New Definition and Prediction of Acute Exacerbation (ECOPD)

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History of Changes in Definition of ECOPD

1821
René Lannec

"**Acute Catarrh**"

Newly developed and/or **worsening cough & sputum**

1987
Anthonisen NR

"**Exacerbation**"

Increased dyspnea, **sputum production**, & sputum **purulence**

2000
COPD: Working Towards a Greater Understanding

A sustained **worsening** of patient's condition from stable state and **beyond normal day-to-day variations**, necessitating **change in regular medication**

2017
ERS/ATS Guideline

Episodes of **increasing respiratory symptoms**, particularly **dyspnea**, **cough & sputum production**, and increased **sputum purulence**

Am J Respir Crit Care Med 2021; 204: 1251-8.

GOLD Definition of COPD Exacerbation

정의	**호흡기 증상의 갑작스러운 악화로 추가적인 치료를 야기**하는 상태	
원인	바이러스나 세균 감염, 대기오염이나 기온 등 환경적 요인	
변화	기도 염증 증가, 점액 생성의 증가, 과팽창 등이 연관된 복합적인 이벤트 → Key symptom인 호흡곤란의 악화에 기여 → 그 외 객담의 양과 화농성 증가, 기침 증가, 천명음 등이 동반될 수 있음	
중요성	건강 상태, 입원율과 재입원, 질병의 진행에 부정적인 영향을 미침	
중증도	**Mild**	**속효성 기관지확장제** 사용(만)이 필요한 경우
	Moderate	**항생제** and/or **경구 스테로이드** 사용이 필요한 경우
	Severe	**입원**이나 **ER 방문**이 필요한 경우
감별진단	폐렴, 기흉, 흉수, 폐색전증, 심인성 폐부종, 부정맥	

GOLD REPORT 2022, pp 113-4. Modified.

Shortcomings of Current ECOPD Definition

1	오로지 「**호흡기 증상의 악화**」라는 **환자의 주관적인 인식에만 의존**함 (환자에 따른 차이 존재) 「호흡기 증상의 악화」는 폐렴, 폐색전증, 심장 문제 등 **다른 상태**에 의해 **유발**되거나 **병발**할 수 있음
2	악화 **증상**을 COPD **악화로 특정할 수 있는 measurable pathophysiological variables**로 나타내지 않음
3	COPD **악화의 발생과 진행**에 대한 **시간 개념이 결여됨** (유사 증상을 나타내는 다른 상태와 감별 어려움)
4	**중증도**는 악화를 치료하기위해 사용된 healthcare resource를 바탕으로 **사후에 결정**되며, **임상 의사**와 **의료 시스템**에 따른 **차이**로 인해 **다양하게 반영**될 수 있음

따라서 **정확**하고 **현실적**이며 **실용적**인 **악화의 정의**와 **중증도 평가**가 **임상** 의사와 **연구**자 모두에게 필요함

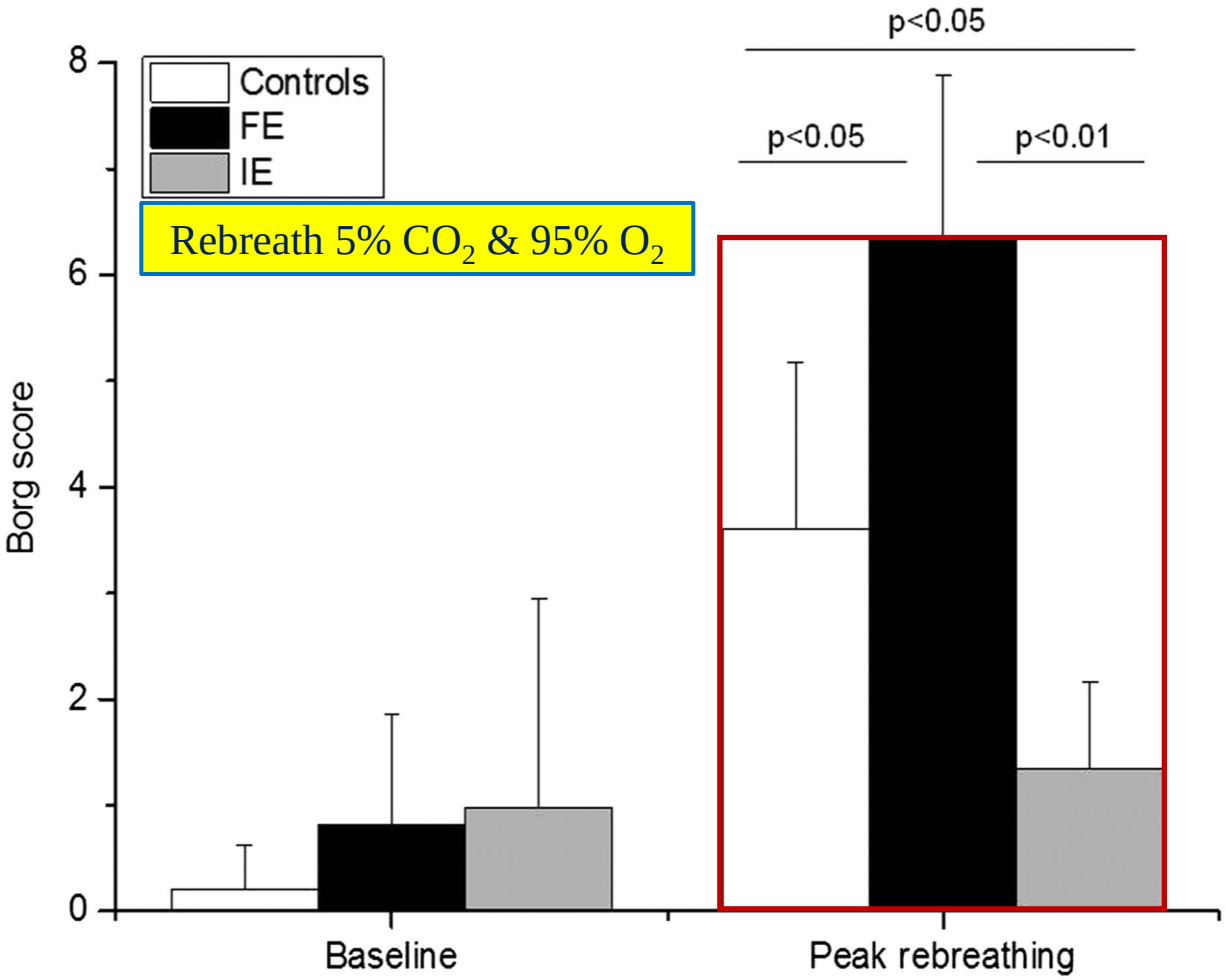
Am J Respir Crit Care Med 2021; 204: 1251-8.

Different Dyspnea Perception in Frequent vs Infrequent ECOPD

Breathing Pattern, $P_{0.1}$, Dyspnea Perception at Baseline

	Controls (n=10)	COPD FE (n=14)	COPD IE (n=20)	p Value FE vs IE
RR (/ min)	14.60±3.97	16.60±3.48	15.75±4.61	0.5
Tidal volume (TV, L)	1.18±0.32	1.24±0.37	1.08±0.35	0.3
Minute ventilation (V_E, L/min)	16.79±4.70	19.78±3.61	16.50±4.58	0.1
TV/IC (%)	–	0.6±0.2	0.6±0.1	0.5
$PetCO_2$ (mm Hg)	46.15±3.11	49.23±4.35	50.73±6.42	0.2
$P_{0.1}$ (cm H_2O)	**1.13±0.48**	**3.88±2.08***	**2.15±1.20***	**<0.001**
Dyspnea perception (Borg scale)	**0.20±0.42**	**0.82±1.03**	**0.97±1.97**	**0.3**

$P_{0.1}$, mouth occlusion pressure 0.1 s after onset of inspiration.

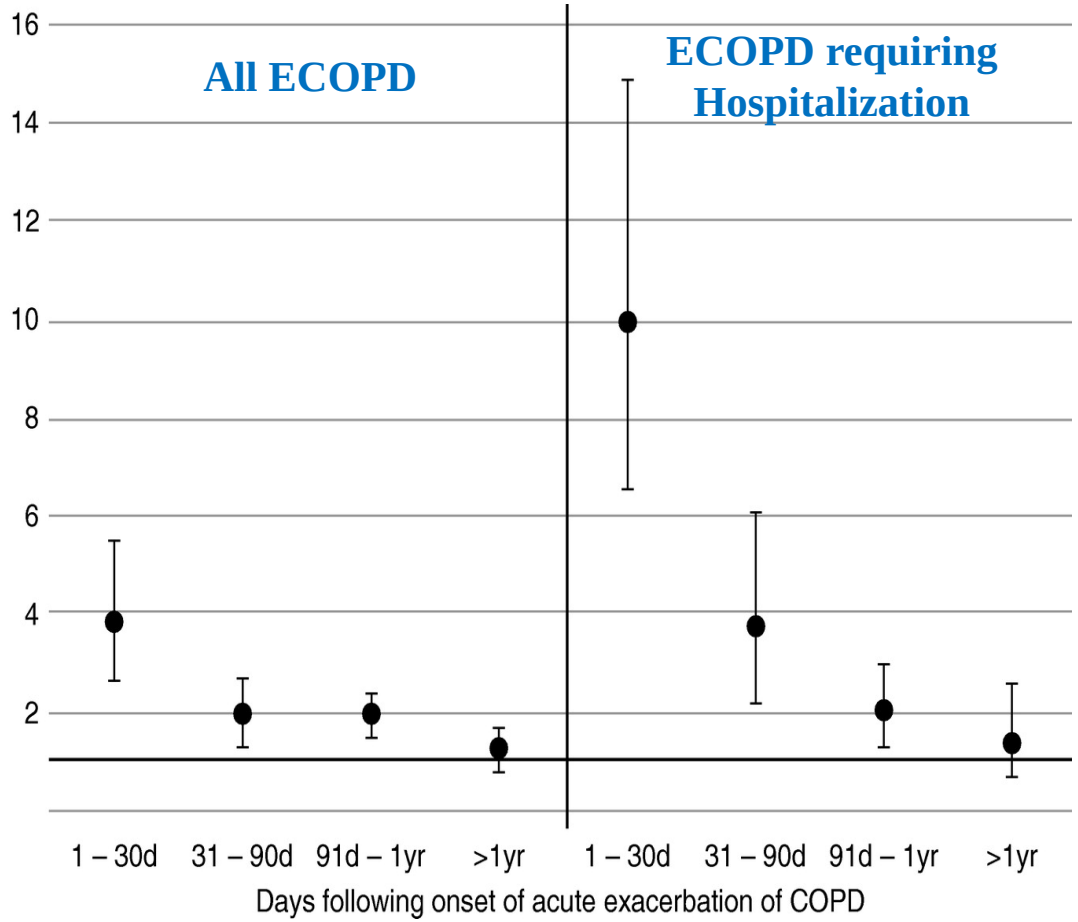


Thorax 2017; 72: 117-21.

ECOPD & Cardiac Event : *Post Hoc* Analysis of SUMMIT

Hazard Ratios for Cardiovascular Disease Event (CV death, MI, Unstable Angina, Stroke, TIA)

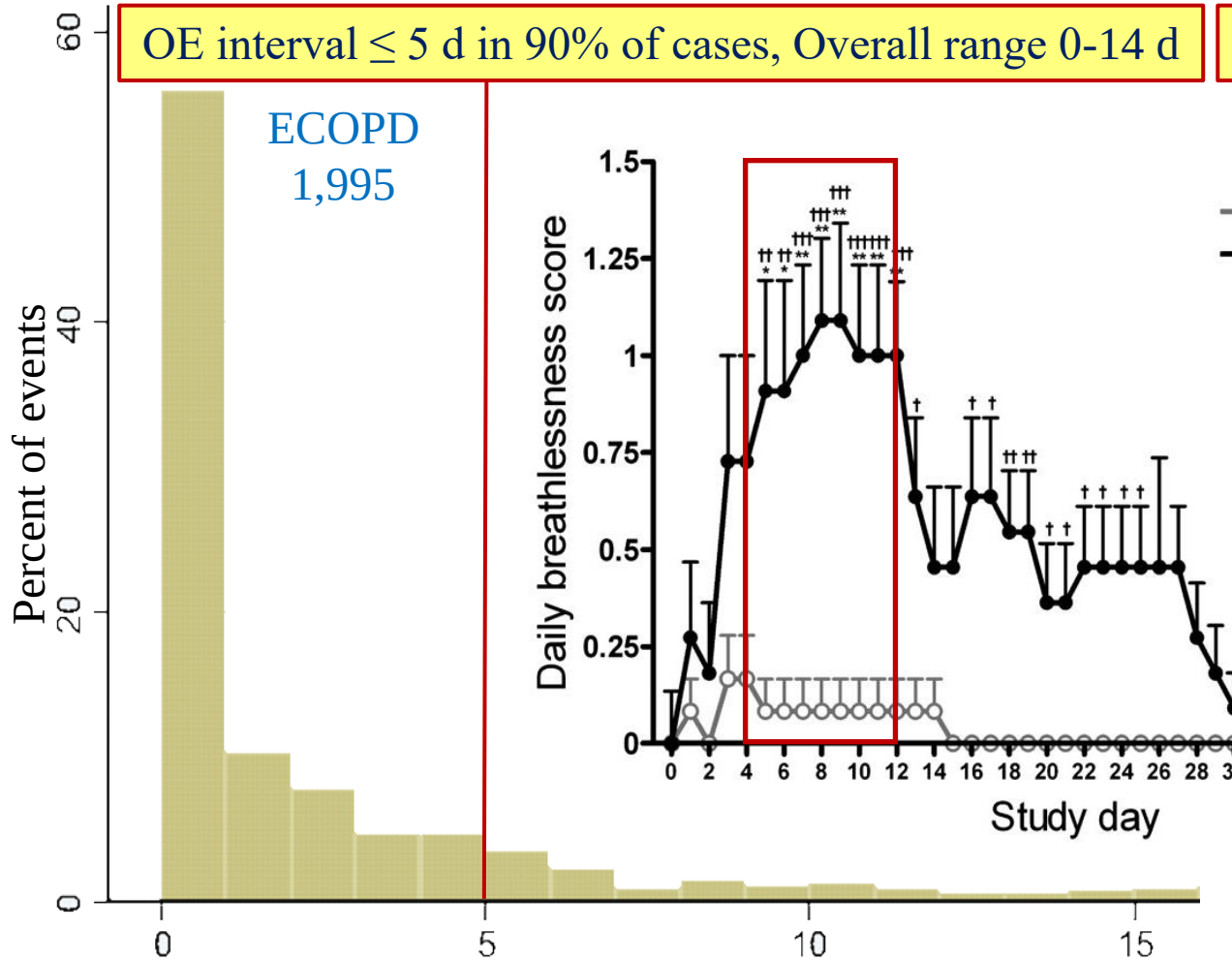
	No of Participants in Period	Observed F/U (Patient-Years)	No of Participants c **CVD Event**	**HR** (95% CI)
All ECOPD				
Baseline	16,477	21,624	487	Reference
1 to 30 days	**4,639**	**363**	**32**	**3.8 (2.7–5.5)**
31 to 90 days	4,235	658	29	1.9 (1.3–2.7)
91 days **to 1 year**	3,779	2,267	91	**1.9 (1.5–2.4)**
> 1 year	2,179	1,744	41	1.2 (0.8–1.7)
ECOPD requiring **Hospitalization**				
Baseline	16,476	25,595	605	Reference
1 to 30 days	**1,243**	**90**	**24**	**9.9 (6.6–14.9)**
31 to 90 days	998	152	15	3.7 (2.2–6.1)
91 days **to 1 year**	862	487	24	**2.0 (1.3–3.0)**
> 1 year	447	330	11	1.3 (0.7–2.6)



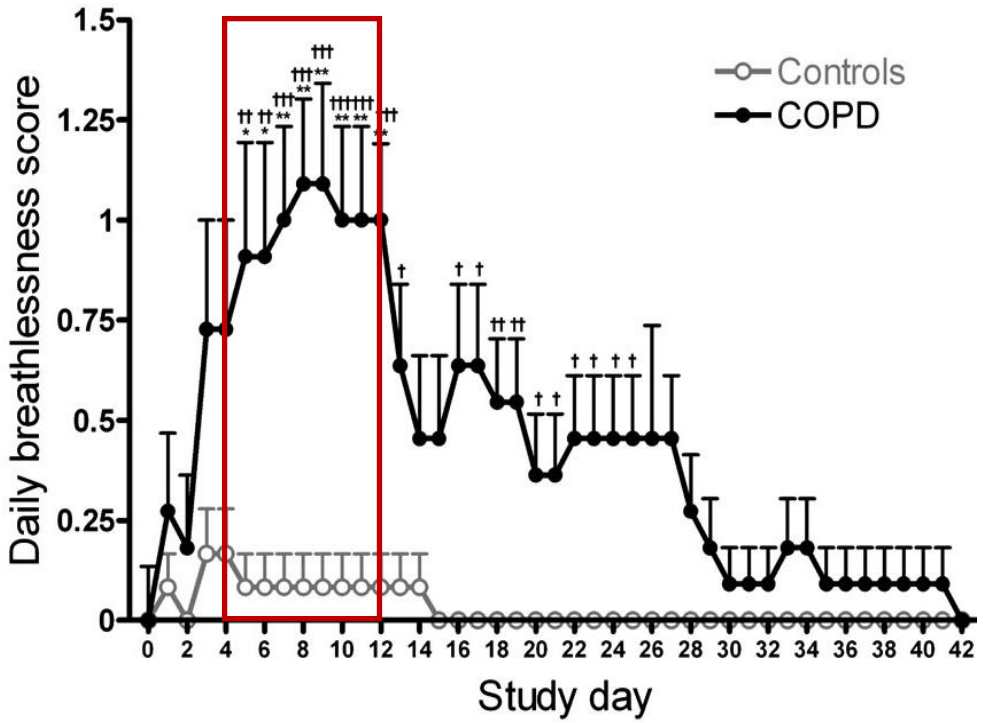
Am J Respir Crit Care Med 2018; 198: 51-7.

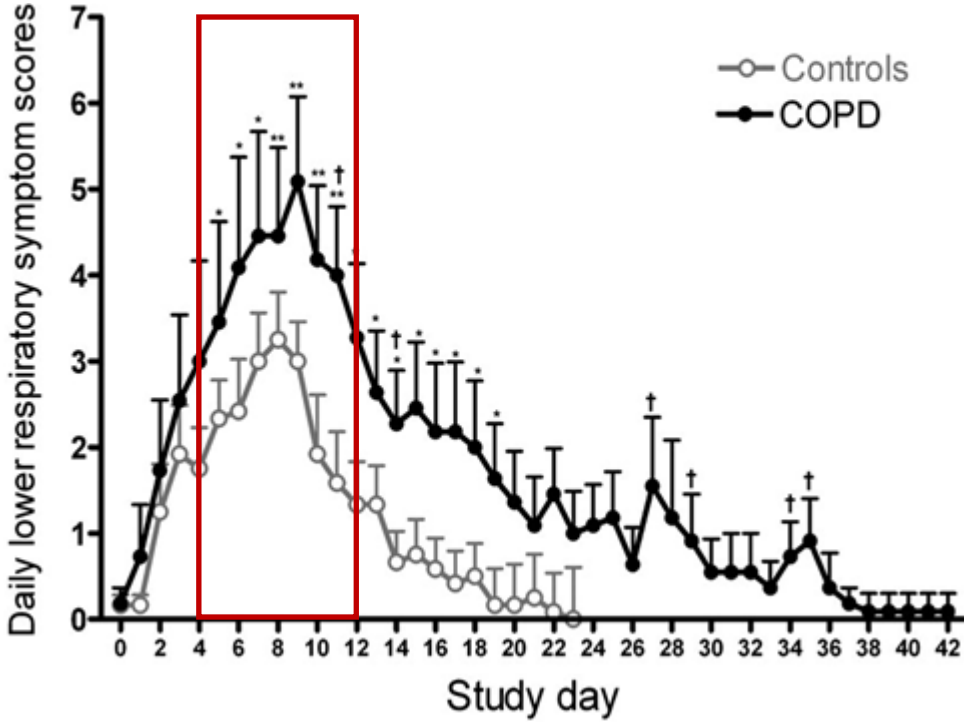
Timing of ECOPD

OE interval ≤ 5 d in 90% of cases, Overall range 0-14 d



Dyspnea & Lower Respiratory Symptoms after Rhinovirus inoculation





Peaking 4–12 days after infection

Thorax 2012; 67: 238-43. Am J Respir Crit Care Med 2011; 183: 734-42.

Different ECOPD Definitions Influence on Effect Sizes (COPE)

Definitions of ECOPD	Patients, No.	Patients No. ≥ 1 ECOPD	RR (95% CI)*	HR (95% CI)†
Unscheduled medical attention			≥ 1 ECOPD	Time to 1st ECOPD
Intervention (ICS discontinuation)	116	54	**1.19 (0.92–1.54)**	**1.47 (1.02–2.12)**
Placebo	112	62		
Short course of oral steroids and/or antibiotics				
Intervention	116	41	**1.44 (1.06–1.96)**	**1.84 (1.23–2.75)**
Placebo	112	57		
Exacerbation according to Anthonisen et al.				
Intervention	116	39	**1.49 (1.09–2.04)**	**1.66 (1.10–2.51)**
Placebo	112	56		
At least 1 symptom & a course of steroids or antibiotics				
Intervention	116	41	**1.42 (1.04–1.93)**	**1.65 (1.10–2.47)**
Placebo	112	56		
At least one symptom				
Intervention	116	49	**1.23 (0.93–1.62)**	**1.36 (0.93–1.99)**
Placebo	112	58		
At least two symptoms				
Intervention	116	41	**1.42 (1.04–1.93)**	**1.58 (1.05–2.37)**
Placebo	112	56		

AJRCCM 2002; 166: 1358-63. CHEST 2009; 136: 918-23.

Updated Definition of ECOPD – The Rome Proposal

정의		**14일 또는 이내의 기간 동안 악화**된 **호흡곤란 and/or 기침과 객담**의 이벤트로, 대체로 기도 감염, 대기오염 및 다른 **원인**에 의한 국소/전신 **염증의 증가**와 관련되어 있으며, **빈호흡**과 **빈맥**이 동반될 수 있다.
진단적 접근	1	생명을 위협할 수 있으며, 적절한 평가와 치료를 요한다.
	2	**COPD의 증거**와, 환자의 증상 및 징후를 유발할 수 있는 **다른 원인** (폐렴, 심부전, 폐색전증 등)에 대한 고려를 포함한 잠재적인 호흡기/비호흡기 동반 질환에 대한 철저한 임상적 평가를 시행해야 한다.
	3	**증상** 평가: **VAS를 이용**한 **호흡곤란의 중증도**, 기침 유무
		징후 평가: **빈호흡**, **빈맥**, 객담의 양과 색, respiratory distress (accessory m. 사용)
	4	**기타** 중증도 평가: **Pulse oximetry**, **CRP**를 포함한 검사실 검사, and/or **ABGA**
	5	원인 규명: 바이러스, 세균, 환경, 기타

Am J Respir Crit Care Med 2021; 204: 1251-8. Table 1. Modified.

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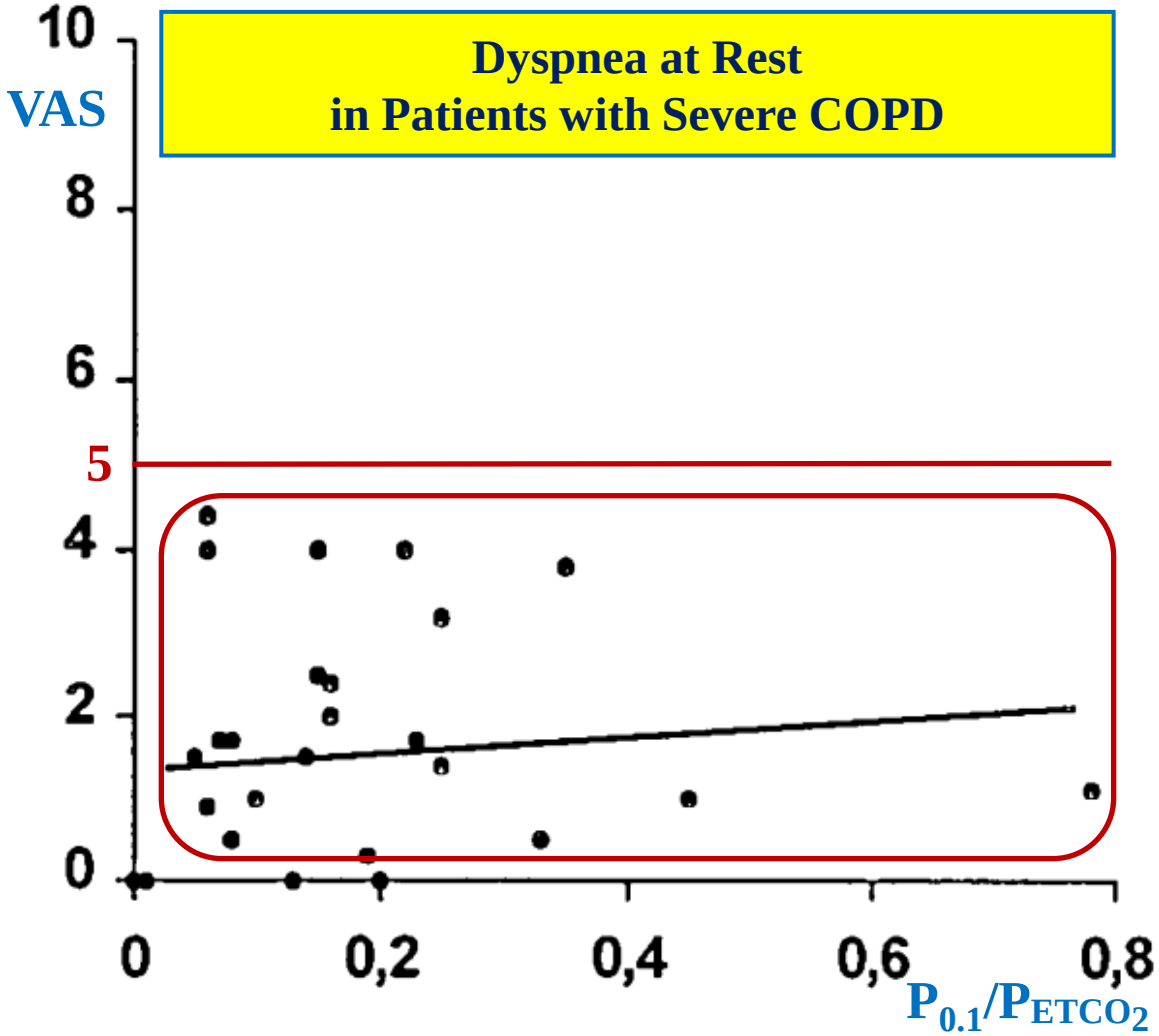
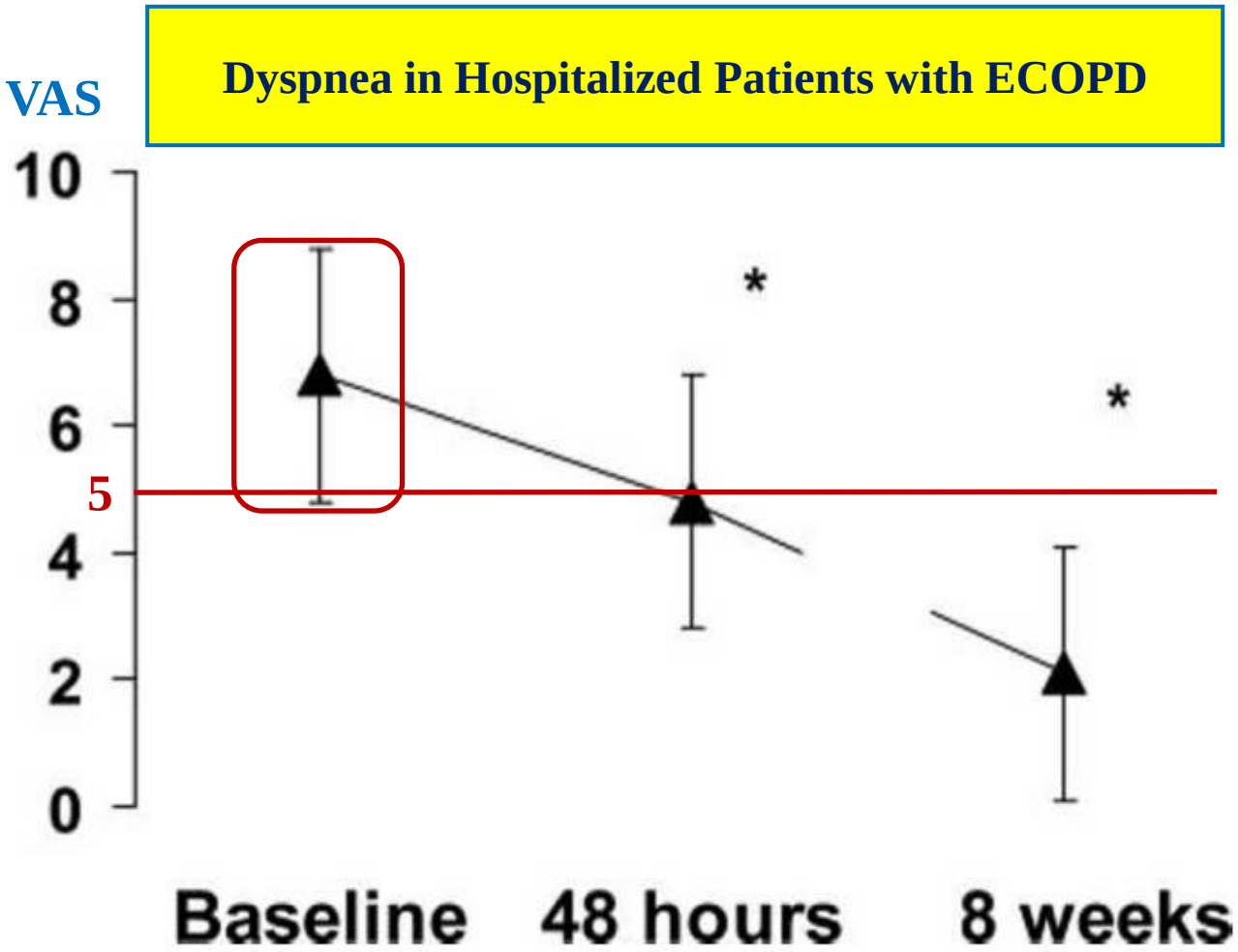
Dyspnea (VAS)
HR, RR
Hypoxemia, Hypercapnia
CRP

Visual Analog Scale (VAS) Dyspnea Score (1)





Chest 1999; 115: 1293-300. Chest 2007; 131: 37-43.

Visual Analog Scale (VAS) Dyspnea Score (2)

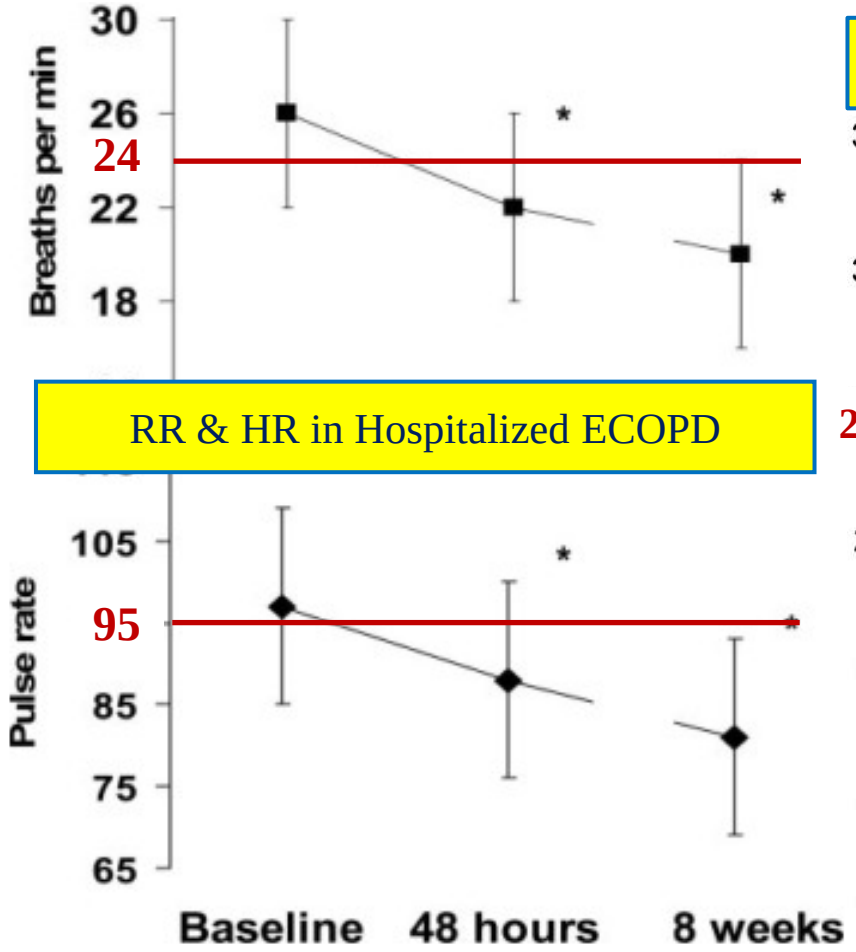
	ECOPD		Convalescence		Pairwise n	FDR p-value
	n	**Median** (95% CI) or n (%)	n	**Median** (95% CI) or n (%)		
HR /min	83	89 (72–112.5)	64	83 (69–100.5)	64	0.004
RR /min	82	22 (15–30)	64	20 (16–24.5)	64	0.000
Dyspnea (MRC)	79	5 (2–5)	63	3 (1.5–5)	59	0.010
Dyspnea (VAS)	80	**7** (3.5–8.75)	64	**3** (0.5–6)	62	0.000
FEV_1 %	86	44.2 (25.5-77)	63	46 (28-81.79)	63	0.687

Logistic Regression Model for Diagnosis of ECOPD						
Dyspnea (VAS)	Neutrophils (%)	**CRP (mg/L)**	Specificity	Sensitivity	NPV	PPV
≥ 5	≥ 60	**≥ 3**	0.89	0.94	0.92	0.92
≥ 5	≥ 65	**≥ 3**	0.95	0.91	0.90	0.95
≥ 5	≥ 70	**≥ 3**	0.96	0.90	0.88	0.97

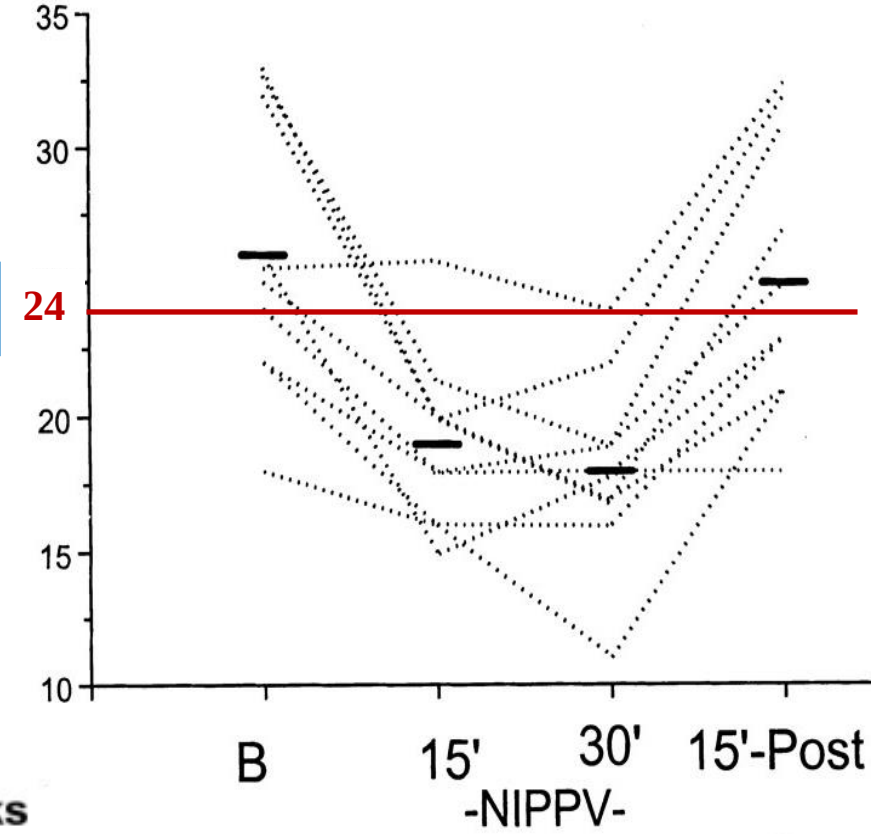
Eur Respir J 2017; 50: 1700075.

Pulse Rate & Respiratory Rate

RR & HR in Hospitalized ECOPD



Change of RR at ECOPD and after NIPPV



Multivariate Analysis for Death or Readmission

359 ECOPDs, 5YR	HR (95% CI)	P value
Age	1.03 (1.02–1.05)	< 0.0001
COPD severity	Ref ($FEV_1 \geq 80\%$)	
$50\% \leq FEV_1 < 80\%$	2.17 (0.67–7.05)	0.20
$30\% \leq FEV_1 < 50\%$	3.17 (1.00–10.6)	0.051
$FEV_1 < 30\%$	4.65 (1.42–15.1)	0.01
RR (at admission)	1.03 (1.003–1.05)	**0.028**
Cr (μmol/L)	1.003 (1.0004–1.006)	0.02
Cancer	2.79 (1.68–4.64)	< 0.0001
Diatetes	1.47 (1.003–2.16)	0.048

HR < 95 bpm & **RR < 24** breaths/min could help separate **mild ECOPDs** from **moderate ECOPDs**

Chest 2007; 131: 37-43. Am J Respir Crit Care Med 1997; 156: 1840-5. Int J COPD 2017; 12: 467-75.

Hypoxemia & Hypercapnia (1)

Is this patient at risk of hypercapnic respiratory failure? (Type 2 Respiratory Failure)

The main risk factor is severe or moderate COPD (Especially with previous Respiratory Failure or on Long Term Oxygen).

Other patients at risk include people with severe chest wall or spinal disease (e.g. kypho-scoliosis), neuro-muscular disease, severe obesity, cystic fibrosis, bronchiectasis or previously un-recognised COPD

Narcotic / sedative overdose not covered by this algorithm- see Table 4 and section 8.13.5

Yes

Target saturation is 88-92% or level on alert card whilst awaiting blood gas results

No

Aim for SpO_2 94-98%

Systematic Review	Oxygen saturation (**SpO_2%**) were monitored in 10/16 studies of **ECOPD**
Hurst et al.	The magnitude of the fall in SpO_2% 2 days into ECOPD was -1.24 standard deviation (SD).
Martin-Lesende et al.	The magnitude of the **fall in SpO_2%** was **2%.**
Burton et al.	The magnitude of SpO2% fall was approximately 1 SD (**from 93.6% to 92.4%**).

BTS Guideline for Oxygen Use, Thorax 2017; 72: i1-90. J Clin Med 2016; 5: 108.

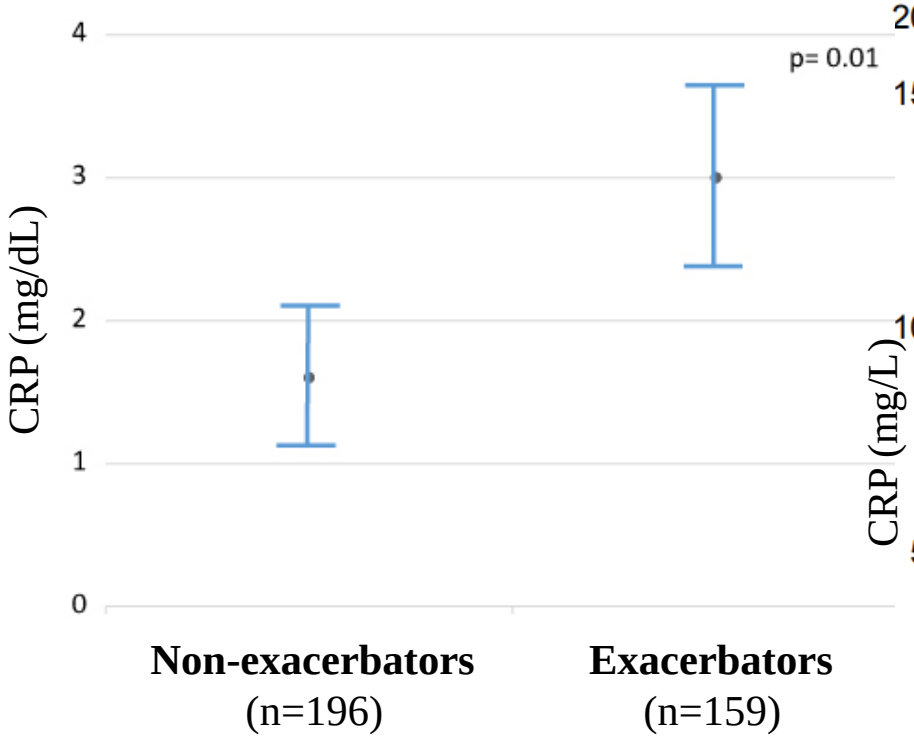
Hypoxemia & Hypercapnia (2)

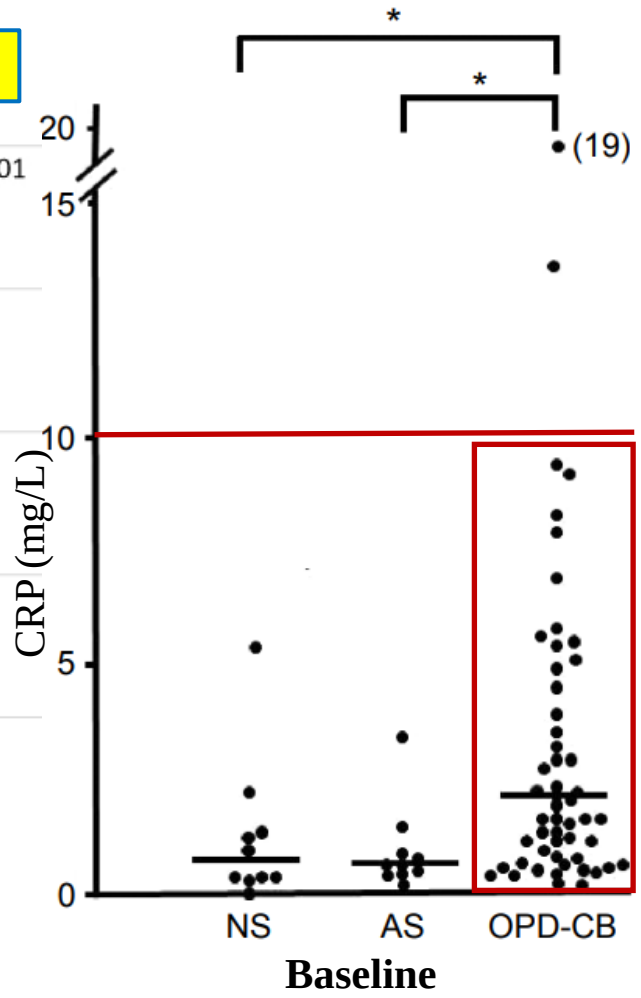
Question	**Should NIV be Used in Acute Hypercapnic Respiratory Failure due to ECOPD ?**
Recommendation	We recommend **bilevel NIV** for patients with **ARF** leading to **acute or acute-on-chronic respiratory acidosis** (pH ≤ 7.35) due to ECOPD (Strong recommendation, high certainty of evidence).
Justification	Pooled analysis demonstrated that bilevel NIV **decreased mortality** (RR 0.63, 95% CI 0.46–0.87; high certainty) and **decreased need for intubation** (RR 0.41, 95% CI 0.33–0.52; moderate certainty).
Implementation considerations	Bilevel NIV should be considered when **pH ≤ 7.35**, **$PaCO_2$ > 45 mmHg** and RR > 20–24 breaths/min despite standard medical therapy.

ERS/ATS NIV Guideline, Eur Respir J 2017; 50: 1602426.

Serum CRP (1)

CRP level in Stable COPD





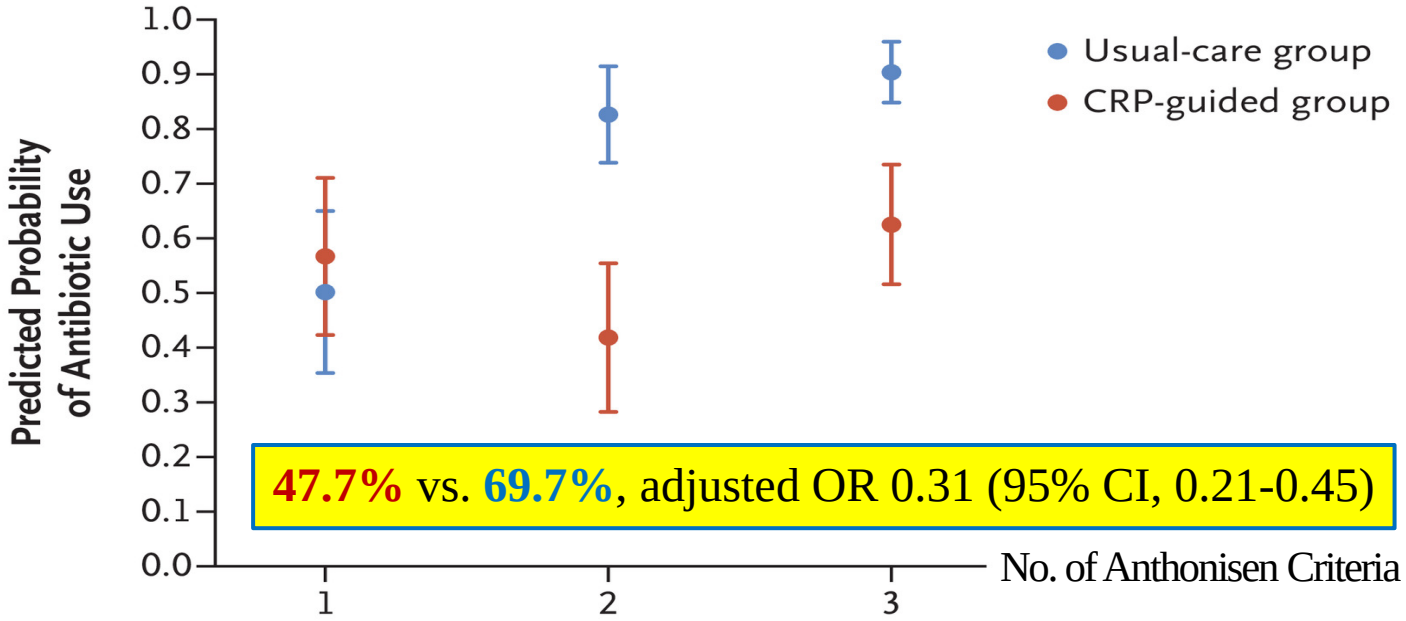
Marker	Inclusion (n=60)	Exacerbation (n=38)	*P*-value
MPO (μg/mL)	27 (15–62)	38 (16–570)	<0.01
NE (μg/mL)	44 (131–102)	53 (23–212)	>0.05
CRP (mg/L)	2.3 (2.0–19.0)	6.5 (0.3–300)	<0.001
Leukocytes ($\times 10^9$/L)	7.1 (4.5–13.5)	8.3 (5.4–16.0)	<0.01
Neutrophils ($\times 10^9$/L)	4.1 (2.3–9.6)	5.5 (3.1–13.0)	<0.01

ECOPD	CRP (mg/L)	GOLD	CRP (mg/L)
Type I	35.3 (9.6~70.9)	Stage I	50.6 (17.2~56.8)
Type II	18.6 (4.4~52.8)	Stage II	43.0 (11.8~71.6)
Type III	**12.6** (3.7~39.4)	Stage III	13.4 (5.1~57.3)
		Stage IV	**12.9** (4.4~51.6)
P value	0.003	P value	0.011

Int J COPD 2020; 15: 681-90. Int J COPD 2015; 10: 1253-63. Chest 2007; 131: 1058-67. Modified.

Serum CRP (2)

CRP Testing to Guide Antibiotic Prescribing for ECOPDs, Multicenter RCT	
CRP level (mg/L)	**Guidance**
< 20	Antibiotics are **unlikely to be beneficial** and usually should not be prescribed
20~40	Antibiotics **may be beneficial**, mainly if **purulent sputum** is present
> 40	Antibiotics are **likely to be beneficial**



- CRP: airway/lung inflammation에 비특이적
- Proposal 목적이 measurable point-of-care marker를 하나라도 포함시키는데 있음
- CRP > 10 mg/L를 mild/moderate ECOPD 구분에 적용하는 것에 panel consensus를 이룸
- Threshold는 추후 조정 가능함

N Engl J Med 2019; 381: 111-20.

Diagnostic Approach to ECOPD – The Rome Proposal

Urgent Medical Contact: Patient with Suspected ECOPD

Confirm ECOPD Diagnosis & Determine Severity

Severity	Criteria for Judging Severity		
Mild (default)	• Dyspnea VAS < 5	• RR < 24 / min	• HR < 95 bpm
	• Resting $SaO_2 \geq 92\%^*$ & change $\leq 3\%^\dagger$	• CRP < 10 mg/L‡	
Moderate (at least 3 of 5)	• **Dyspnea VAS ≥ 5**	• **RR ≥ 24** / min	• **HR ≥ 95** bpm
	• **Resting SaO_2 < 92%*** & **change ≤ 3%**	• **CRP ≥ 10** mg/L	• Hypoxemia (≤ 60) or Hypercapnia‡
Severe	• Hypercapnia & Acidosis (**$PaCO_2$ > 45mmHg** & **pH < 7.35**)		

*breathing ambient air or patient's usual oxygen prescription, †when known, ‡if obtained,

Consider Differential Diagnosis

Heart failure
Pneumonia
Pulmonary embolism

Appropriate Testing & Treatment

Determine Etiology

Viral Testing, Sputum Culture, Other

Am J Respir Crit Care Med 2021; 204: 1251-8. Figure 2. Modified.

CES (COPD Exacerbation Syndrome) Severity Criteria

	Baseline	Assessment of acute episode					
	Baseline risk stratification	Dyspnea (mMRC)	Altered level of consciousness	Respiratory rate	Gas exchange		
Mild	Low risk	≤ 2	Absent	< 24	SaO_2 ≥ 95%	Mild	All criteria must be met
Moderate	High risk FEV_1 < 50% mMRC 2-4 ECOPD ≥ 2			24 - 30	SaO_2 90 - 94%	Moderate	Any yellow criterion
severe	Any risk stratification	≥ 3	Drowsiness	≥ 30	PaO_2<60 mmHg o SaO_2<90%	severe	Any red criterion regardless of the baseline risk level
Very severe			Stupor/coma		pH<7,30 $PaCO_2$≥60 mmHg	Very severe	Any purple criterion, regardless of the baseline risk level

GesEPOC (Spanish COPD Guideline) 2021, Archivos de Bronconeumología 2022; 2: T159–70.

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Predictors of Future Exacerbation

Previous Exacerbation History

Airflow Limitation (FEV_1)

PA-to-Aorta Cross-Sectional Dimension Ratio

Emphysema Severity

Airway Wall Thickness

Presence of Chronic Bronchitis

Severe Vitamin D deficiency

Anxiety

Socioeconomic Status

Number of Comorbidities ↑

Physical Activity ↓

Dyspnea Score ↑

CAT or SGRQ ↑

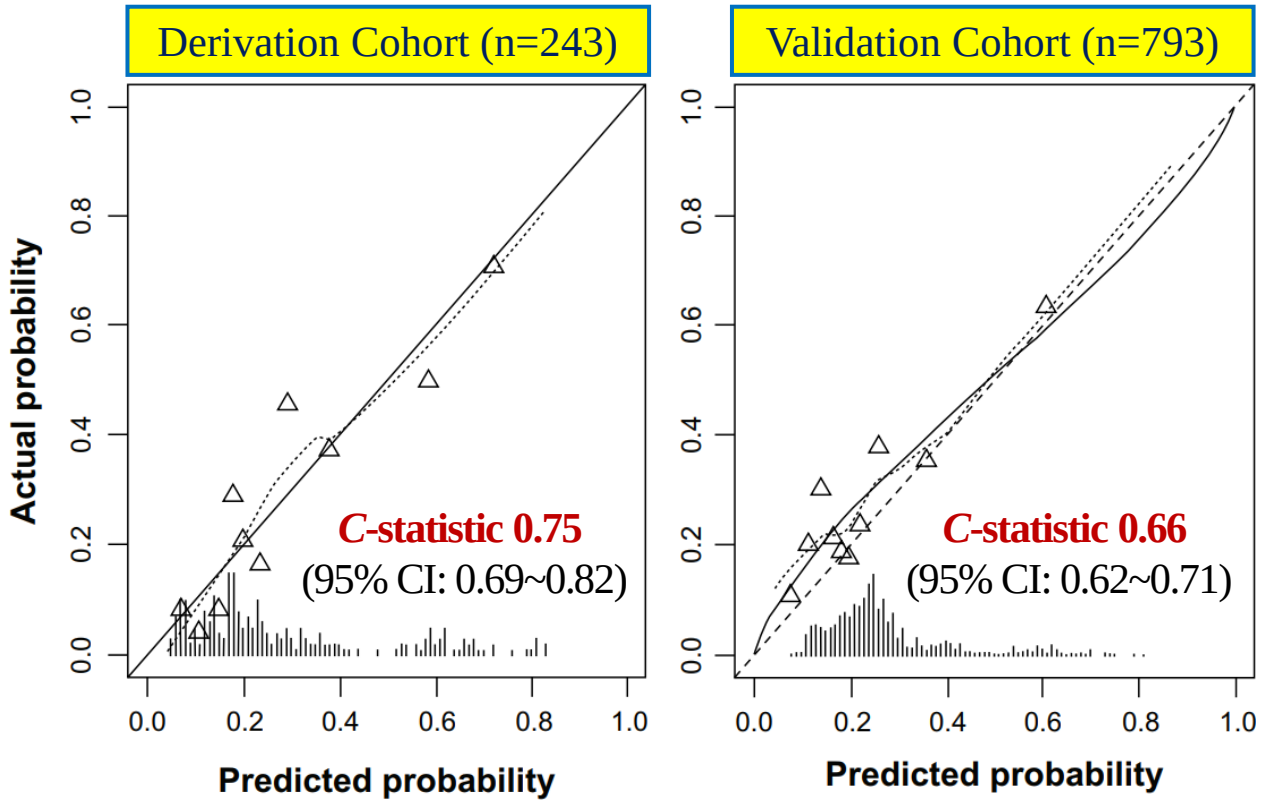
Presence of GERD

CRP, Fibrinogen, Eosinophil...

GOLD REPORT 2022; p 115. Breathe 2021; 17: 210081.

Development & Validation of ECOPD Risk Prediction Model

Final Prediction Model to Predict ECOPD		
Independent Variables	**OR**	**95% CI**
Previous exacerbations	**5.07**	2.55~10.07
FEV_1, % predicted (OR per 5%)	0.95	0.88~1.03
Smoking, PYRs (2log transformed)	1.16	1.01~1.35
History of Vascular Disease	**1.92**	0.89~4.12



Risk of ECOPD within the next 24 months =
$1 / [1 + \exp - (-1.33 + 1.62 \times$ **previous AE** $- 0.05 \times$ **FEV_1** (%) $+ 0.15 \times 2\log($**PYRs**$) + 0.65 \times$ **history of vascular disease**$)]$

Int J COPD 2013; 8: 493-9.

Prediction Model for total AE	Incidence Rate Ratio				
Database (DB)	COPDGene	OLIN	RECODE	ECLIPSE	UPLIFT
Fixed set of predictors					
Sex	**1.23**	**2.86**	1.20	**1.31**	1.09
Age (years)	1.00	1.00	1.00	**1.01**	**1.01**
FEV1 (%)	**0.99**	**0.96**	**0.98**	**0.99**	**0.99**
No. of previous AE	**1.75**	**1.49**	**1.58**	**1.38**	**1.25**
BMI < 20	0.98	1.65	–	1.09	**1.20**
History of CVD	1.07	1.13	1.06	0.98	0.99
SGRQ score	**1.01**	–	**1.02**	**1.01**	**1.01**
Treatment group in trial	–	–	1.08	–	**0.83**
Other DB-specific predictors					
Current smoker	**0.81**	–	1.07	**0.88**	1.05
Pack-years	–	–	–	–	**1.002**
Time since diagnosis (years)	–	–	–	–	1.005
Diagnosis of emphysema	–	–	–	–	0.97
Cough	**1.16**	–	–	–	–
Wheeze	**1.37**	–	–	–	–
MRC dyspnea	–	–	0.98	1.03	–
Charlson comorbidity index	–	–	0.98	–	0.98
Other comorbidities	–	–	–	1.00	–
6MWD (m)	–	–	–	**1.001**	–
Physical activity IPAQ	–	–	0.81	–	–
ICS at baseline	–	–	–	–	**1.30**
Resting SpO_2 (%)	**0.97**	–	–	–	–
Fibrinogen (mg/dL)	–	–	–	1.00	–

Prediction Model for severe AE	Incidence Rate Ratio			
Database (DB)	COPDGene	RECODE	ECLIPSE	UPLIFT
Fixed set of predictors				
Sex	**1.22**	0.64	1.05	1.09
Age (years)	1.00	1.02	**1.03**	**1.03**
FEV1 (%)	**0.99**	**0.98**	**0.98**	**0.97**
No. of previous severe AE	**2.15**	**5.19**	**1.99**	**1.68**
BMI < 20	1.30	–	**1.44**	**1.83**
History of CVD	1.26	0.64	**1.38**	1.11
SGRQ score	**1.02**	**1.03**	**1.02**	**1.01**
Treatment group in trial	–	0.96	–	**0.86**
Other DB-specific predictors				
Current smoker	0.99	1.23	1.11	**1.23**
Pack-years	–	–	–	1.00
Time since diagnosis (years)	–	–	–	1.01
Diagnosis of **emphysema**	–	–	–	**1.18**
Cough	1.01	–	–	–
Wheeze	**1.34**	–	–	–
MRC dyspnea	–	1.14	0.93	–
Charlson comorbidity index	–	1.03	–	1.03
Other comorbidities	–	–	0.87	–
6MWD (m)	–	–	1.00	–
Physical activity IPAQ	–	0.98	–	–
ICS at baseline	–	–	–	**1.23**
Resting SpO_2 (%)	1.00	–	–	–
Fibrinogen (mg/dL)	–	–	1.00	–

Model Validation Results for Total & Severe Exacerbations

	COPDGene		OLIN		RECODE		ECLIPSE		UPLIFT	
	Rate	MAE	Rate	MAE	Rate	MAE	Rate	MAE	Rate	MAE
Total exacerbations										
Weighted mean **observed rate**	**0.61**	–	**0.15**	–	**0.51**	–	**1.22**	–	**0.79**	–
Predicted rates										
Model 1: FEV1 only	**0.65**	**0.63**	**0.18**	0.28	**0.51**	**0.62**	**1.25**	**1.05**	**0.83**	**0.64**
Model 2: fixed set of predictors	0.65	**0.58**	0.25	0.28	0.57	**0.56**	1.31	**0.80**	0.89	**0.62**
Model 3: model 2 + data source-specific predictors	0.66	**0.58**	Na	Na	0.57	**0.56**	1.28	**0.81**	0.89	**0.62**
Model 4: zero-inflated model	0.64	0.58	0.20	0.22	0.66	0.60	1.24	0.77	0.91	0.62
Model 5: exacerbations in the previous year	Na	Na	Na	Na	**0.60**	**0.64**	**1.09**	0.94	**0.82**	**0.84**
Severe exacerbations										
Weighted mean **observed rate**	0.17	–	0.02	–	0.07	–	0.27	–	0.15	–
Predicted rates										
Model 1: FEV1 only	0.22	0.25	Na	Na	0.07	0.13	0.28	0.34	0.18	0.22
Model 2: fixed set of predictors	0.22	0.22	Na	Na	0.17	0.19	0.34	0.44	0.40	0.34
Model 3: model 2 + data source-specific predictors	0.22	0.22	Na	Na	0.18	0.21	0.33	0.44	0.41	0.35
Model 4: zero-inflated model	0.21	0.22	Na	Na	0.24	0.23	0.30	0.41	0.34	0.30
Model 5A: exacerbations in the previous year	Na	Na	Na	Na	0.14	0.17	0.19	0.34	0.27	0.34

Int J COPD 2017:12 3183-94.

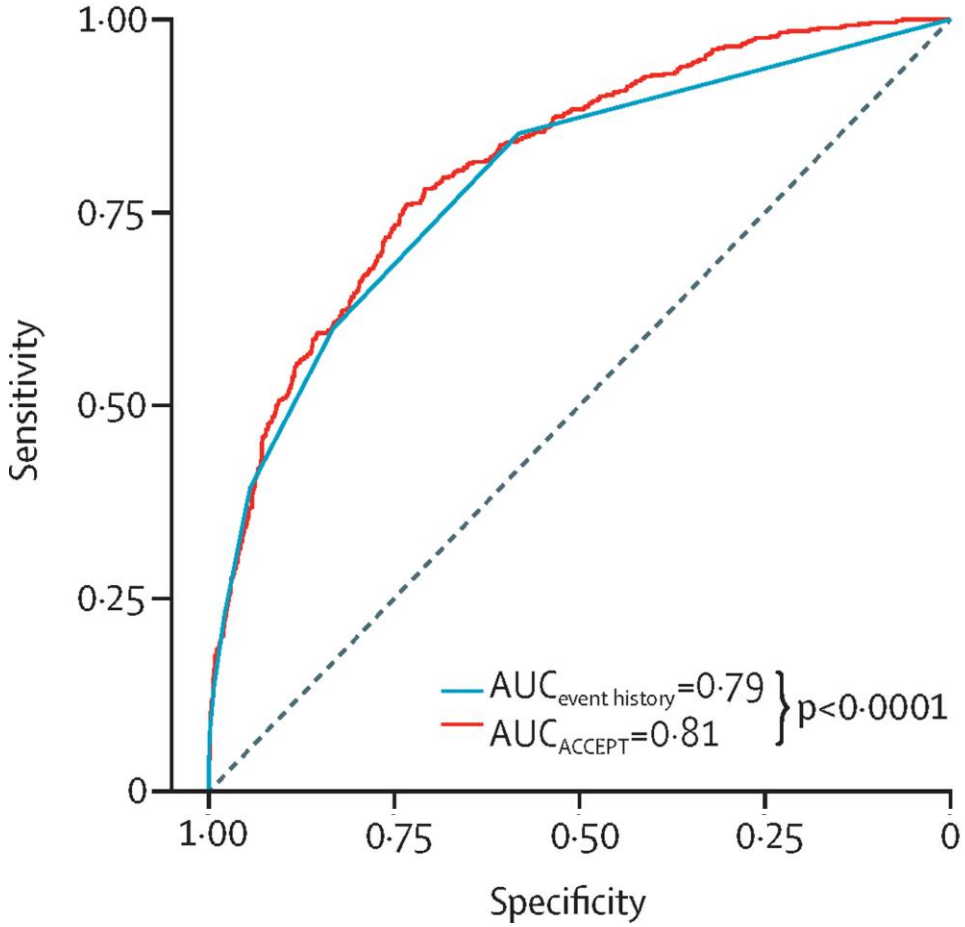
Acute COPD Exacerbation Prediction Tool (ACCEPT)

Model coefficients for the joint rate–severity prediction model of COPD exacerbations				
3 Trials (n=2380) MACRO STATCOPE OPTIMAL	Rate Component		Severity Component	
	Estimate ln (HR) (95% CI)	p value	Estimate ln (OR) (95% CI)	p value
Intercept	−0·009 (−0·58 to 0·56)	0·97	−3·849 (−5·54 to −2·16)	<0·0001
Sex (male vs female)	−0·152 (−0·25 to −0·05)	0·003	0·377 (0·08 to 0·67)	0·01
Age at baseline (per 10 years)	−0·018 (−0·08 to 0·05)	0·58	0·109 (−0·07 to 0·29)	0·24
Current smoker at baseline	−0·195 (−0·32 to −0·07)	0·003	0·390 (0·03 to 0·75)	0·03
Oxygen therapy past year	0·085 (−0·03 to 0·20)	0·16	0·538 (0·20 to 0·88)	0·002
Baseline **FEV1** (% of predicted)	−0·428 (−0·79 to −0·07)	0·02	−1·119 (−2·24 to 0·01)	0·05
SGRQ score (per 10 units)	0·100 (0·07 to 0·13)	<0·0001	0·199 (0·11 to 0·29)	<0·0001
BMI (per 10 units)	−0·123 (−0·21 to −0·04)	0·004	−0·103 (−0·36 to 0·15)	0·43
CVD-indicated **Statins**	0·095 (−0·03 to 0·22)	0·13	0·315 (−0·03 to 0·67)	0·08
LAMA	0·144 (0·03 to 0·25)	0·01	−0·134 (−0·45 to 0·18)	0·40
LABA	0·118 (−0·01 to 0·24)	0·07	0·012 (−0·34 to 0·36)	0·95
ICS	0·216 (0·09 to 0·34)	0·001	0·376 (0·03 to 0·72)	0·03
Random effect variance	0·60 (0·51 to 0·69)	<0·0001	2·385 (1·63 to 3·14)	<0·0001
Random effect covariance	0·147	0·17	..	..

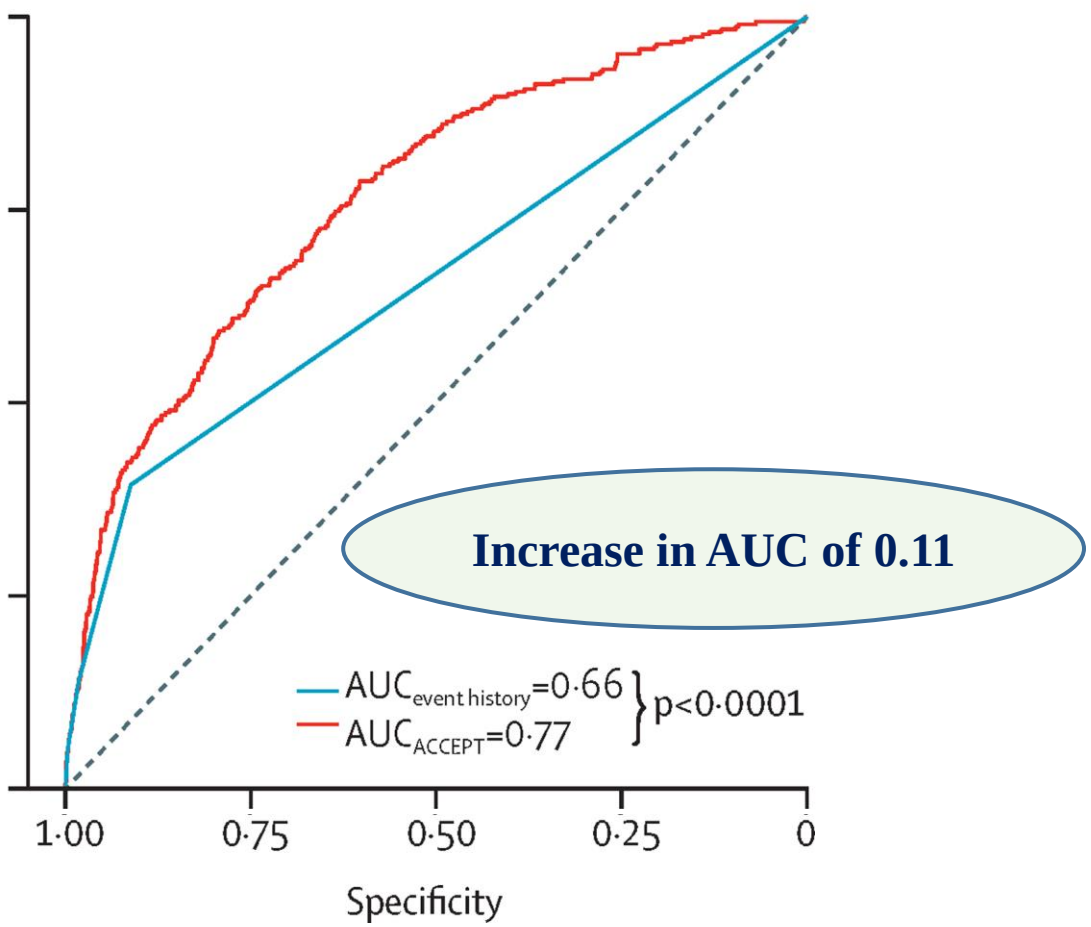
Lancet Respir Med 2020; 8: 1013-21.

External Validation of ACCEPT in ECLIPSE Cohort

All Patients with at least 2 ECOPD



All Patients with at least 1 Severe ECOPD



Lancet Respir Med 2020; 8: 1013-21.

Acute COPD Exacerbation Prediction Tool (ACCEPT)

Model *
ACCEPT (Adibi et al, 2020)

Gender *
male

Age (year) *
65

Is the patient currently a smoker? *
yes

Post-bronchodilator FEV1 (% predicted) *
70

St. Georges Respiratory Questionnaire Score (SGRQ)

If SGRQ is not available, please enter COPD Assessment Test (CAT) Score
15

Body mass index (BMI) *
23

Has the patient received oxygen therapy within the last year? *
no

Is the patient currently on statins? *
yes

Is the patient currently on LAMAs? *
yes

Is the patient currently on LABAs? *
no

Is the patient currently on inhaled corticosteroids? *
no

Number of All Exacerbations within the last 12 months *
1

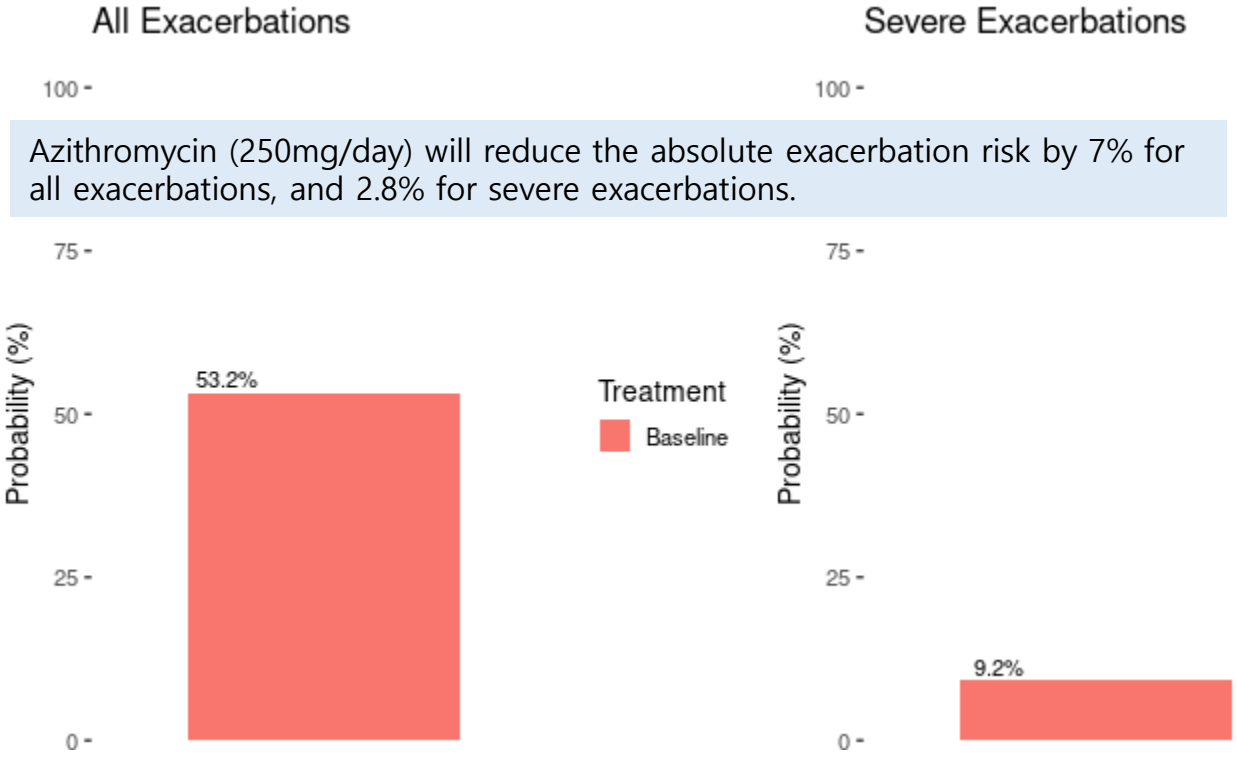
Number of Severe Exacerbations within the last 12 months *
0

I agree to terms

Run the prediction model | Start over

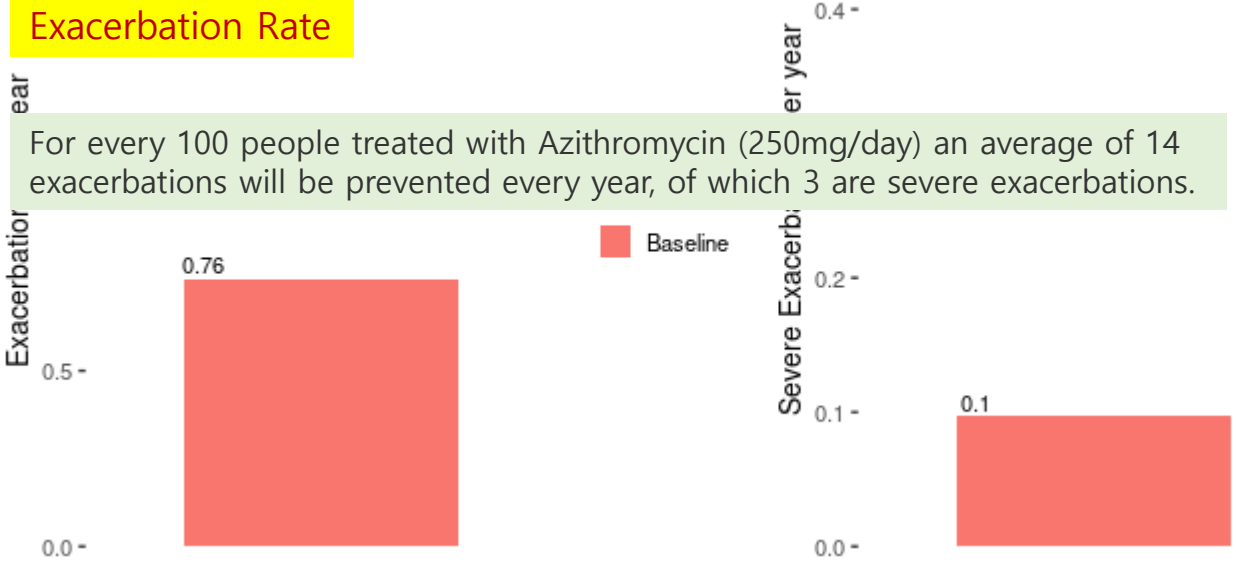
https://resp.core.ubc.ca/ipress/accept

Exacerbation Risk



Azithromycin (250mg/day) will reduce the absolute exacerbation risk by 7% for all exacerbations, and 2.8% for severe exacerbations.

Exacerbation Rate



For every 100 people treated with Azithromycin (250mg/day) an average of 14 exacerbations will be prevented every year, of which 3 are severe exacerbations.

TABLE OF CONTENTS

SUMMARY

❖ New Definition of Exacerbation & Severity Determination

- 정의에 **시간 개념**이 포함됨 (2주 이내)
- 다른 원인 또는 병발 가능한 질환에 대한 임상적 평가 강조
- **측정 가능한 요소**로 증상, 징후, 중증도 평가 (Dyspnea VAS, RR, HR, SpO_2, CRP + ABGA)
- 새로운 제안에 대한 **validation** 요망

❖ Prediction of Future Exacerbation

- **과거 악화력**이 가장 강력한 예측 인자
- 다른 **여러 변수를 포함한 모델**로 예측의 오류를 줄이고 정확도를 높일 수 있음
- Application 등으로 **도구화된 예측 모델** 활용 가능