4. may affect the use of treatments for HF (e.g. renin–angiotensin system inhibitors contra-indicated in some patients with severe renal dysfunction or beta-blockers relatively contra-indicated in asthma). <sup>395,396</sup>
5. evidence base for HF treatment is more limited as co-morbidities were mostly an exclusion criterion in trials; efficacy and safety of interventions is therefore often lacking in the presence of co-morbidities.
6. drugs used to treat co-morbidities may cause worsening HF (e.g. NSAIDs given for arthritis, some anti-cancer drugs). <sup>397</sup>
7. interaction between drugs used to treat HF and those used to treat co-morbidities, resulting in lower efficacy, poorer safety, and the occurrence of side effects (e.g. beta-blockers for HFrEF and beta-agonists for COPD and asthma). <sup>391,395,396</sup>

HF = heart failure; COPD = chronic obstructive pulmonary disease; HFrEF = heart failure with reduced ejection fraction; NSAIDs = non-steroidal anti-inflammatory drugs.

# $\beta$ -blockers and CHF



Bristow MR et al. Clin Drug Ther 1989

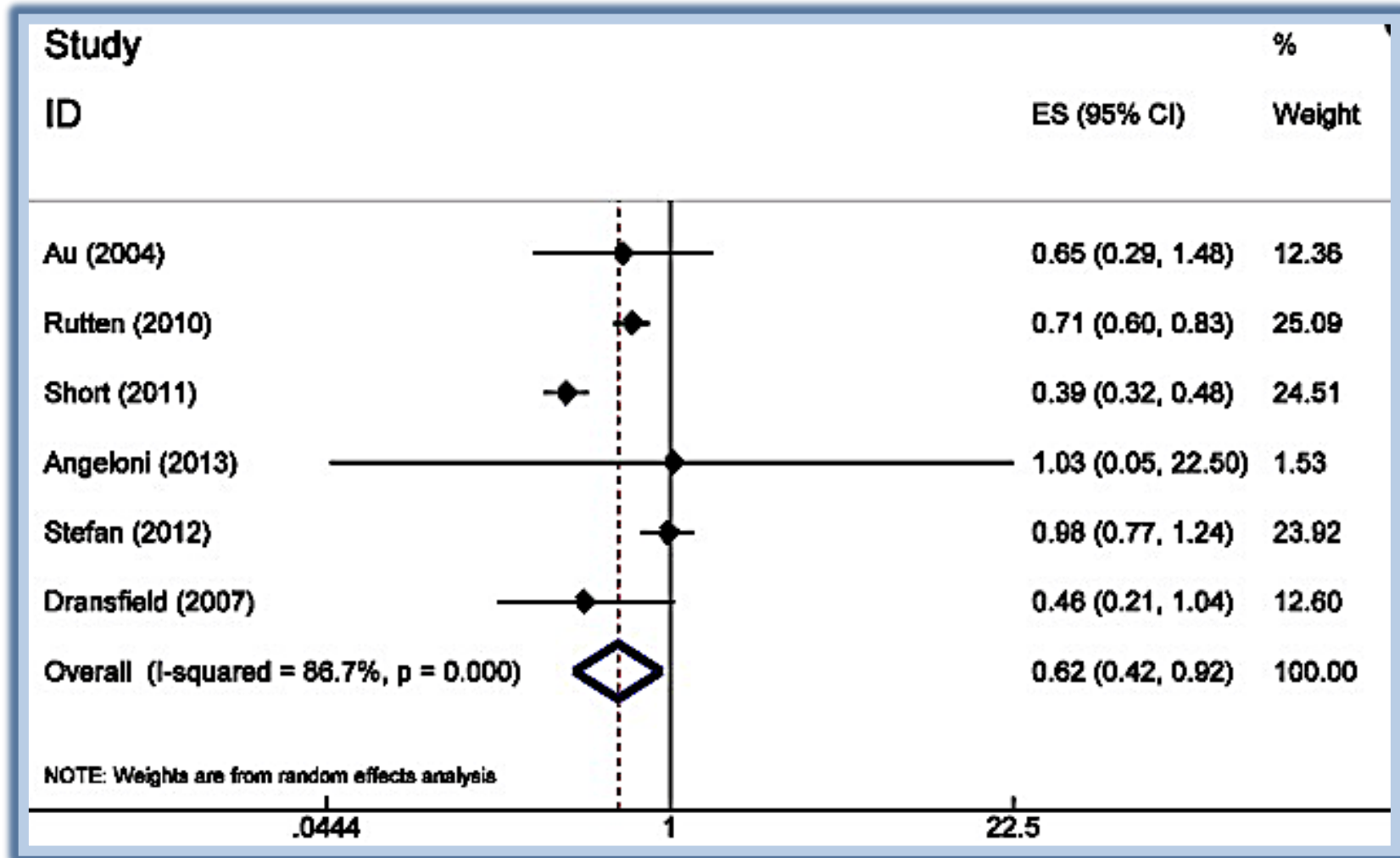


# The association between COPD and heart failure risk: a review

International Journal of COPD 2013;8 305–312

**Abstract:** Chronic obstructive pulmonary disease (COPD) is commonly associated with heart failure (HF) in clinical practice since they share the same pathogenic mechanism. Both conditions incur significant morbidity and mortality. Therefore, the prognosis of COPD and HF combined is poorer than for either disease alone. Nevertheless, usually only one of them is diagnosed. An active search for each condition using clinical examination and additional tests including plasma natriuretic peptides, lung function testing, and echocardiography should be obtained. The combination of COPD and HF presents many therapeutic challenges. The beneficial effects of selective  $\beta$ 1-blockers should not be denied in stable patients who have HF and coexisting COPD. Additionally, statins, angiotensin-converting enzyme inhibitors, and angiotensin-receptor blockers may reduce the morbidity and mortality of COPD patients. Moreover, caution is advised with use of inhaled  $\beta$ 2-agonists for the treatment of COPD in patients with HF. Finally, noninvasive ventilation, added to conventional therapy, improves the outcome of patients with acute respiratory failure due to hypercapnic exacerbation of COPD or HF in situations of acute pulmonary edema. The establishment of a combined and integrated approach to managing these comorbidities would seem an appropriate strategy. Additional studies providing new data on the pathogenesis and management of patients with COPD and HF are needed, with the purpose of trying to improve quality of life as well as survival of these patients.

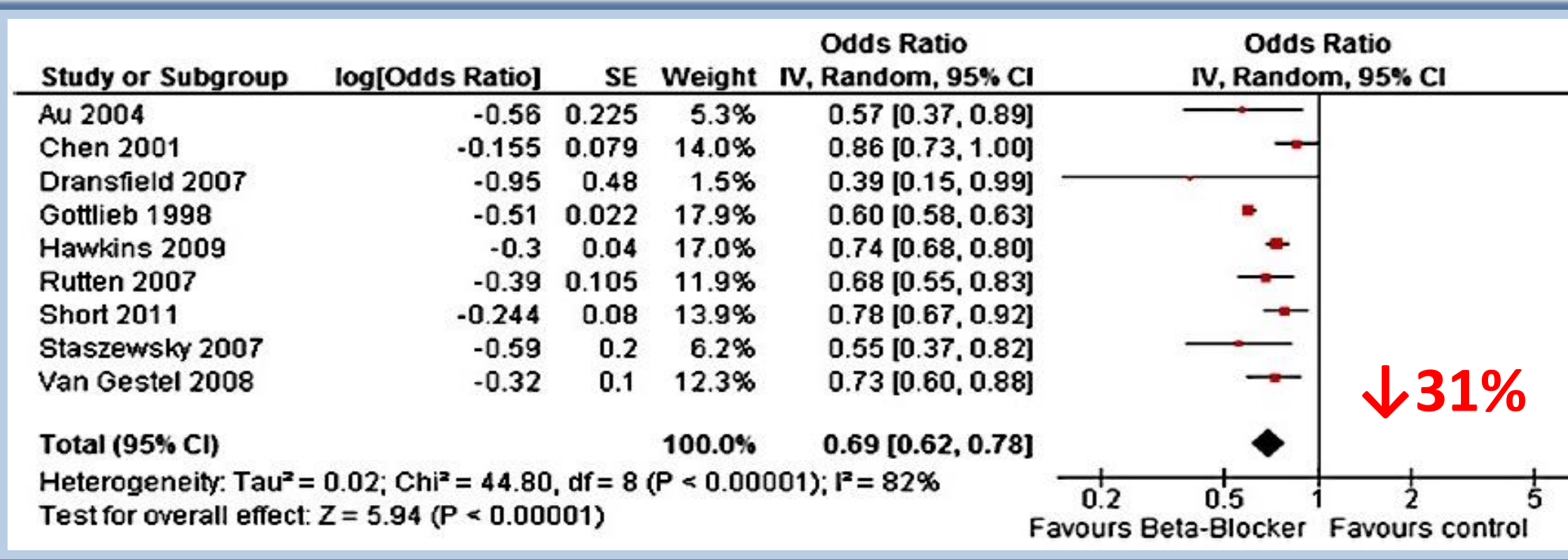
# $\beta$ -blockers are associated with a significant reduction in COPD exacerbations



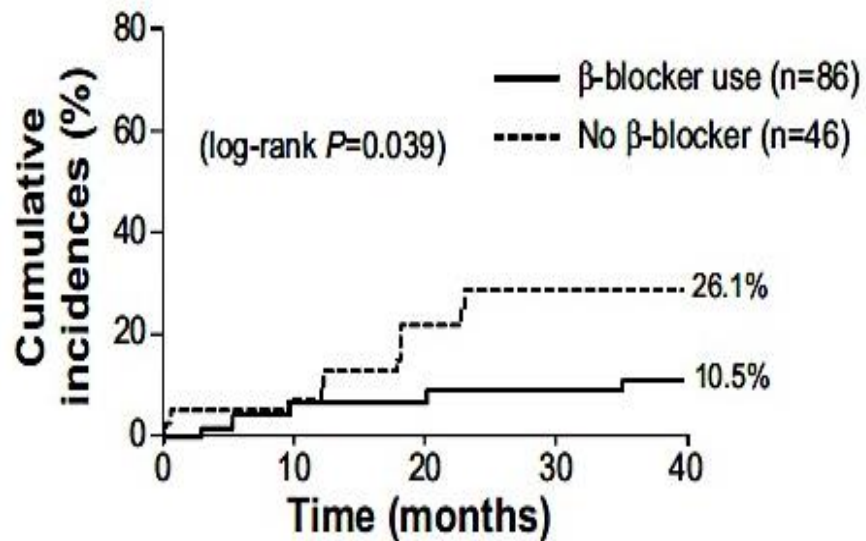


# Association between beta-blockers and all-cause mortality in patients with COPD

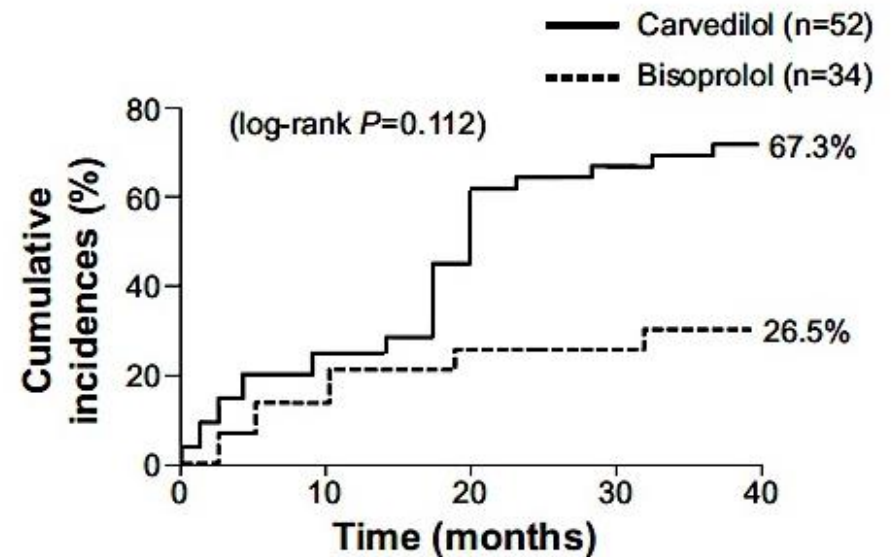
> 50.000 pts, retrospective cohort studies



# B-blockers use and all-cause death in patients with HF and COPD



$\beta$ -blocker use	86	84	82	79	77
No $\beta$ -blocker	46	44	36	34	34

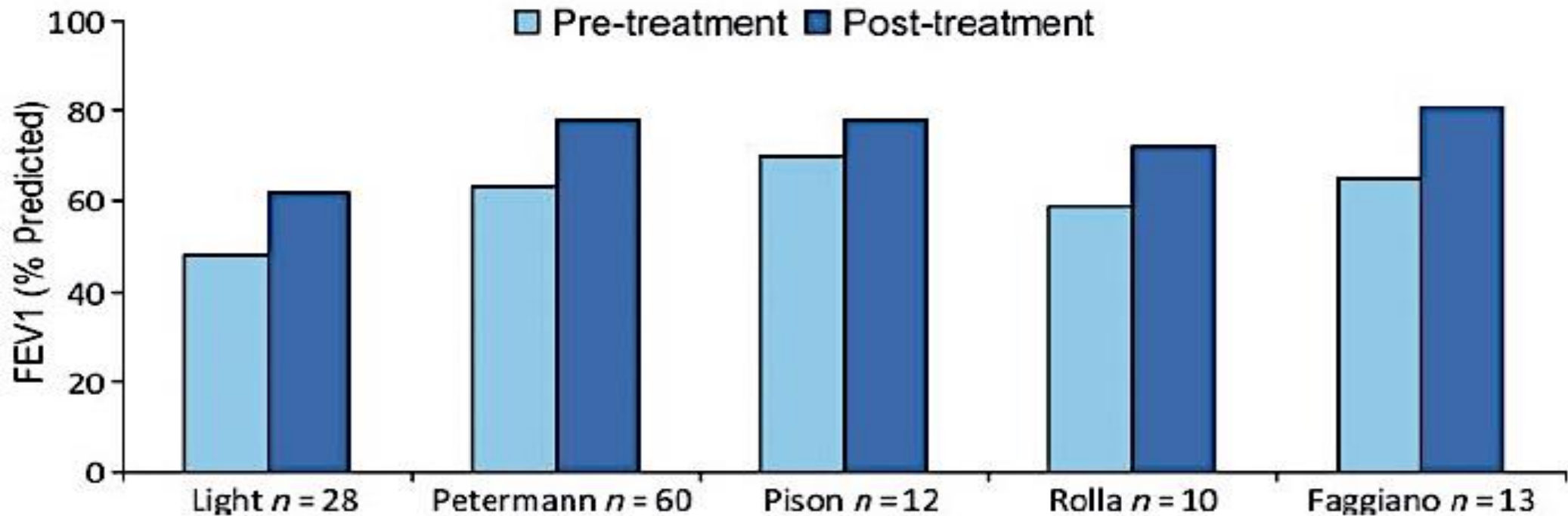


Carvedilol	52	42	28	20	17
Bisoprolol	34	29	27	26	25

# Obstruction in acute HF

Changes in forced expiratory volume in 1 s following treatment of decompensated heart failure

↑11-34%



# Conclusioni

- La coesistenza di scompenso cardiaco e BPCO è molto frequente e pone diverse problematiche terapeutiche
- L'efficacia del beta-blocco nei pazienti con BPCO può essere estesa ai soggetti con malattia più grave
- La sicurezza dei beta-agonisti nei pazienti con HF e concomitante BPCO può essere utilizzata previa opportuna fenotipizzazione del paziente