YU MC 영남대학교병원

NON-PHARMACOLOGICAL TREATMENT and CO-MORBIDITIES

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Contents

- **Non-pharmacologic Tx.**
  - Smoking cessation
  - Vaccination
  - Pulmonary rehabilitation
  - BSC, Palliative, Hospice care
  - Nutritional support
  - Interventions

Contents

- **Co-morbidities**
  - Cardiovascular disease(HTN, CHF, IHD)
  - DM
  - Dyslipidemia
  - Anxiety, Depression

Contents

- **Non-pharmacologic Tx.**
  - **Smoking cessation**
  - Vaccination
  - Pulmonary rehabilitation
  - BSC, Palliative, Hospice care
  - Nutritional support
  - Interventions

GOLD REPORT 2024 KEY CHANGES SUMMARY

Key Changes

- Information about **PRISm** (preserved ratio but impaired spirometry) has been expanded (Page 13)
- A new section on **Hyperinflation** has been added (Page 17)
- In the **Spirometry** section further clarification about pre-bronchodilator spirometry has been added (Page 26)
- A new section on **Screening for COPD in Targeted Populations** (Page 29) has been added with information on **Leveraging Lung Cancer Imaging for COPD screening** (Page 29), including spirometry screening in targeted populations, and **Leveraging Incidental Lung Imaging Abnormalities for COPD Screening** (Page 30)
- In the **Initial Assessment** section, the paragraphs on **Blood Eosinophil Count** have been updated (Page 34)
- **Interstitial Lung Abnormalities** are now covered (Page 38)
- The section on **Smoking Cessation** has been revised (Page 43)
- **Vaccination Recommendations** for people with COPD have been updated in line with current guidance from the US Centers for Disease Control (CDC) (Page 46)
- **Managing Inhaled Therapy** has been expanded (Page 53) and includes information on a patient's **Ability to use the Delivery System Correctly** (Page 54) and **Choice of Inhaler Device** (Page 54)
- A new section on **Pharmacotherapies for Smoking Cessation** has been added (Page 68)

SMOKING CESSATION

40% of COPD patients: current smoker

Long term quit success rates: 20%

Counseling

Pharmacotherapies

Nicotine replacement products :

-nicotine replacement(patch..), electronic cigarettes (e-cigarettes, vaping)

Pharmacological product:

-varenicline, bupropion, nortriptyline

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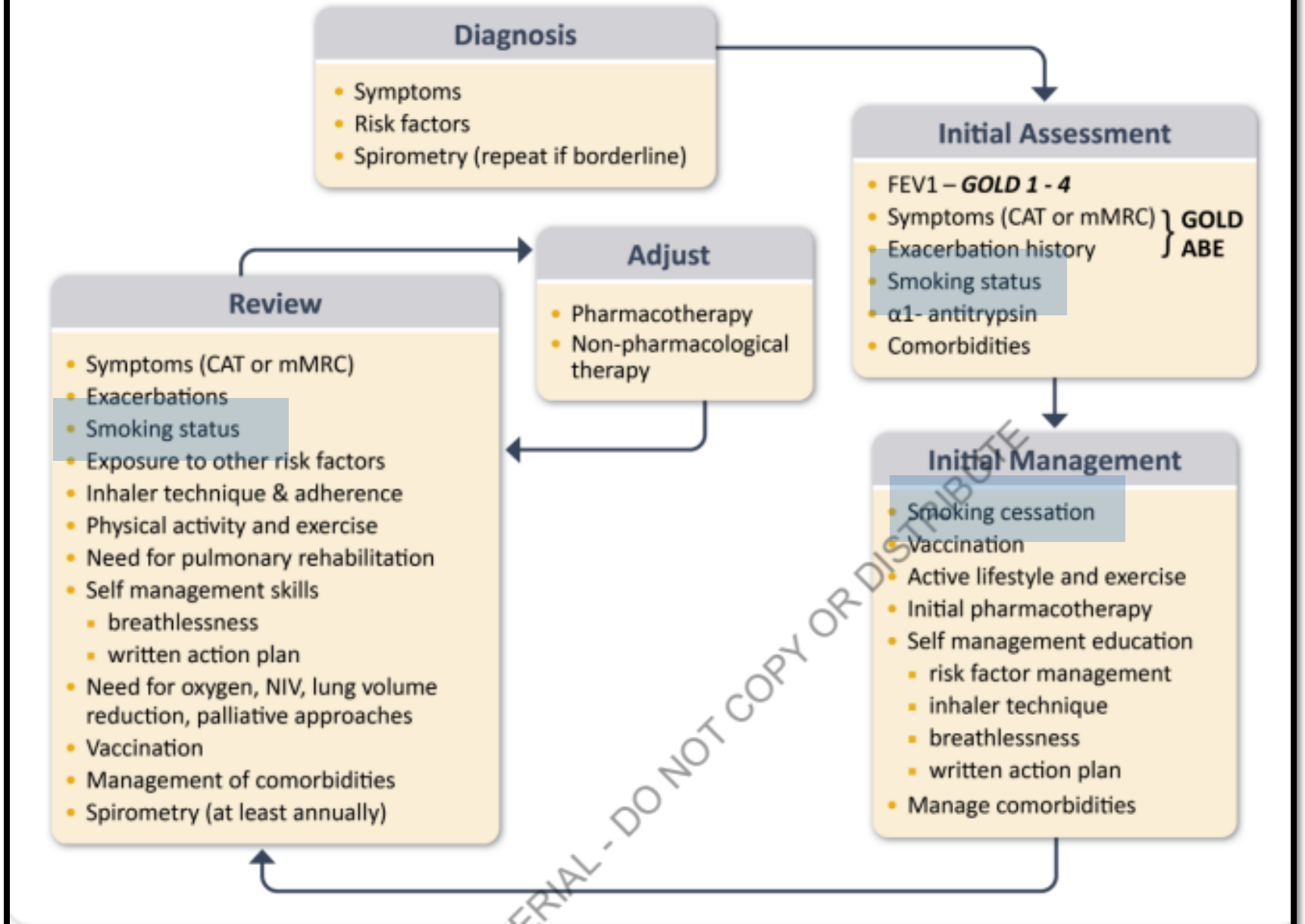
Management of COPD

Figure 3.2



2024 GOLD report

5A

Brief Strategies to Help the Patient Willing to Quit

Figure 3.4

ASK	Systematically identify all tobacco users at every visit *Implement an office-wide system that ensures that, for EVERY patient at EVERY clinic visit, tobacco-use status is queried and documented*
ADVISE	Strongly urge all tobacco users to quit *In a clear, strong, and personalized manner, urge every tobacco user to quit*
ASSESS	Determine willingness and rationale of patient's desire to make a quit attempt. *Ask every tobacco user if he or she is willing to make a quit attempt at this time (e.g., within the next 30 days)*
ASSIST	Aid the patient in quitting *Help the patient with a quit plan; provide practical counseling; provide intra-treatment social support; help the patient obtain extra-treatment social support; recommend use of approved pharmacotherapy except in special circumstances; provide supplementary materials*
ARRANGE	Schedule follow-up contact *Schedule follow-up contact, either in person or via telephone*

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A five-step program for intervention

ASK	**진료를 올 때 마다 매번 물어봐라 현재 흡연 상태를 매번 기록을 하라**
ADVISE	**단호한 어조로 당장 담배를 끊게 혼내라**
ASSESS	**금연에 대한 의지를 확인하고, 언제까지 끊을 것인지(30일이내) 약속을 해라**
ASSIST	**교육, Counseling, 금연 약물 등을 지원해라**
ARRANGE	**위에 것들을 re-assess 하기 위한 다음 약속을 잡아라**

Smoking cessation (interventions)

ELSEVIER

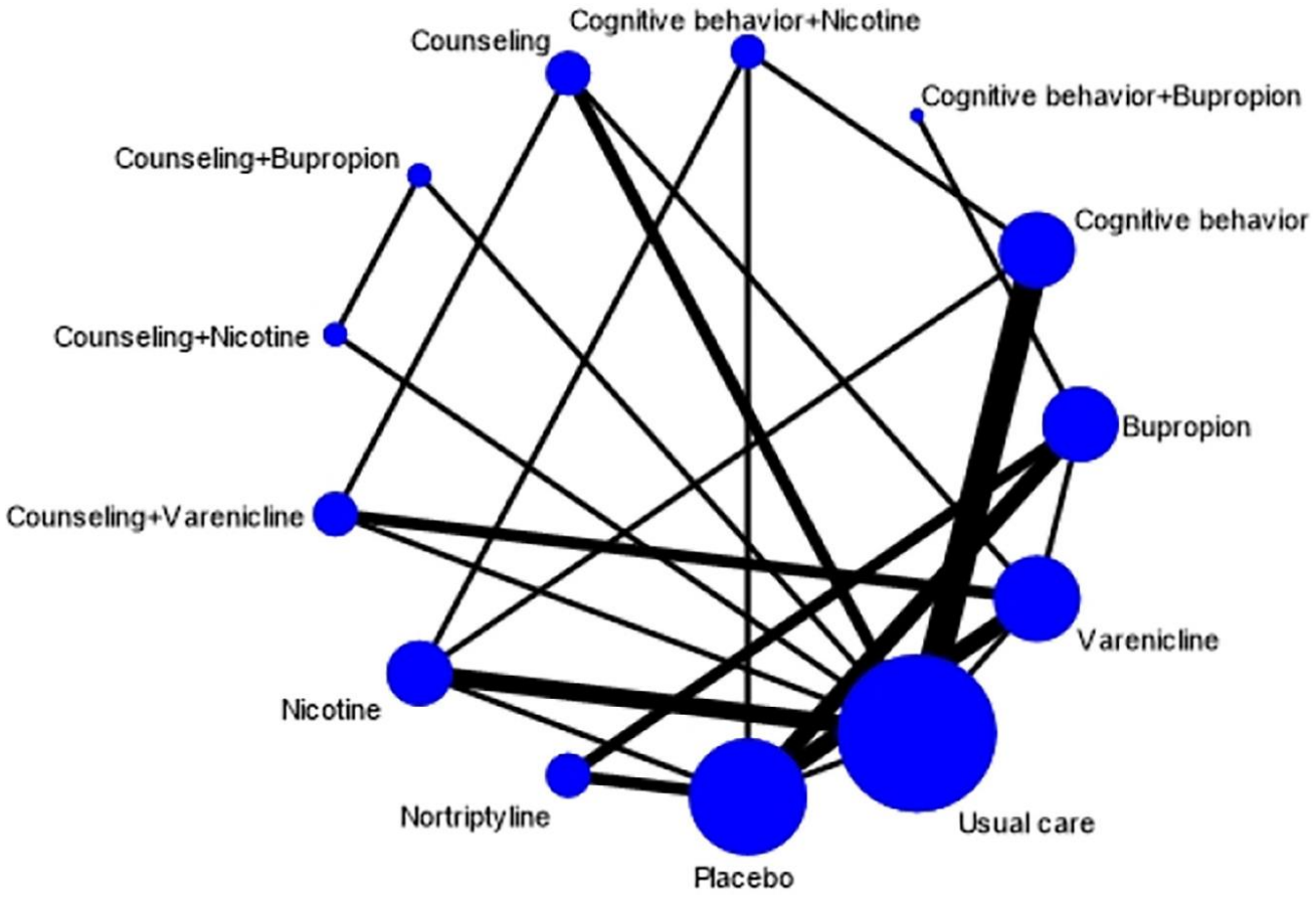
International Journal of Nursing Studies
Volume 136, December 2022, 104362

Effects of different interventions on smoking cessation in chronic obstructive pulmonary disease patients: A systematic review and network meta-analysis

Xuefeng Wei [a b c 1], Kangle Guo [a b c 1], Xue Shang [a b c], Shizhong Wang [d], Chaoqun Yang [a b c], Jieyun Li [f], Yanfei Li [b c], Kehu Yang [a b c], Xiuxia Li [a b c], Xiaohui Zhang [e]

13,480 **COPD** pt.
23 studies (RCT), Network meta-analysis, f/u period 12개월

Counseling, Pharmacotherapy

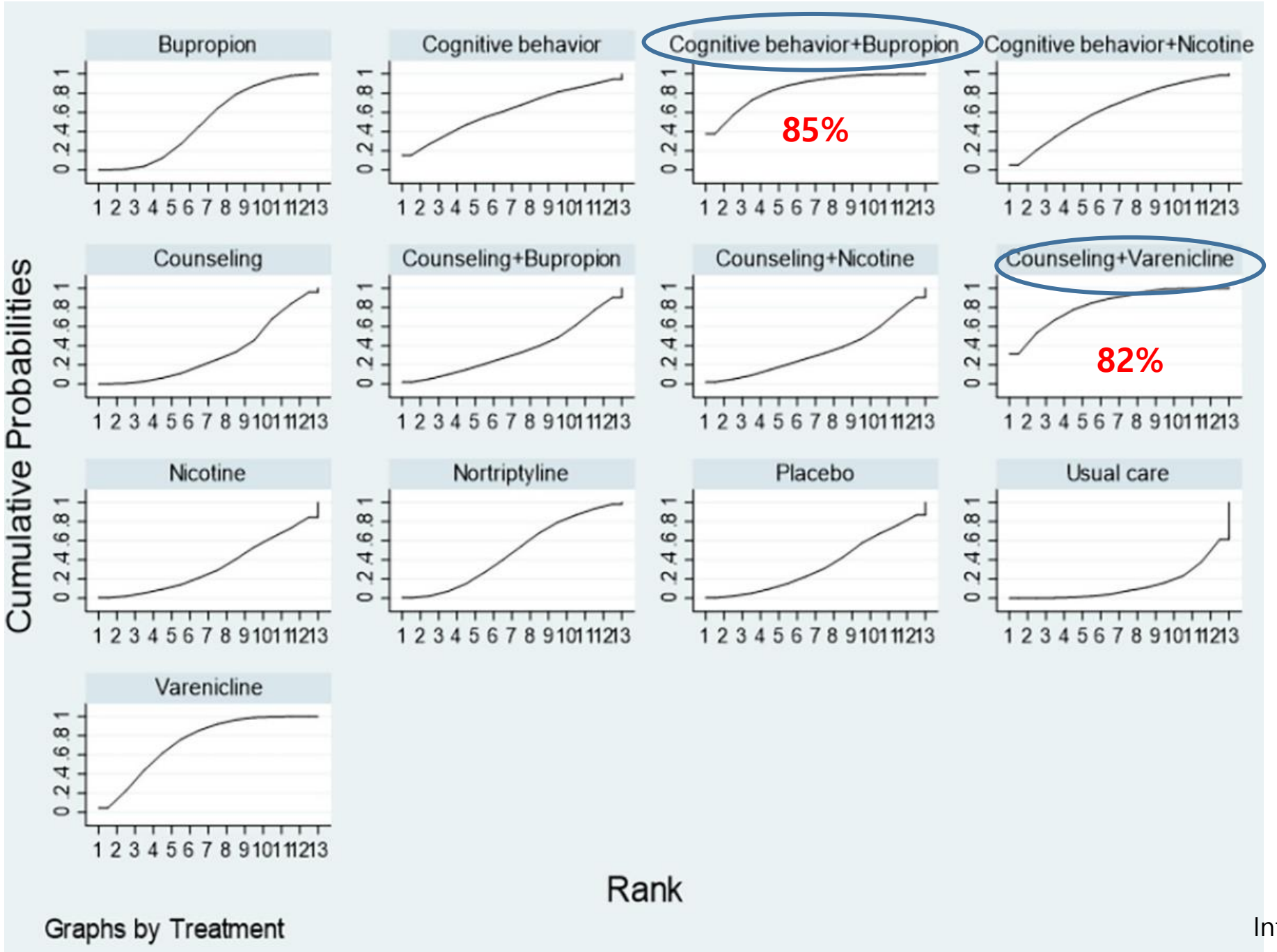


1) 심리 상담 기법 중 어떠한 것이 더 효과적인가?

2) 약제 중 가장 효과적인 것은?

3) 상담 혹은 약물치료에 있어서 단독 치료와 병합치료 중 더 효과적인 것은?

Int J Nurs Stud. 2022 Dec:136:104362.



SUCRA probability ranking (by drug)

1. Varenicline (73.5%)
2. Bupropion (51%)
3. Nortriptyline (47.7%)
4. Placebo (34.8%)
5. NRT (33.1%)
6. Usual care (13.8%)

SUCRA probability ranking (by 상담)

1. Cognitive behavior therapy (61.3%)
2. Counseling (32.7%)

병합치료가 더 우수

Int J Nurs Stud. 2022 Dec:136:104362.

Beck Depression Inventory (BDI)

벡 우울척도(Beck Depression Inventory; BDI)

벡 우울척도는 어린이와 성인의 우울 정도를 측정하는 데 사용되는 21개의 객관식 질문으로 구성된 자가보고 설문지입니다. 지난 1주일간 겪었던 일반적인 우울 증상을 떠올리며 편한 마음으로 답변하시면 됩니다.

Beck Depression Inventory (벡우울척도)

지난 2주 동안의 당신의 기분과 상태를 생각해 보시고, 이를 가장 잘 설명하는 문장의 번호에 표시해 주십시오.

1.	슬픈 기분	0점	나는 슬프지 않다.
		1점	나는 슬프다.
		2점	나는 항상 슬퍼서 그것을 떨쳐버릴 수가 없다.
		3점	나는 너무나 슬프고 불행해서 도저히 견딜 수가 없다.
2.	비관적 사고	0점	나는 앞날에 대해 기대할 것이 아무것도 없다고 느낀다.
		1점	나는 앞날에 대해서 별로 낙심하지 않는다.
		2점	나의 앞날은 아주 절망적이고 나아질 가망이 없다고 느낀다.
		3점	나는 앞날에 대해서 비관적인 느낌이 든다.
3.	실패감	0점	나는 실패자라고 느끼지 않는다.
		1점	나는 보통 사람들보다 더 많이 실패한 것 같다.
		2점	내가 살아온 과거를 뒤돌아 보면 생각나는 것은 실패뿐이다.
		3점	나는 인간으로서 완전히 실패자인 것 같다.
4.	만족감 감소	0점	나는 전과 같이 일상 생활에 만족하고 있다.
		1점	나의 일상 생활은 전처럼 즐겁지 않다.
		2점	나는 더 이상 어떤 것에서도 참된 만족을 얻지 못한다.
		3점	나는 모든 것이 다 불만스럽고 지겹다.

SMOKING CESSATION

40% of COPD patients: current smoker

Long term quit success rates: 20%

Counseling

Pharmacotherapies

Nicotine replacement products :

-nicotine replacement(patch..), electronic cigarettes (e-cigarettes, vaping)

Pharmacological product:

-varenicline, bupropion, nortriptyline

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Smoking cessation (NRT vs E-cigarette)

EUROPEAN RESPIRATORY *review*
THE RESPIRATORY PROFESSIONAL'S UPDATE
ON MEDICINE, SCIENCE AND SURGERY

Eur Respir Rev. 2022 Mar 31; 31(163): 210215.
Published online 2022 Mar 23. doi: 10.1183/16000617.0215-2021

PMCID: PMC9488503
PMID: 35321930

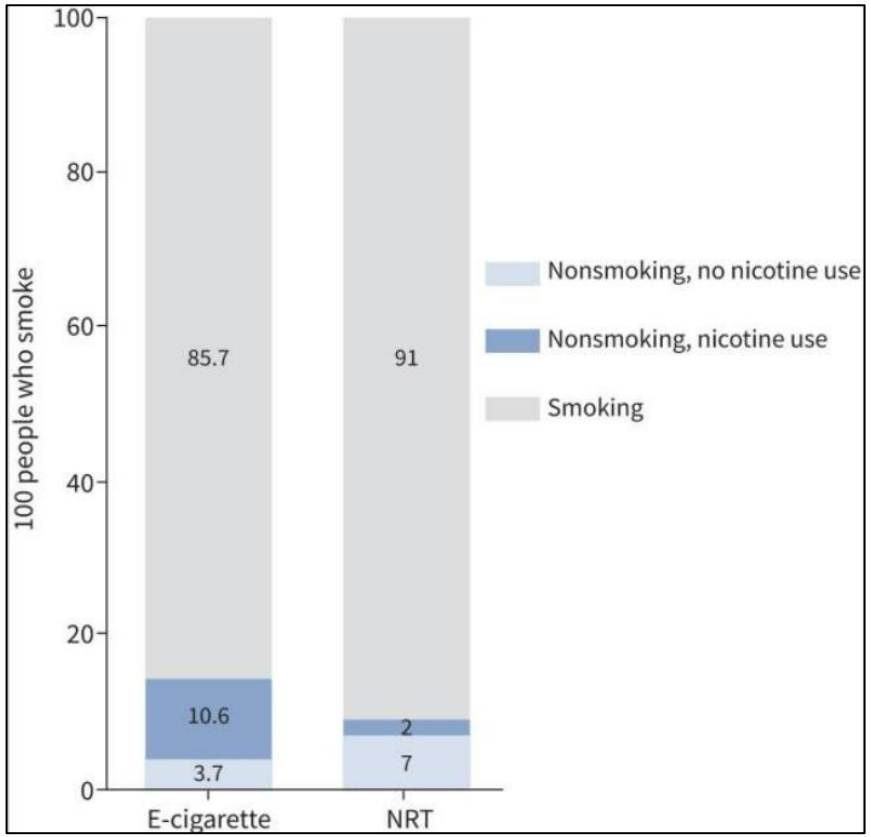
E-cigarettes and nicotine abstinence: a meta-analysis of randomised controlled trials

Reiner Hanewinkel,[✉1] Kathrin Niederberger,[2,3] Anya Pedersen,[2] Jennifer B. Unger,[4] and Artur Galimov[4]

4 RCT, N=1598 (51.0% female)
평균 나이: 41~54yr
평균 흡연량: 14-21 pack/day
평균 추적기간: 6개월

전자담배 vs 니코틴 대체 요법

- NTR (gum, nasal spray, transdermal patch, sublingular tablet)



Nicotine abstinence rate
- NRT > E-cigarette (RR 0.50 (95% CI 0.32-0.77))

Continuous use of allocated products
- NRT < E-cigarette (RR 8.94 (95% CI 3.98-20.07)

Successful cigarette quitters
- NRT < E-cigarette (RR 1.58 (95% CI 1.20-2.08)

Permanant nicotine dependence → E-cigarette

Eur Respir Rev. 2022 Mar 31; 31(163): 210215.

Smoking cessation (E-cigarette & COPD)

J Public Health (Oxf). 2022 Mar 7;44(1):158-164. doi: 10.1093/pubmed/fdaa229.

Association between E-cigarette use and chronic obstructive pulmonary disease in non-asthmatic adults in the USA

Godfred O Antwi [1], Darson L Rhodes [1]

Affiliations + expand

PMID: 33348361 DOI: 10.1093/pubmed/fdaa229

USA, Behavioral Risk Factor Surveillance Survey(BRFSS)
→ the Largest repeated **cross-sectional national survey** in USA

Asthma 진단 제외

N=177,209 / Current E-ciga user n=7,175 / Former E-ciga user n=25,926

Table 2 Association between E-cigarette use and COPD

	OR (95% CI)
E-cigarette use	
Never user	Ref.
Daily user	1.53 (1.11–2.03)
Some days	1.43 (1.13–1.80)
Former user	1.46 (1.28–1.67)
Cigarette smoking status	
Never	Ref.
Current	4.75 (4.11–5.49)
Former	3.16 (2.80–3.58)

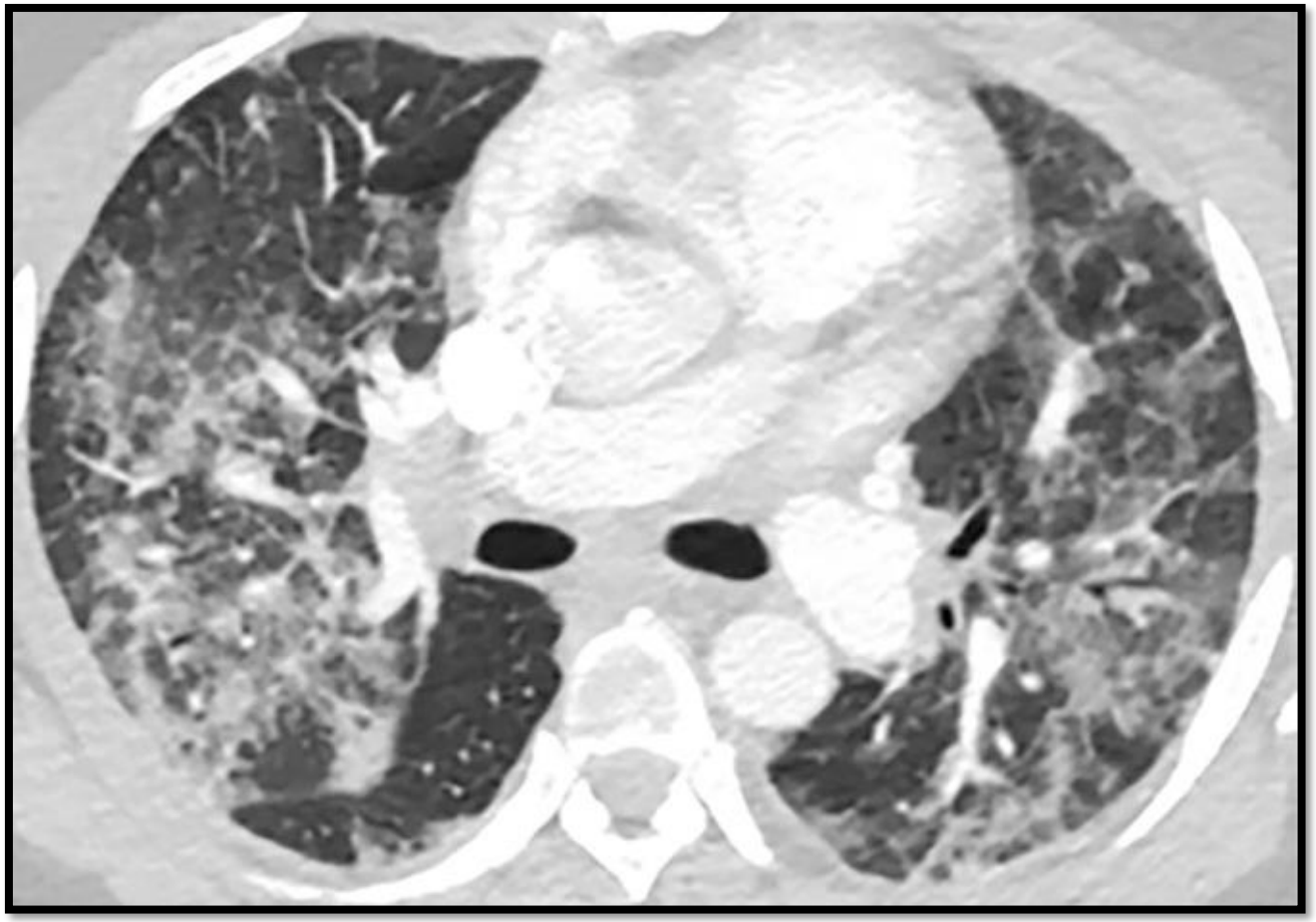
J Public Health (Oxf). 2022 Mar 7;44(1):158-164

Table 3 Association between E-cigarette use and COPD by combustible cigarette smoking status

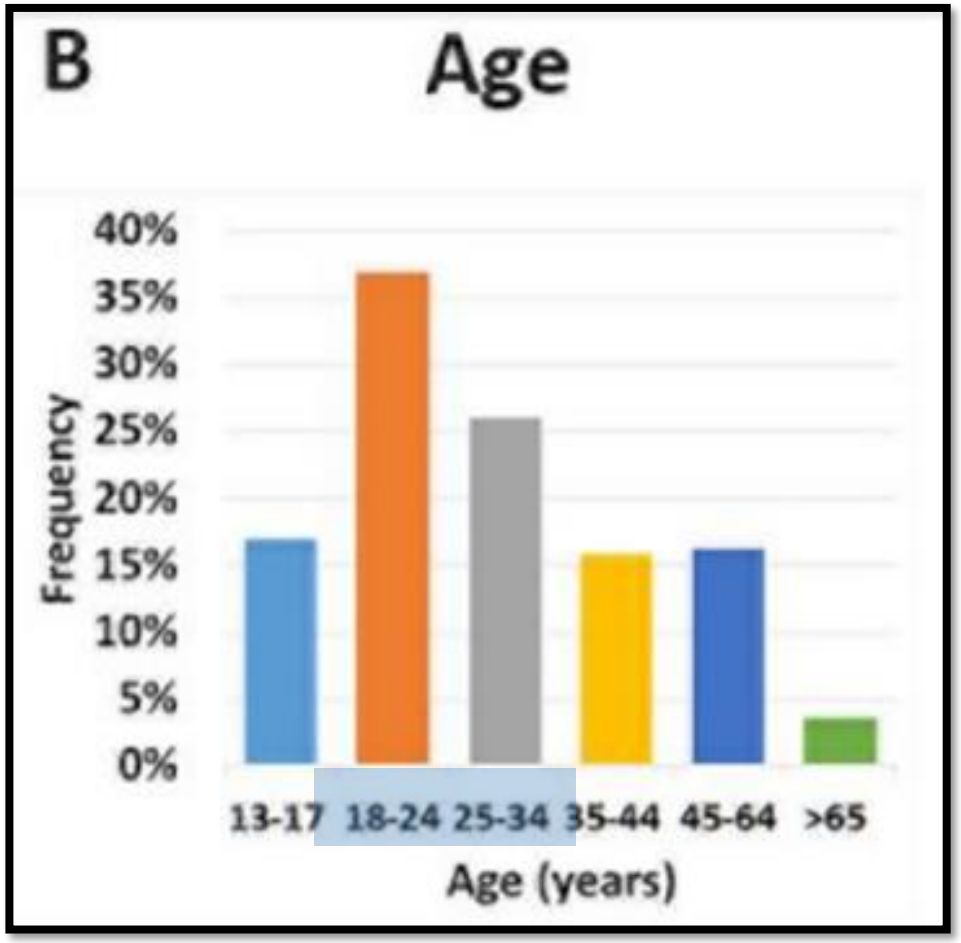
Odds of having COPD [OR (95% CI), P values]			
	Combustible-cigarette smoking status		
E-cigarette use	**Current-smoker**	**Former-smoker**	**Never-smoker**
Never	Ref.	Ref.	Ref.
Daily user	0.99 (0.67–1.46), $P = 0.97$	1.90 (1.25–2.88), $P = 0.003$	3.17 (1.04–9.63), $P = 0.04$
Some days	1.22 (0.92–1.61), $P = 0.23$	1.53 (0.90–2.60), $P = 0.12$	1.61 (0.87–3.09), $P = 0.12$
Former user	1.10 (0.94–1.29), $P = 0.17$	2.12 (1.72–2.60), $P < 0.0001$	1.55 (1.01–2.38), $P = 0.04$

Adjusted for age, gender, race/ethnicity, marital status, educational level, past month leisure time physical activity and BMI.

EVALI
(e-cigarette and vaping-associated lung injury)

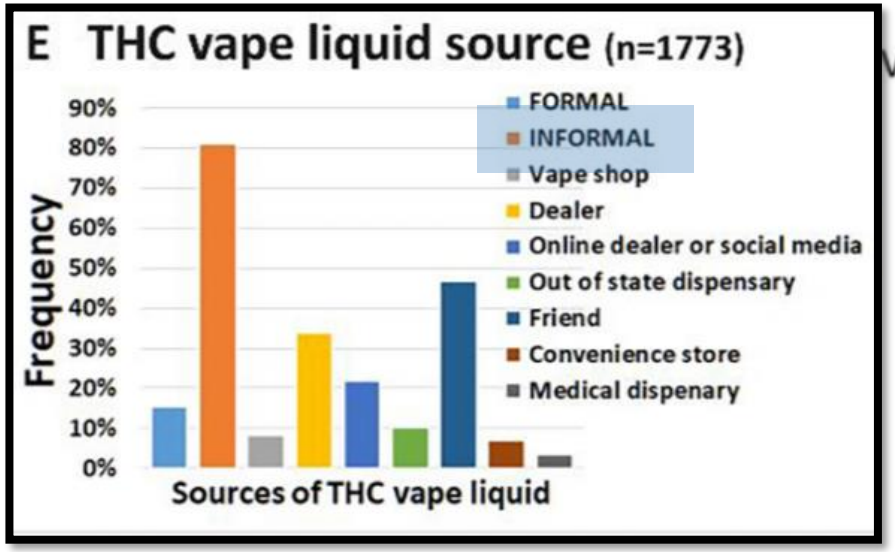


Acute Lung Injury



Crit Rev Toxicol. 2022 Mar;52(3):188-220.

EVALI
(e-cigarette and vaping-associated lung injury)

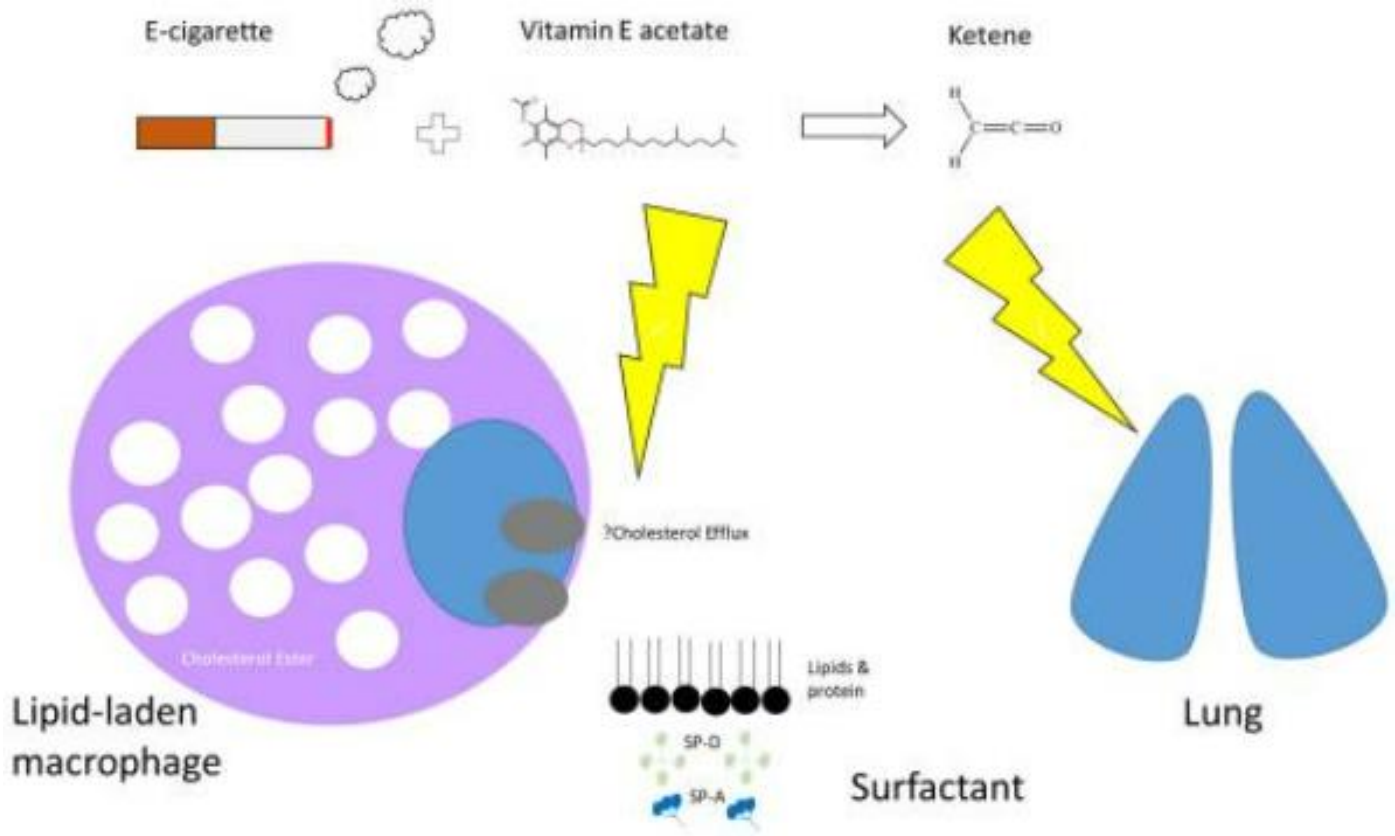


Crit Rev Toxicol. 2022 Mar;52(3):188-220.

Medicina (Kaunas). 2022 Mar 10;58(3):412.

일반적으로 Nicotine, 과일 & 멘톨 향료
비일반적, THC (대마초 성분) → 높은 수준의 Vit E acetate 함유

EVALI
(e-cigarette and vaping-associated lung injury)



2020년 부터 발병 감소
제조사에서 Vit E acetate
함유 제품 제거 및 THC
관련 법 집행 강화

Medicina (Kaunas). 2022 Mar 10;58(3):412.

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NON-PHARMCOLOGICAL TREATMENT

AT DIAGNOSIS

NON-PHARMACOLOGIC MANAGEMENT OF COPD*

PATIENT GROUP	ESSENTIAL	RECOMMENDED	DEPENDING ON LOCAL GUIDELINES
A	Smoking Cessation (can include pharmacologic treatment)	Physical Activity	Flu Vaccination Pneumococcal Vaccination Pertussis Vaccination Covid-19 Vaccination
B, C and D	Smoking Cessation (can include pharmacologic treatment) Pulmonary Rehabilitation	Physical Activity	Flu Vaccination Pneumococcal Vaccination Pertussis Vaccination Covid-19 Vaccination

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NON-PHARMCOLOGICAL TREATMENT

AT DIAGNOSIS

Non-Pharmacological Management of COPD*

Figure 3.12

Patient Group	Essential	Recommended	Depending on Local Guidelines
A	Smoking cessation (can include pharmacological treatment)	Physical activity	Influenza vaccination COVID-19 vaccinations Pneumococcal vaccination Pertussis vaccination Shingles vaccination RSV vaccination
B and E	Smoking cessation (can include pharmacological treatment) Pulmonary rehabilitation	Physical activity	Influenza vaccination COVID-19 vaccinations Pneumococcal vaccination Pertussis vaccination Shingles vaccination RSV vaccination

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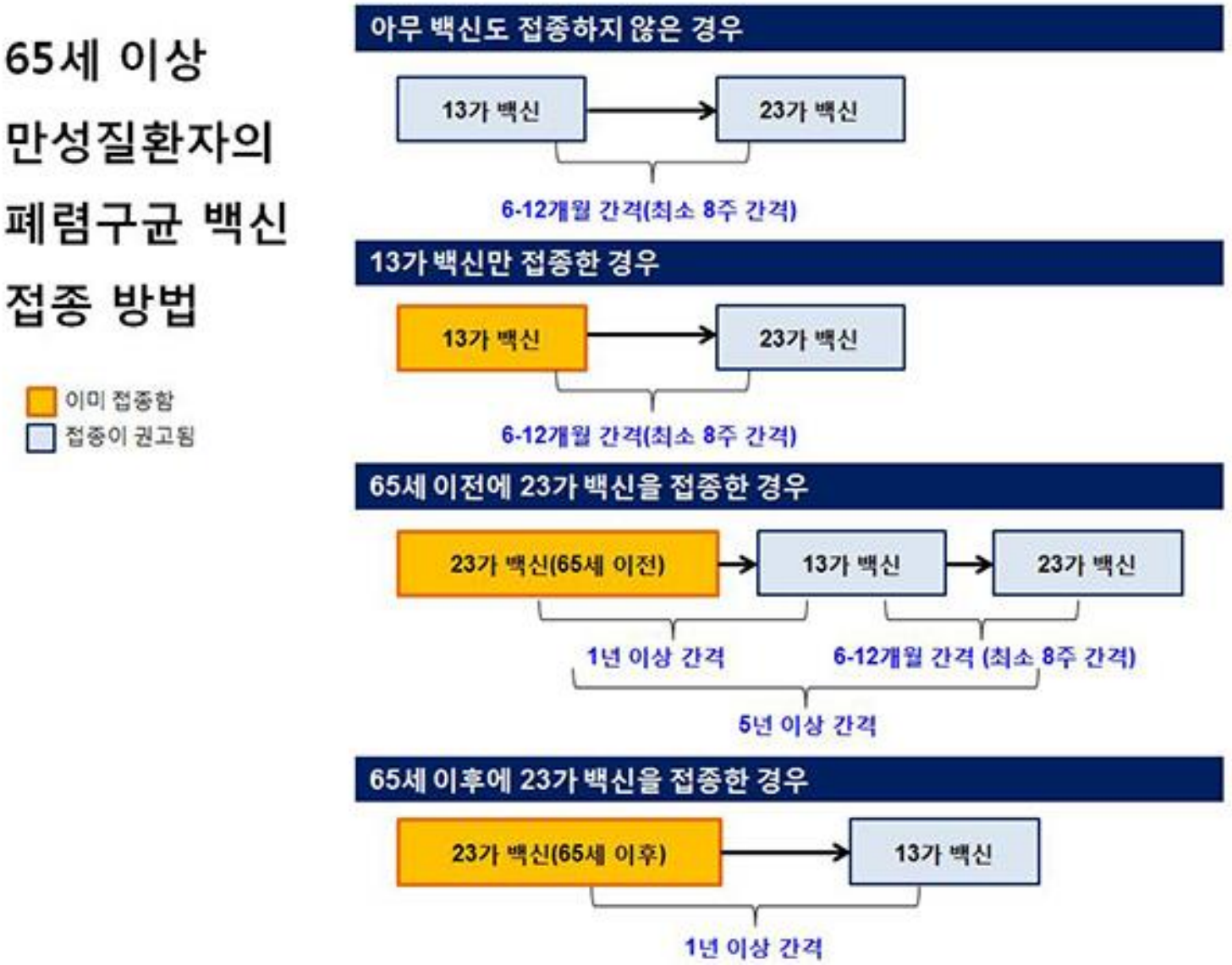
Pneumococcal Vaccination

65세 이상 만성질환자의 폐렴구균 백신 접종 방법



대한감염학회

Pneumococcal Vaccination

SCIENTIFIC REPORTS
nature research

Sci Rep. 2021; 11: 15948.
Published online 2021 Aug 5. doi: 10.1038/s41598-021-95129-w

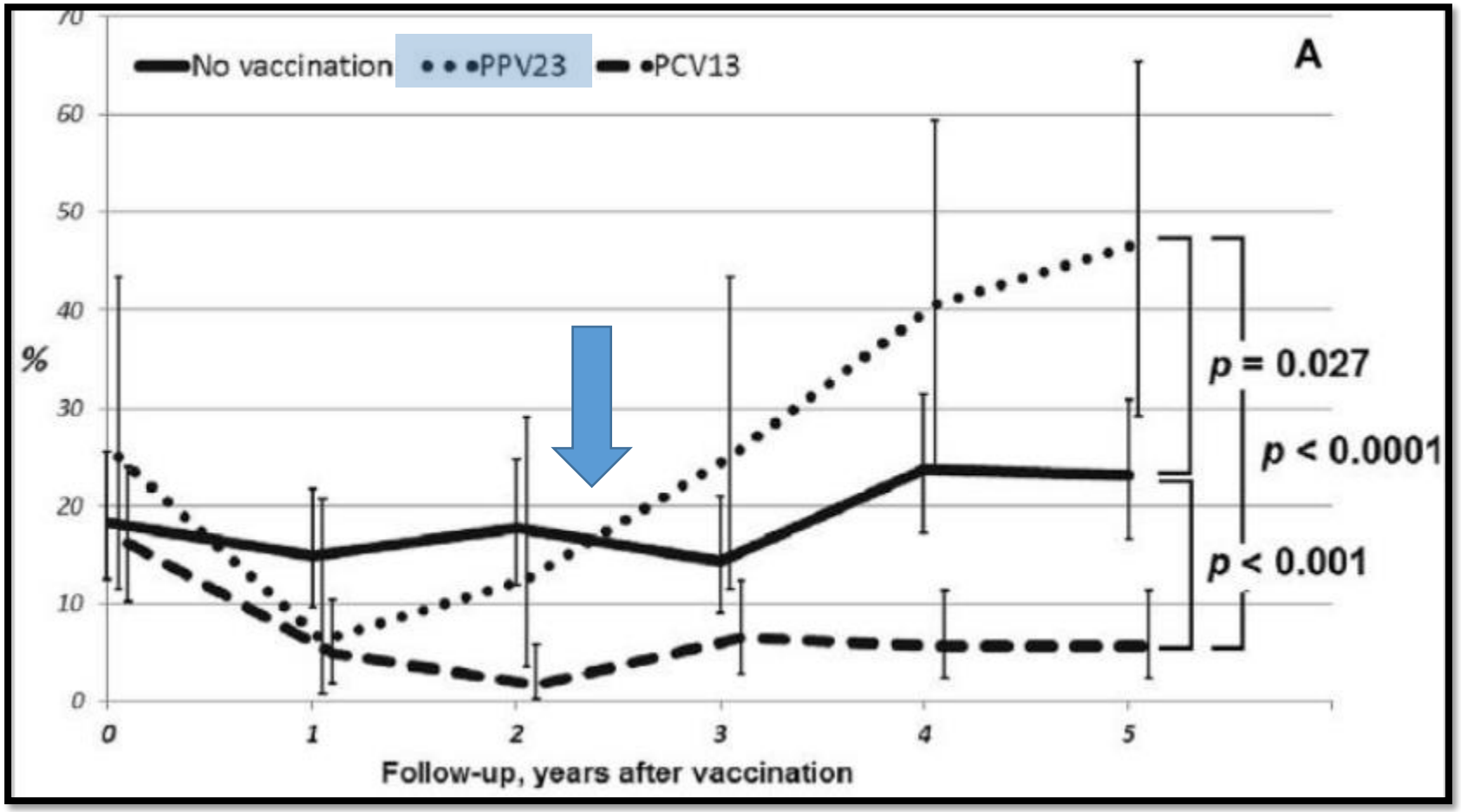
PMCID: PMC8342495
PMID: 34354113

Comparative effectiveness of pneumococcal vaccination with PPV23 and PCV13 in COPD patients over a 5-year follow-up cohort study

Galina L. Ignatova,[1] Sergey N. Avdeev,[2] and Vladimir N. Antonov[1]

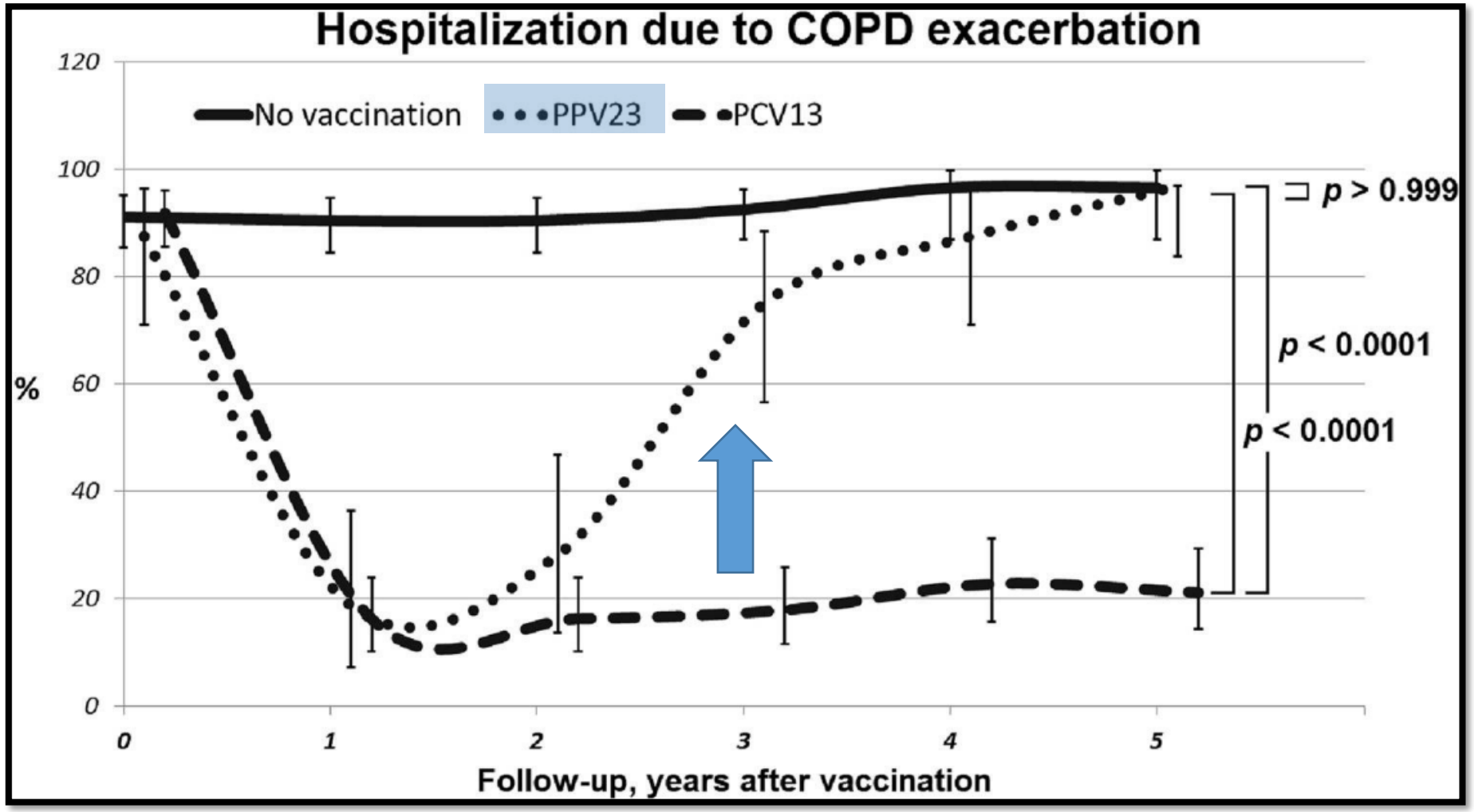
Open label, prospective cohort study
N = 302, PCV13(n=123), PPSV23(n=32)

Pneumonia admission rate



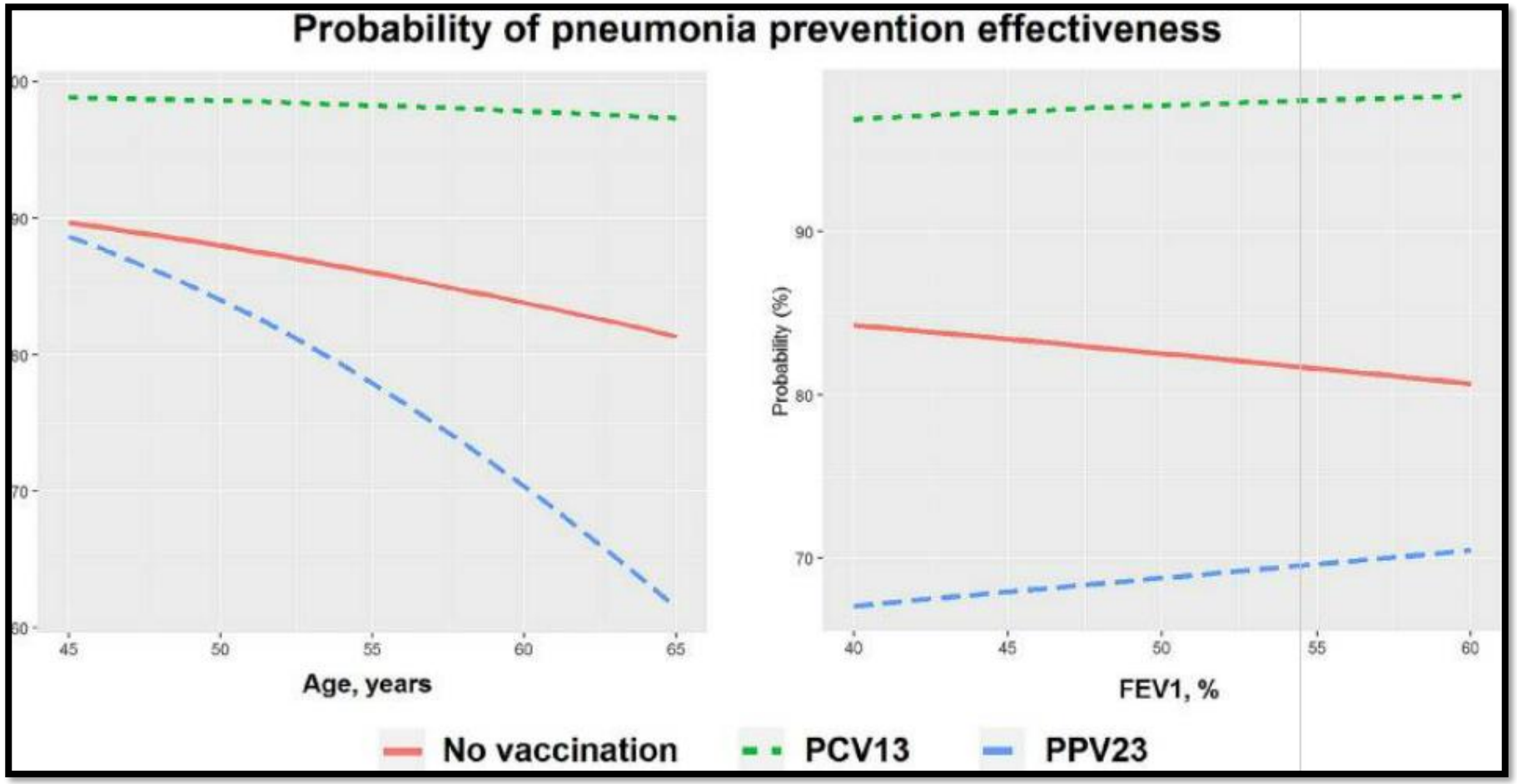
Sci Rep. 2021 Aug 5;11(1):15948.

Hospitalization d/t COPD AE



Sci Rep. 2021 Aug 5;11(1):15948.

Pneumonia prevention effectiveness



Multivariable model of pneumonia prevention

Sci Rep. 2021 Aug 5;11(1):15948.

Pneumococcal Vaccination

Practice Guideline > MMWR Recomm Rep. 2023 Sep 8;72(3):1-39. doi: 10.15585/mmwr.rr7203a1.

Pneumococcal Vaccine for Adults Aged ≥19 Years: Recommendations of the Advisory Committee on Immunization Practices, United States, 2023

Miwako Kobayashi, Tamara Pilishvili, Jennifer L Farrar, Andrew J Leidner, Ryan Gierke, Namrata Prasad, Pedro Moro, Doug Campos-Outcalt, Rebecca L Morgan, Sarah S Long, Katherine A Poehling, Adam L Cohen

PCV(Pneumococcal conjugate vaccine) 15 → PCV 13을 완전히 대체
PCV (Pneumococcal conjugate vaccine) 20

Adults ≥65 years old
Complete pneumococcal vaccine schedules

Prior vaccines	Option A	Option B
None*	PCV20	PCV15 → ≥1 year† → PPSV23
PPSV23 only at any age	≥1 year → PCV20	≥1 year → PCV15
PCV13 only at any age	≥1 year → PCV20	≥1 year† → PPSV23
PCV13 at any age & **PPSV23** at <65 yrs	≥5 years → PCV20	≥5 years§ → PPSV23

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
† Consider minimum interval (8 weeks) for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak (CSF) leak
§ For adults with an immunocompromising condition, cochlear implant, or CSF leak, the minimum interval for PPSV23 is ≥8 weeks since last PCV13 dose and ≥5 years since last PPSV23 dose; for others, the minimum interval for PPSV23 is ≥1 year since last PCV13 dose and ≥5 years since last PPSV23 dose

Shared clinical decision-making for those who already completed the series with PCV13 and PPSV23

Prior vaccines	Shared clinical decision-making option
Complete series: PCV13 at any age & **PPSV23** at ≥65 yrs	≥5 years → PCV20 — Together, with the patient, vaccine providers **may choose** to administer PCV20 to adults ≥65 years old who have already received PCV13 (but not PCV15 or PCV20) at any age and PPSV23 at or after the age of 65 years old.

다당질백신(PPSV) < 단백접합백신(PCV) : Immune 낮은 환자에서도 높은 면역성을 획득

Ref. CDC

Adults 19–64 years old with chronic health conditions
Complete pneumococcal vaccine schedules

Prior vaccines	Option A	Option B
None*	PCV20	PCV15 → ≥1 year → PPSV23
PPSV23 only	≥1 year → PCV20	≥1 year → PCV15
PCV13† only	≥1 year → PCV20	≥1 year → PPSV23 Review pneumococcal vaccine recommendations again when your patient turns 65 years old.
PCV13† and PPSV23	**No vaccines** are recommended at this time. Review pneumococcal vaccine recommendations again when your patient turns 65 years old.	
Chronic health conditions	• Alcoholism • Chronic heart disease, including congestive heart failure and cardiomyopathies • Chronic liver disease	• Chronic lung disease, including chronic obstructive pulmonary disease, emphysema, and asthma • Cigarette smoking • Diabetes mellitus

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
† Adults with chronic medical conditions were previously not recommended to receive PCV13

2013.10~2016.09 CAP admission, USA adult

PCV 13 serotype 4.6%
PCV 15 serotype 4.6% + **1.4%**
PCV 20 serotype 4.6% + **3.3%**

Adults ≥65 years old
Complete pneumococcal vaccine schedules

Prior vaccines	Option A	Option B
None*	PCV20	PCV15 → ≥1 year† → PPSV23
PPSV23 only at any age	≥1 year → PCV20	≥1 year → PCV15
PCV13 only at any age	≥1 year → PCV20	≥1 year† → PPSV23
PCV13 at any age & **PPSV23** at <65 yrs	≥5 years → PCV20	≥5 years§ → PPSV23

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines
† Consider minimum interval (8 weeks) for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak (CSF) leak
§ For adults with an immunocompromising condition, cochlear implant, or CSF leak, the minimum interval for PPSV23 is ≥8 weeks since last PCV13 dose and ≥5 years since last PPSV23 dose; for others, the minimum interval for PPSV23 is ≥1 year since last PCV13 dose and ≥5 years since last PPSV23 dose

Shared clinical decision-making for those who already completed the series with PCV13 and PPSV23

Prior vaccines	Shared clinical decision-making option
Complete series: PCV13 at any age & **PPSV23** at ≥65 yrs	≥5 years → PCV20 — Together, with the patient, vaccine providers **may choose** to administer PCV20 to adults ≥65 years old who have already received PCV13 (but not PCV15 or PCV20) at any age and PPSV23 at or after the age of 65 years old.

다당질백신(PPSV) < 단백접합백신(PCV) : Immune 낮은 환자에서도 높은 면역성을 획득

Ref. CDC

제약·바이오 > 외자사

MSD 15가 폐렴구균 백신 '박스뉴반스' 국내 허가

문성호 기자 | 발행날짜: 2023-11-03 12:02:19

가

13년 만에 새로운 폐렴구균 백신
생후 6주부터 전 연령층 접종 가능

[메디칼타임즈=문성호 기자] 한국MSD는 자사의 15가 폐렴구균 단백접합 백신 '박스뉴반스(Vaxneuvance)'가 10월 31일자로 식품의약품안전처의 허가를 받았다고 3일 밝혔다.

박스뉴반스는 국내에 13년 만에 허가된 폐렴구균 백신이다.

https://www.medicaltimes.com/

NON-PHARMCOLOGICAL TREATMENT

AT DIAGNOSIS

Non-Pharmacological Management of COPD*

Figure 3.12

Patient Group	Essential	Recommended	Depending on Local Guidelines
A	Smoking cessation (can include pharmacological treatment)	Physical activity	Influenza vaccination COVID-19 vaccinations Pneumococcal vaccination Pertussis vaccination Shingles vaccination RSV vaccination
B and E	Smoking cessation (can include pharmacological treatment) Pulmonary rehabilitation	Physical activity	Influenza vaccination COVID-19 vaccinations Pneumococcal vaccination Pertussis vaccination Shingles vaccination RSV vaccination

2024 GOLD report

RSV Vaccination (phase III clinical trial)

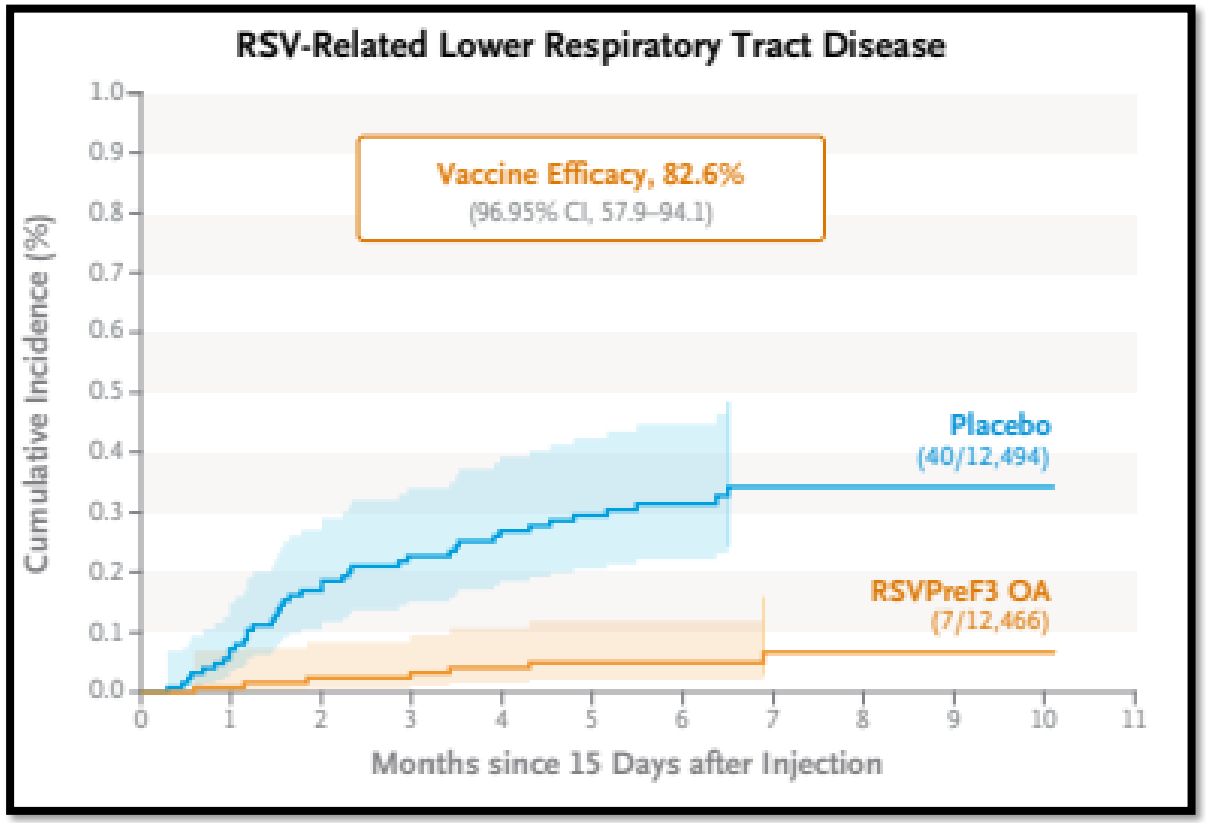
The NEW ENGLAND JOURNAL of MEDICINE

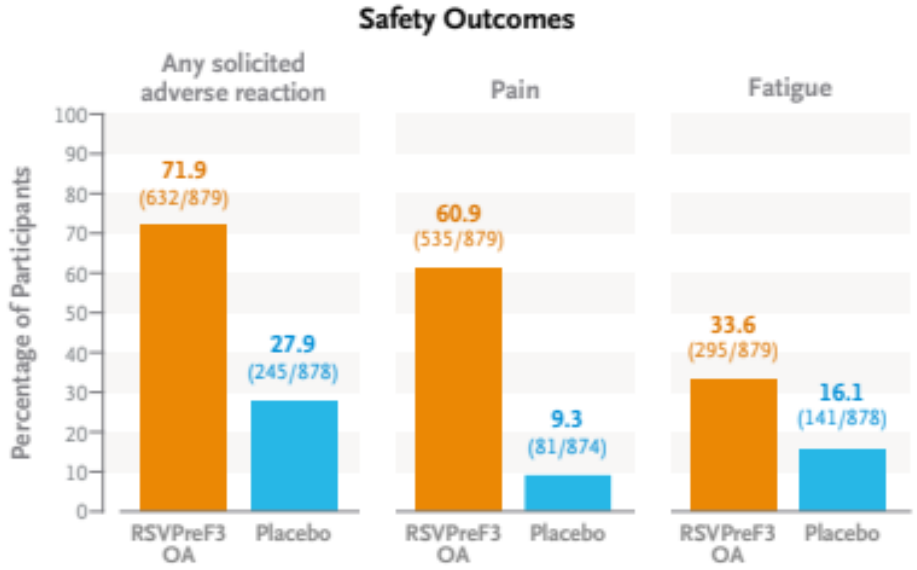
RESEARCH SUMMARY

Efficacy and Safety of a Bivalent RSV Prefusion F Vaccine in Older Adults

Walsh EE et al. DOI: 10.1056/NEJMoa2213836

60세 이상





N Engl J Med 2023; 388:595-608

RSV Vaccination (phase III clinical trial)

RESEARCH SUMMARY

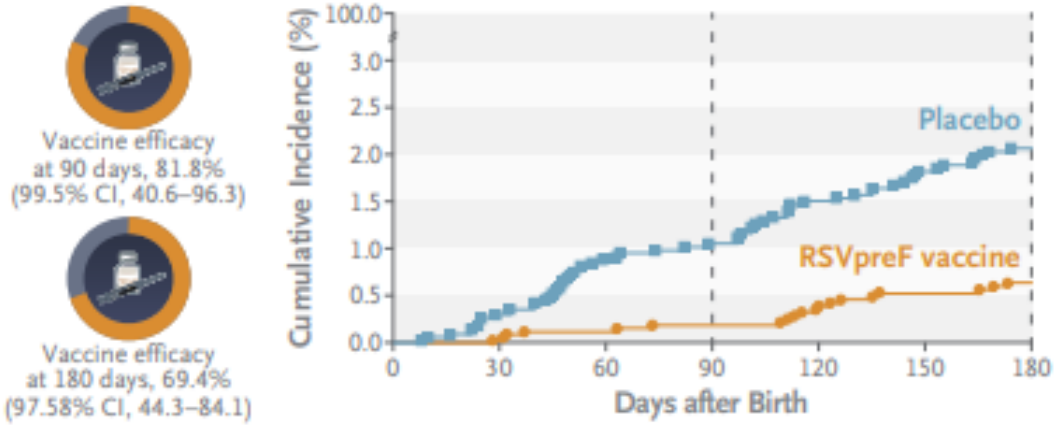
N=7392
임신 24주~36주 산모

Bivalent Prefusion F Vaccine in Pregnancy to Prevent RSV Illness in Infants

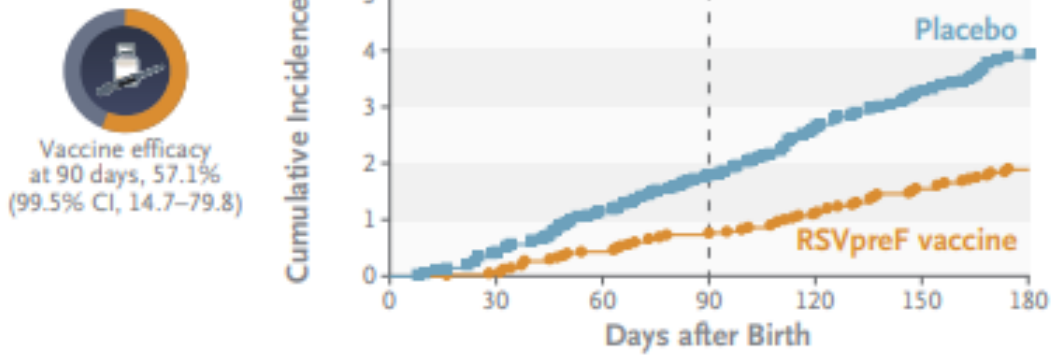
Kampmann B et al. DOI: 10.1056/NEJMoa2216480

N Engl J Med 2023; 388:1451-1464

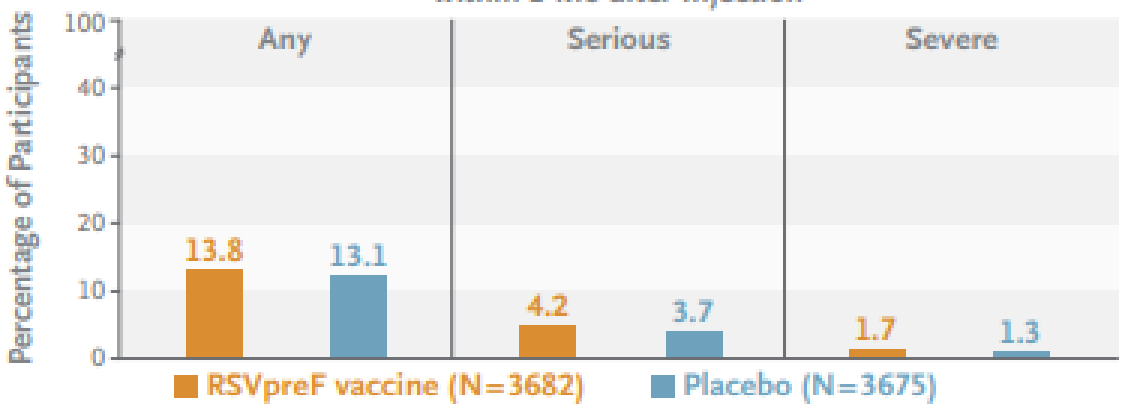
Severe RSV-Associated Lower Respiratory Tract Illness



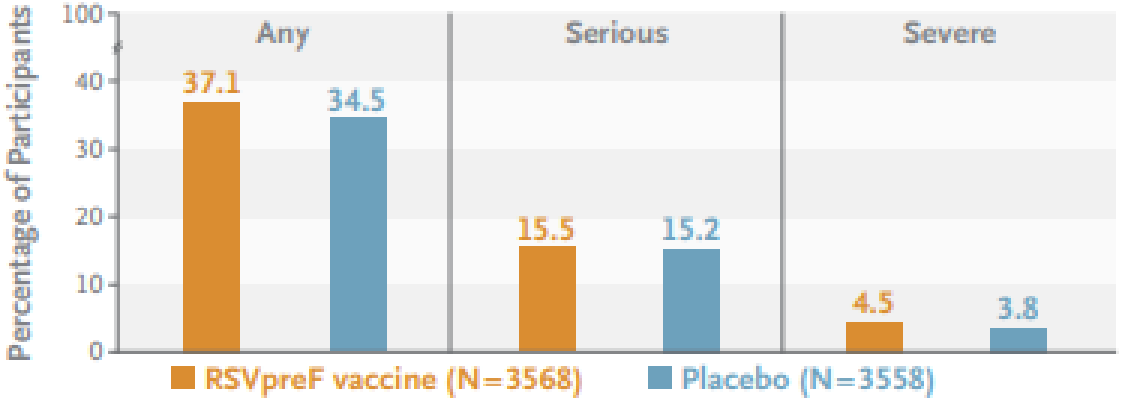
RSV-Associated Lower Respiratory Tract Illness



≥1 Adverse Event in Maternal Participants within 1 Mo after Injection



≥1 Adverse Event in Infant Participants within 1 Mo after Birth



Contents

- **Non-pharmacologic Tx.**
  - Smoking cessation
  - Vaccination
  - **Pulmonary rehabilitation**
  - BSC, Palliative, Hospice care
  - Nutritional support
  - Interventions

Management of Severe but not Life-threatening Exacerbations*

Figure 4.5

Assess severity of symptoms, blood gases, chest radiograph

Administer supplemental oxygen therapy, obtain serial arterial blood gas, venous blood gas and pulse oximetry measurements

Bronchodilators:

- Increase doses and/or frequency of short-acting bronchodilators
- Combine short-acting beta 2-agonists and anticholinergics
- Consider use of long-acting bronchodilators when patient becomes stable
- Use spacers or air-driven nebulizers when appropriate

Consider oral corticosteroids

Consider antibiotics (oral) when signs of bacterial infection are present

Consider noninvasive mechanical ventilation (NIV)

At all times:

- Monitor fluid balance
- Consider subcutaneous heparin or low molecular weight heparin for thromboembolism prophylaxis
- Identify and treat associated conditions (e.g., heart failure, arrhythmias, pulmonary embolism etc.)

*Local resources need to be considered

Pulmonary Rehabilitation

GOLD *report* 2021

Limited data exist regarding the effectiveness of pulmonary rehabilitation after an acute exacerbation of COPD, but systematic reviews have shown that among those patients who have had a recent exacerbation (≤ 2 weeks from prior hospitalization), pulmonary rehabilitation can reduce readmissions and mortality.[259] However, initiating pulmonary rehabilitation before the patient's discharge may compromise survival through unknown mechanisms.[260] Pulmonary rehabilitation also ranks as one of the most cost-effective treatment strategies.[249]

GOLD *report* 2023

There are limited data from large RCTs regarding the effectiveness of pulmonary rehabilitation after hospitalization for an acute exacerbation of COPD. A systematic review that included 13 RCTs reported reduced mortality, and number of readmissions among patients who had pulmonary rehabilitation initiated during hospitalization or within 4 weeks of discharge.[280] Long-term effects on mortality were not statistically significant, but improvements in health-related quality of life and exercise capacity appeared to be maintained for at least 12 months. These results have been corroborated by real world evidence, from a large population-based cohort of more than 190,000 patients hospitalized for COPD in the US, in whom initiation of pulmonary rehabilitation within 90 days of discharge, while rare, was significantly associated with lower risk of mortality[281] and fewer rehospitalizations at one year.[282] One study has reported that initiating pulmonary rehabilitation before the patient's discharge may compromise survival through unknown mechanisms.[283] Pulmonary rehabilitation ranks as one of the most cost-effective treatment strategies.[267]

GOLD *report* 2024

There are data from large RCTs regarding the effectiveness of pulmonary rehabilitation after hospitalization for an acute exacerbation of COPD. A systematic review that included 13 RCTs reported reduced mortality, and number of readmissions among patients who had pulmonary rehabilitation initiated during hospitalization or within 4 weeks of discharge.[701] Long-term effects on mortality were not statistically significant, but improvements in health-related quality of life and exercise capacity appeared to be maintained for at least 12 months. These results have been corroborated by real world evidence, from a large population-based cohort of more than 190,000 patients hospitalized for COPD in the US, in whom initiation of pulmonary rehabilitation within 90 days of discharge, while rare, was significantly associated with lower risk of mortality[704] and fewer rehospitalizations at one year.[1004] One study has reported that initiating pulmonary rehabilitation before the patient's discharge may compromise survival through unknown mechanisms.[1005] Pulmonary rehabilitation ranks as one of the most cost-effective treatment strategies.[615]

Pulmonary rehabilitation

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International Journal of Chronic Obstructive Pulmonary Disease
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Int J Chron Obstruct Pulmon Dis. 2023; 18: 881–893.
Published online 2023 May 15. doi: 10.2147/COPD.S397361
PMCID: PMC10198174
PMID: 37215744

Effects of Early Pulmonary Rehabilitation on Hospitalized Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis

Hsin- Yueh Lu,[#1,*] Chiu-Fan Chen,[#2,3,*] David Lin Lee,[2,3] Yi-Ju Tsai,[4] and Pei-Chin Lin[4,5]

20 RCT, Systemic review and Meta-Analysis
N=1274

AECOPD pt.

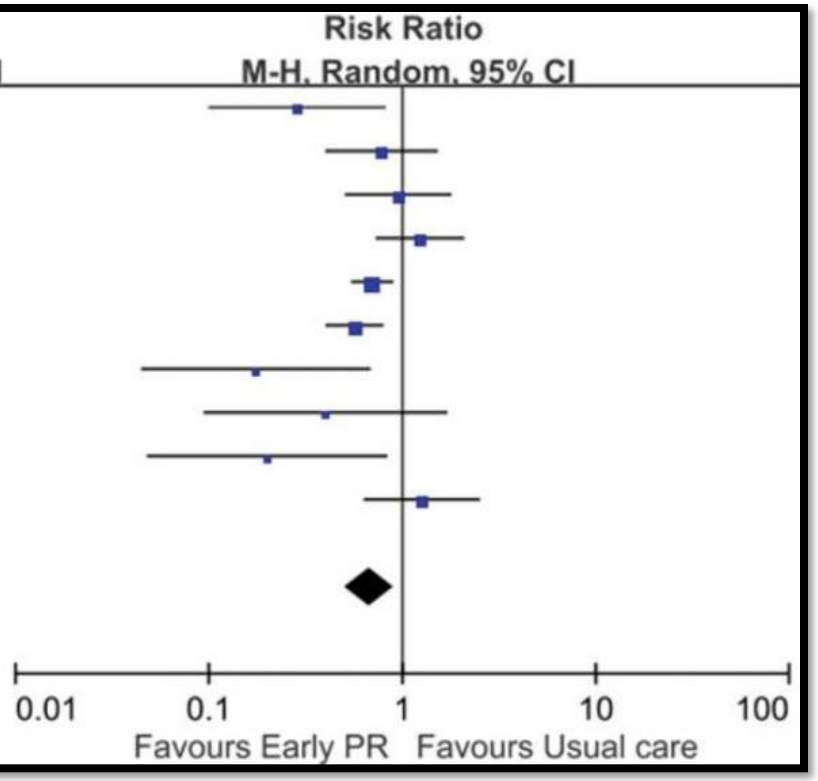
Early PR(입원중 or 퇴원후 4주이내 시작) vs No PR group

Hospital readmission

Study or Subgroup	Early PR Events	Early PR Total	Usual care Events	Usual care Total	Weight	Risk Ratio M-H, Random, 95% CI
Behnke 2000 [19]	3	14	9	12	6.0%	0.29 [0.10, 0.82]
Eaton 2009 [21]	11	47	15	50	10.7%	0.78 [0.40, 1.52]
Johnson-Warrington 2016 [32]	12	35	13	36	11.3%	0.95 [0.50, 1.79]
Ko 2011 [25]	16	30	13	30	13.3%	1.23 [0.73, 2.09]
Ko 2017 [26]	44	90	63	90	19.4%	0.70 [0.54, 0.90]
Ko 2020 [27]	26	68	46	68	17.4%	0.57 [0.40, 0.80]
Man 2004 [29]	2	20	12	21	4.0%	0.17 [0.04, 0.69]
Murphy 2005 [30]	2	13	5	13	3.7%	0.40 [0.09, 1.70]
Seymour 2010 [36]	2	30	10	30	3.7%	0.20 [0.05, 0.84]
Troosters 2010 [37]	9	17	8	19	10.3%	1.26 [0.63, 2.51]
Total (95% CI)		**364**		**369**	**100.0%**	**0.68 [0.50, 0.92]**
Total events	127		194			

Heterogeneity: $Tau^2 = 0.11$; $Chi^2 = 20.31$, df = 9 (P = 0.02); $I^2 = 56\%$

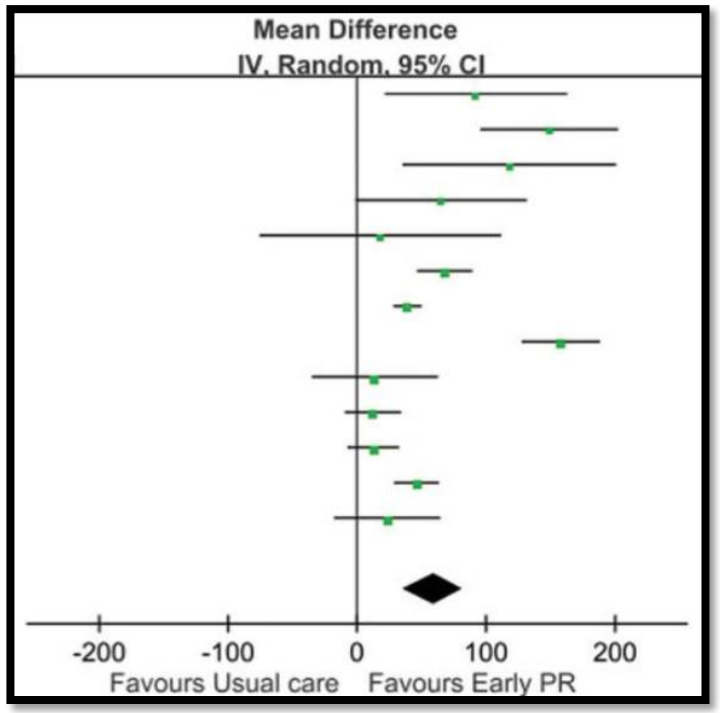
Test for overall effect: Z = 2.52 (P = 0.01)



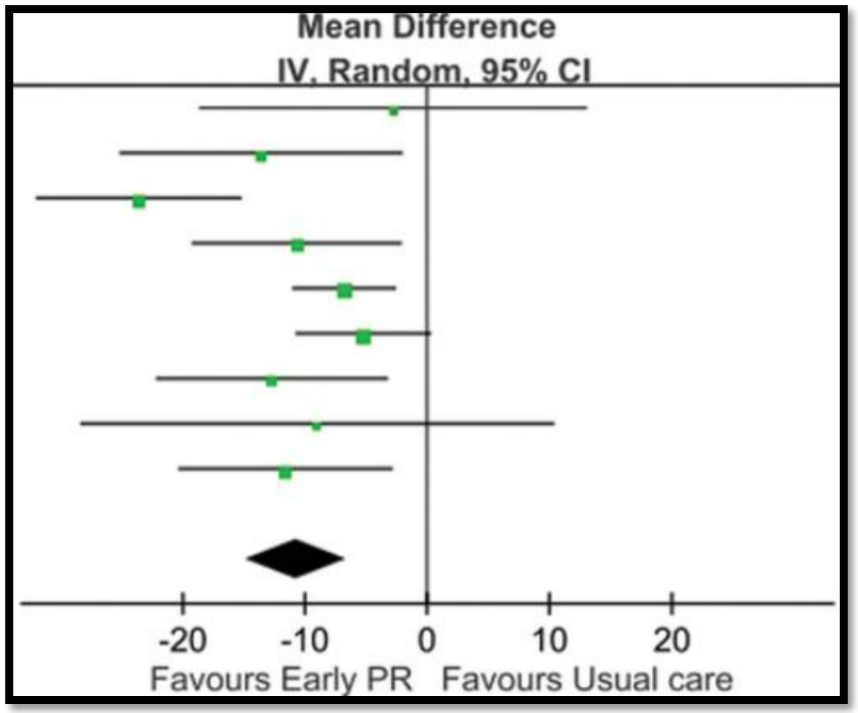
Heterogeneity +

Int J Chron Obstruct Pulmon Dis. 2023 May 15:18:881-893.

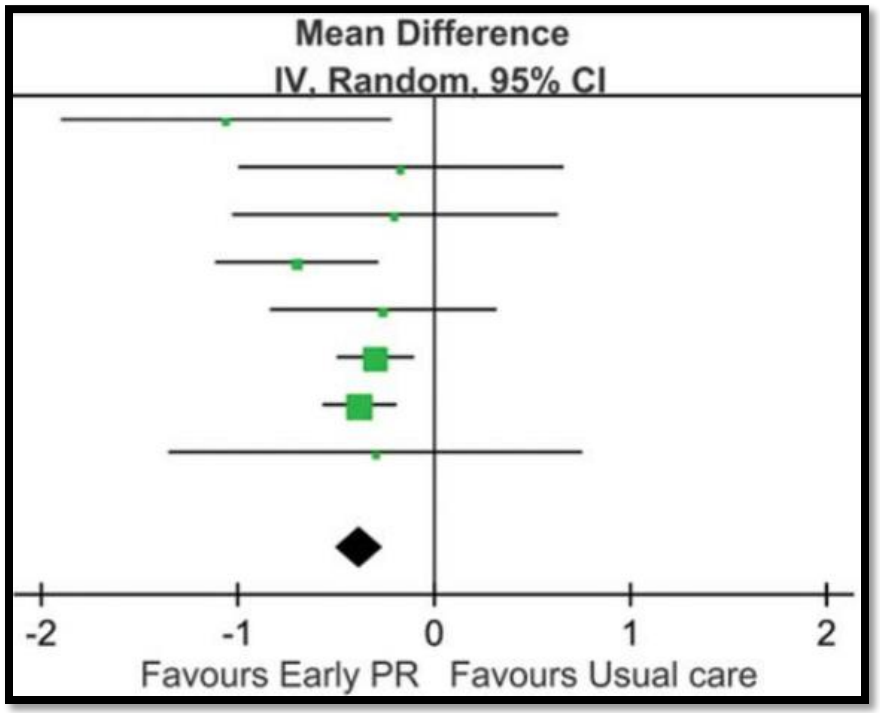
6MWD, SGRQ, mMRC



59.73 meter
95%CI (36.34–83.12); I^2 = 88%



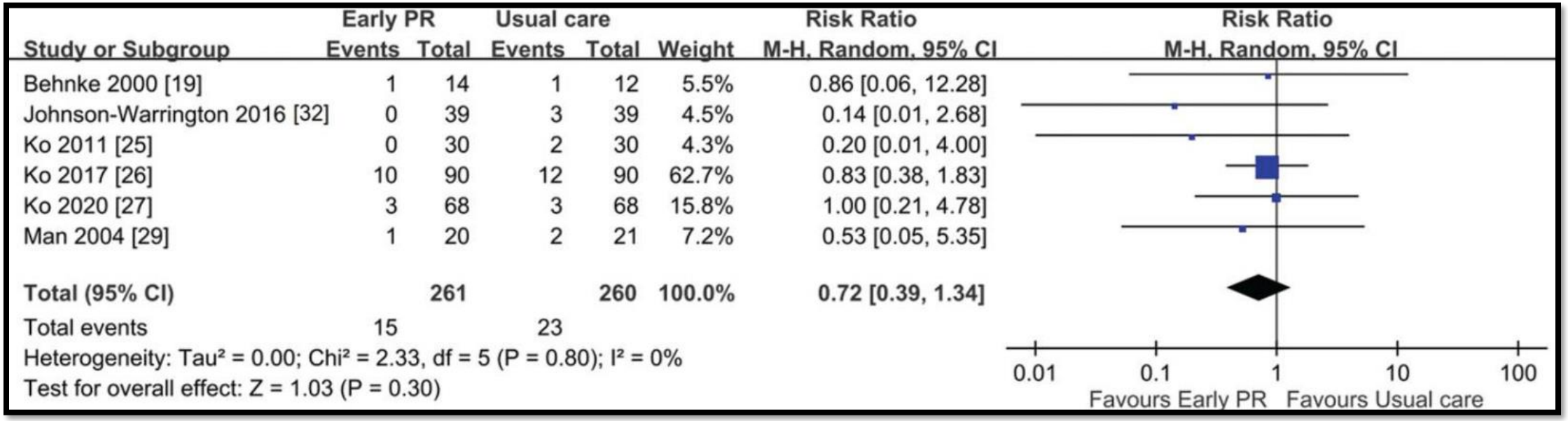
−0.79
95% CI(−1.26 to −0.32); I^2 = 56%



−0.38
95% CI(−0.50∼−0.25); I^2 = 0%

Int J Chron Obstruct Pulmon Dis. 2023 May 15:18:881-893.

Mortality



Study or Subgroup	Early PR Events	Early PR Total	Usual care Events	Usual care Total	Weight	Risk Ratio M-H, Random, 95% CI
Behnke 2000 [19]	1	14	1	12	5.5%	0.86 [0.06, 12.28]
Johnson-Warrington 2016 [32]	0	39	3	39	4.5%	0.14 [0.01, 2.68]
Ko 2011 [25]	0	30	2	30	4.3%	0.20 [0.01, 4.00]
Ko 2017 [26]	10	90	12	90	62.7%	0.83 [0.38, 1.83]
Ko 2020 [27]	3	68	3	68	15.8%	1.00 [0.21, 4.78]
Man 2004 [29]	1	20	2	21	7.2%	0.53 [0.05, 5.35]
Total (95% CI)		**261**		**260**	**100.0%**	**0.72 [0.39, 1.34]**
Total events	15		23			

Heterogeneity: Tau² = 0.00; Chi² = 2.33, df = 5 (P = 0.80); I² = 0%

Test for overall effect: Z = 1.03 (P = 0.30)

Int J Chron Obstruct Pulmon Dis. 2023 May 15:18:881-893.

Pulmonary rehabilitation

Meta-Analysis > Ann Am Thorac Soc. 2023 Feb;20(2):307-319.
doi: 10.1513/AnnalsATS.202206-545OC.

Safety and Efficacy of Inpatient Pulmonary Rehabilitation for Patients Hospitalized with an Acute Exacerbation of Chronic Obstructive Pulmonary Disease: Systematic Review and Meta-analyses

Débora Petry Moecke [1 2], Kai Zhu [1 2], Jagdeep Gill [1 2], Shanjot Brar [1 2], Polina Petlitsyna [2], Ashley Kirkham [2], Mirha Girt [3], Joel Chen [4], Hannah Peters [2], Holly Denson-Camp [2], Stephanie Crosbie [2], Pat G Camp [1 2]

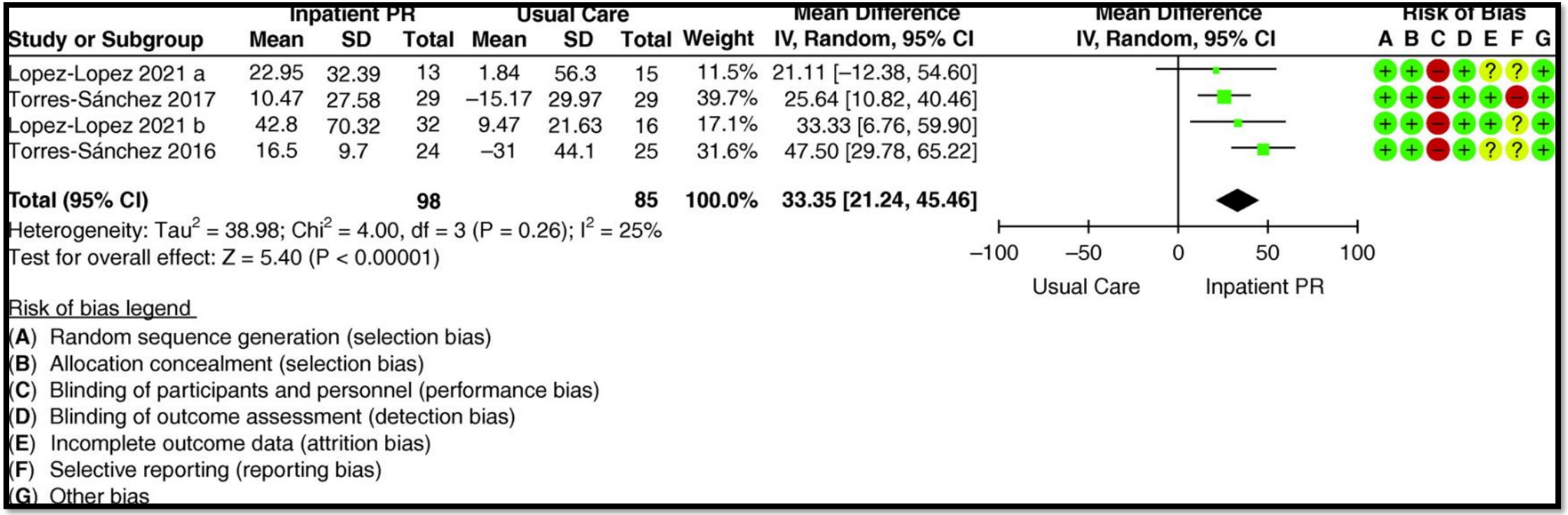
Affiliations + expand

PMID: 36191273 DOI: 10.1513/AnnalsATS.202206-545OC

27 RCT, N=1317

신체활동이 가능한 19세 이상 AECOPD 환자
입원시 PR 시작 vs 입원시 Non-PR group
Mobilization, Exercise, Ambulation

Lower limb strength



Study or Subgroup	Inpatient PR Mean	SD	Total	Usual Care Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Lopez-Lopez 2021 a	22.95	32.39	13	1.84	56.3	15	11.5%	21.11 [–12.38, 54.60]
Torres-Sánchez 2017	10.47	27.58	29	–15.17	29.97	29	39.7%	25.64 [10.82, 40.46]
Lopez-Lopez 2021 b	42.8	70.32	32	9.47	21.63	16	17.1%	33.33 [6.76, 59.90]
Torres-Sánchez 2016	16.5	9.7	24	–31	44.1	25	31.6%	47.50 [29.78, 65.22]
Total (95% CI)			**98**			**85**	**100.0%**	**33.35 [21.24, 45.46]**

Heterogeneity: $Tau^2 = 38.98$; $Chi^2 = 4.00$, df = 3 (P = 0.26); $I^2 = 25\%$
Test for overall effect: Z = 5.40 (P < 0.00001)

Mean Difference IV, Random, 95% CI

–100 –50 0 50 100

Usual Care Inpatient PR

Risk of Bias A B C D E F G

Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

무게를 이용한 Kg, 근력측정

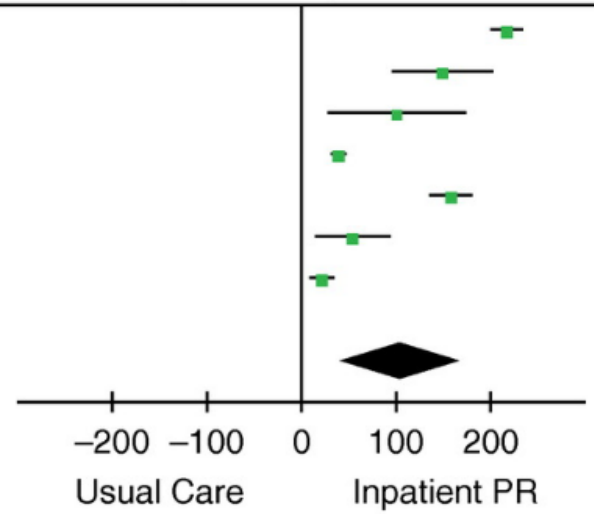
Ann Am Thorac Soc. 2023 Feb;20(2):307-319.

6MWD

Study or Subgroup	Inpatient PR Mean	SD	Total	Usual Care Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Behnke 2000	225	29.7	15	8	17.5	15	14.9%	217.00 [199.55, 234.45]
Borges 2014	160	61	15	11	83	14	13.6%	149.00 [95.68, 202.32]
Greulich 2014	95.55	120.84	20	–5.34	114.41	20	12.5%	100.89 [27.96, 173.82]
He 2015	49	14.82	66	9.8	20.39	28	15.0%	39.20 [30.84, 47.56]
Kirsten 1998	183	35.69	14	25	25.07	15	14.8%	158.00 [135.41, 180.59]
Lu 2020	67.2	93.79	36	13	77.96	36	14.2%	54.20 [14.36, 94.04]
Troosters 2010	35.75	11.75	19	14	25.75	17	15.0%	21.75 [8.42, 35.08]
Total (95% CI)			**185**			**145**	**100.0%**	**105.41 [42.80, 168.03]**

Heterogeneity: $Tau^2 = 6{,}770.95$; $Chi^2 = 443.11$, df = 6 ($P < 0.00001$); $I^2 = 99\%$

Test for overall effect: Z = 3.30 (P = 0.0010)



Risk of bias legend

(**A**) Random sequence generation (selection bias)
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(**F**) Selective reporting (reporting bias)
(**G**) Other bias

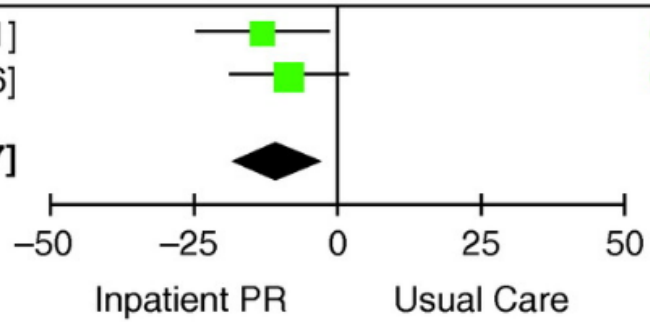
Ann Am Thorac Soc. 2023 Feb;20(2):307-319.

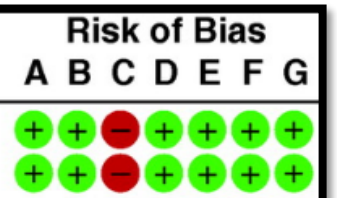
SGRQ

Study or Subgroup	Inpatient PR Mean	SD	Total	Usual Care Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Borges 2014	–2.4	19.6	15	10.7	11.8	14	43.9%	–13.10 [–24.79, –1.41]
Greulich 2014	–6.43	16.68	20	2.05	16.67	20	56.1%	–8.48 [–18.82, 1.86]
Total (95% CI)			**35**			**34**	**100.0%**	**–10.51 [–18.25, –2.77]**

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.34$, df = 1 (P = 0.56); $I^2 = 0\%$

Test for overall effect: Z = 2.66 (P = 0.008)





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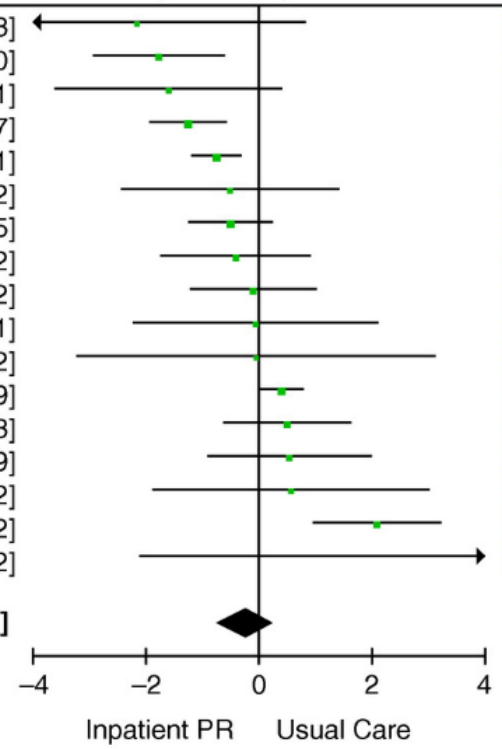
(**F**) Selective reporting (reporting bias)
(**G**) Other bias

Ann Am Thorac Soc. 2023 Feb;20(2):307-319.

Length of stay in the hospital

Study or Subgroup	Inpatient PR Mean	SD	Total	Usual Care Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Lopez-Lopez 2021 a	8.84	3.54	27	11	5.29	15	2.3%	−2.16 [−5.15, 0.83]
Knaut 2020	5.6	1.49	13	7.37	1.6	14	7.0%	−1.77 [−2.94, −0.60]
Borges 2014	8	2.2	15	9.6	3.2	14	4.1%	−1.60 [−3.61, 0.41]
Troosters 2010	8.25	0.25	17	9.5	1.5	19	9.3%	−1.25 [−1.93, −0.57]
Mirza 2020	7	0.5	16	7.75	0.75	16	10.3%	−0.75 [−1.19, −0.31]
Liao 2021	12.96	4.7	34	13.47	3.4	36	4.3%	−0.51 [−2.44, 1.42]
Leonardi 2022	5.5	0.9	10	6	0.8	10	9.0%	−0.50 [−1.25, 0.25]
Lopez-Lopez 2021 b	9.24	1.89	32	9.65	2.36	16	6.3%	−0.41 [−1.74, 0.92]
Torres-Sánchez 2016	8.7	2	24	8.8	2	25	7.3%	−0.10 [−1.22, 1.02]
Lopez-Lopez 2020	9.45	3.02	22	9.51	4.22	22	3.7%	−0.06 [−2.23, 2.11]
Greulich 2014	8.58	3.81	20	8.63	6.16	20	2.1%	−0.05 [−3.22, 3.12]
Lu 2020	9.3	0.8	36	8.9	0.9	36	10.4%	0.40 [0.01, 0.79]
Greening 2014	11	5.33	169	10.5	5	151	7.2%	0.50 [−0.63, 1.63]
Torres-Sánchez 2018	9.75	3.57	60	9.21	3.18	30	5.9%	0.54 [−0.91, 1.99]
Lopez-Lopez 2018	9.78	3.56	23	9.21	3.18	10	3.1%	0.57 [−1.88, 3.02]
Torres-Sánchez 2017	12.47	1.9	29	10.38	2.47	29	7.2%	2.09 [0.96, 3.22]
Nava 1998	38.1	14.3	48	33.2	11.7	16	0.5%	4.90 [−2.12, 11.92]
Total (95% CI)			**595**			**479**	**100.0%**	**−0.23 [−0.74, 0.28]**

Heterogeneity: $Tau^2 = 0.61$; $Chi^2 = 55.74$, df = 16 ($P < 0.00001$); $I^2 = 71\%$
Test for overall effect: $Z = 0.90$ ($P = 0.37$)



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Ann Am Thorac Soc. 2023 Feb;20(2):307-319.

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  - Smoking cessation
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  - Pulmonary rehabilitation
  - **BSC, Palliative, Hospice care**
  - Nutritional support
  - Interventions

Palliative Care, End of Life and Hospice Care in COPD

Figure 3.16

- All clinicians managing patients with COPD should be aware of the effectiveness of palliative approaches to symptom control and use these in their practice **(Evidence D)**
- End of life care should include discussions with patients and their families about their views on resuscitation, advance directives and place of death preferences **(Evidence D)**
- Opiates, neuromuscular electrical stimulation (NMES), oxygen and fans blowing air onto the face can relieve breathlessness **(Evidence C)**
- Nutritional supplementation should be considered in malnourished patients with COPD (**Evidence B**) as it may improve respiratory muscle strength and overall health status **(Evidence B)**
- Fatigue can be improved by self-management education, pulmonary rehabilitation, nutritional support and mind-body interventions **(Evidence B)**

2024 GOLD report

Supportive care

Randomized Controlled Trial > JAMA. 2022 Nov 22;328(20):2022-2032.
doi: 10.1001/jama.2022.20206.

Effect of Regular, Low-Dose, Extended-release Morphine on Chronic Breathlessness in Chronic Obstructive Pulmonary Disease: The BEAMS Randomized Clinical Trial

Magnus Ekström [1 2], Diana Ferreira [3], Sungwon Chang [2], Sandra Louw [4], Miriam J Johnson [5], Danny J Eckert [6], Belinda Fazekas [2], Katherine J Clark [7 8], Meera R Agar [2], David C Currow [3 9]; Australian National Palliative Care Clinical Studies Collaborative

Multicenter, double-blind, placebo-controlled RCT

JAMA®

QUESTION Does regular, low-dose, extended-release morphine improve the intensity of worst breathlessness in people with chronic obstructive pulmonary disease (COPD) and severe chronic breathlessness?

CONCLUSION Extended-release morphine compared with placebo did not significantly reduce the intensity of worst breathlessness in people with COPD.

POPULATION

81 Men
75 Women

mMRC 3-4

Adults with COPD and chronic breathlessness

Median age: 72 years

LOCATIONS

20 Centers in Australia

INTERVENTION

160 Patients randomized
156 Patients analyzed

55	51	50
8 mg/d of morphine	**16 mg/d of morphine**	**Placebo**
8 mg of oral extended-release morphine given daily	16 mg of oral extended-release morphine given daily	Placebo pills given daily

PRIMARY OUTCOME

Change in the intensity of worst breathlessness on a numerical rating scale from baseline (scale range, 0-10; 10 being worst or most intense)

FINDINGS

Within-group mean (SD) change

8 mg/d of morphine:	-0.8 (1.7)
16 mg/d of morphine:	-1.0 (1.7)
Placebo:	-0.7 (1.7)

At 1 week, there were no significant between-group differences:

8 mg/d of morphine vs placebo:
Mean difference, −0.3 (95% CI, −0.9 to 0.4)

16 mg/d of morphine vs placebo:
Mean difference, −0.3 (95% CI, −1.0 to 0.4)

JAMA. 2022 Nov 22;328(20):2022-2032.

Supportive care

JAMA Internal Medicine

View Article

JAMA Intern Med. 2020 Oct; 180(10): 1306–1314.
Published online 2020 Aug 17. doi: 10.1001/jamainternmed.2020.3134

PMCID: PMC7432282
PMID: 32804188

Effect of Sustained-Release Morphine for Refractory Breathlessness in Chronic Obstructive Pulmonary Disease on Health Status

A Randomized Clinical Trial

Cornelia A. Verberkt, MSc,[1] Marieke H. J. van den Beuken-van Everdingen, MD, PhD,[2] Jos M. G. A. Schols, MD, PhD,[1,3] Niels Hameleers, MSc,[1] Emiel F. M. Wouters, MD, PhD,[4,5,6] and Daisy J. A. Janssen, MD, PhD✉[1,4]

Multicenter, double-blind, placebo-controlled RCT
mMRC 2~4, N=124
4주 뒤 평가, 10mg bid → 1주뒤 tid까지 증량 가능(NRS score 1점미만 개선시)

Variable	Morphine vs placebo			
	Total study population (n = 111)		Subgroup with mMRC grades 3-4 (n = 49)	
	Mean difference (95% CI)	*P* value	Mean difference (95% CI)	*P* value
Primary outcomes				
CAT score	−2.18 (−4.14 to −0.22)	.03	−1.17 (−4.17 to 1.84)	.44
$Paco_2$, mm Hg	1.19 (−2.70 to 5.07)	.55	1.84 (−4.95 to 8.64)	.59
Secondary outcomes				
Pao_2, mm Hg	−3.79 (−9.70 to 2.12)	.21	−5.92 (−15.73 to 3.90)	.23
Sao_2, %	−1.09 (−2.93 to 0.75)	.24	−1.72 (−5.02 to 1.58)	.30
Respiratory rate	−1.46 (−2.84 to −0.09)	.04	−0.73 (−2.79 to 1.34)	.49
$PtcCO_2$, mm Hg	1.39 (−0.65 to 3.42)	.18	1.02 (−1.78 to 3.82)	.47
SpO_2, %	−0.33 (−0.95 to 0.29)	.29	−0.09 (−1.09 to 0.91)	.86
% Time overnight SpO_2 below 90%	−0.04 (−19.61 to 19.52)[a]	>.99	10.84 (−19.64 to 41.32)[b]	.48
Overnight SpO_2, %	0.16 (−1.48 to 1.81)[a]	.84	−0.03 (−2.90 to 2.85)[b]	.99
Functional exercise performance (6MWT)	−5.07 (−61.38 to 51.20)[b]	.86	1.49 (−87.47 to 90.46)[b]	.97
General mobility (TUG)	−0.04 (−0.54 to 0.47)[d]	.89	0.00 (−0.87 to 0.87)[b]	.99
Care dependency (CDS)	−0.33 (−3.34 to 2.69)	.83	−1.56 (−6.65 to 3.52)	.54
Breathlessness previous 24 h (NRS)				
Mean	−0.60 (−1.55 to 0.35)	.21	−1.31 (−2.80 to 0.17)	.08
Worst	−0.56 (−1.41 to 0.28)	.19	−1.33 (−2.50 to −0.16)	.03

JAMA Intern Med. 2020 Oct; 180(10): 1306–1314.

Contents

- **Non-pharmacologic Tx.**
  - Smoking cessation
  - Vaccination
  - Pulmonary rehabilitation
  - BSC, Palliative, Hospice care
  - **Nutritional support**
  - Interventions

The role of diet and nutrition in the management of COPD

Rosanne J.H.C.G. Beijers [1], Michael C. Steiner[2] and Annemie M.W.J. Schols[1]

Number 6 in the Series "Non-pharmacological interventions in COPD: state of the art and future directions"
Edited by Geert M. Verleden and Wim Janssens

[1]Department of Respiratory Medicine, NUTRIM School of Nutrition and Translational Research in Metabolism, Maastricht University Medical Centre+, Maastricht, The Netherlands. [2]Leicester NIHR Biomedical Research Centre – Respiratory, Department of Respiratory Sciences, University of Leicester, Leicester, UK.

- Vit. D 결핍은 COPD 환자에게서 존재하며, 중증도에 따라 증가
- <25nmol/L 이하인 경우 보충이 적극 권장

Nutritional support (COPD & Vit.D)

BMJ Open Respiratory Research

Visit this Journal BMJ

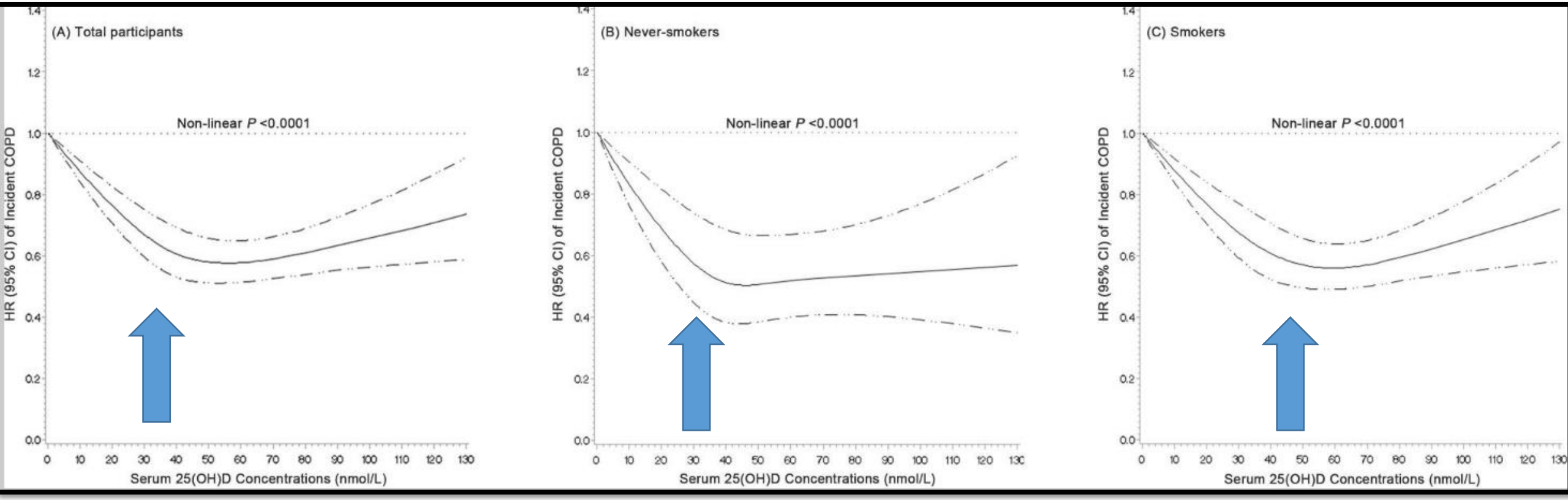
BMJ Open Respir Res. 2023; 10(1): e001684.
Published online 2023 Jun 23. doi: 10.1136/bmjresp-2023-001684

PMCID: PMC10314673
PMID: 37353234

Vitamin D status and chronic obstructive pulmonary disease risk: a prospective UK Biobank study

Zheng Zhu,[1] Xinglin Wan,[2] Jiannan Liu,[3] Dandan Zhang,[3] Pengfei Luo,[1] Wencong Du,[1] Lulu Chen,[1] Jian Su,[1] Dong Hang,[2] Jinyi Zhou,[✉2] and Xikang Fan[✉1]

403,648 pt. c Serum 25(OH)D lv. & without COPD
약 12년간 추적
COPD가 생긴 11,008 case를 분석

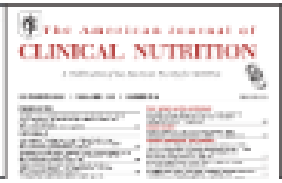


Non-linear but negatively associated with incidence of COPD

BMJ Open Respir Res. 2023 Jun;10(1):e001684.

Nutritional support (COPD & Vit.D)

ELSEVIER
The American Journal of Clinical Nutrition



Am J Clin Nutr. 2022 Aug; 116(2): 491–499.
Published online 2022 Apr 6. doi: 10.1093/ajcn/nqac083
PMCID: PMC9348978
PMID: 35383823

Vitamin D supplementation in chronic obstructive pulmonary disease patients with low serum vitamin D: a randomized controlled trial

Rachida Rafiq,✉ Floor E Aleva, Jasmijn A Schrumpf, Johannes M Daniels, Pierre M Bet, Wim G Boersma, Paul Bresser, Michiel Spanbroek, Paul Lips, Tim J van den Broek, Bart J F Keijser, André J A M van der Ven, Pieter S Hiemstra, Martin den Heijer, Renate T de Jongh, and PRECOVID-study group

Multicenter, double-blind, RCT
1년 이내 악화력 있는 Vit. D def.(15-55nmol/L) COPD pt.
N=155 (Vit. D 74명 vs Placebo 81명) → 1년간 주 1회 Vit.D3 16,800 IU 투여

Effect of vitamin D on time to first and second exacerbations and time to first hospitalization[1]

	HR (95% CI)	*P* value
Time to first exacerbation		
Intention-to-treat population (n = 155)	1.01 (0.67, 1.54)	0.93
Subgroup ≤25 nmol/L (n = 31)	0.55 (0.13, 2.30)	0.41
Time to second exacerbation		
Intention-to-treat population (n = 155)	0.80 (0.44, 1.43)	0.44
Subgroup ≤25 nmol/L (n = 31)	2.00 (0.24, 16.22)	0.52
Time to first hospitalization		
Intention-to-treat population (n = 155)	1.03 (0.51, 2.07)	0.93
Subgroup ≤25 nmol/L (n = 31)	1.09 (0.17, 7.01)	0.92

Effect of vitamin D supplementation on physical function and inflammatory markers[1]

	Mean/percentage difference (95% CI)	*P* value
Physical function (n = 155)		
6-min walking test, m	34 (−4, 71)	0.08
Handgrip strength, kg	1.15 (−1.20, 3.50)	0.34
Spirometry (n = 154)		
FEV_1, %predicted	−0.91 (−6.15, 4.34)	0.73
FVC, %predicted	−2.52 (−7.72, 2.67)	0.34
Maximal respiratory mouth pressures (n = 150)		
MIP, kPa	−0.47 (−2.74, 1.79)	0.68
MEP, kPa	0.28 (−0.71, 1.27)	0.58
Inflammatory markers (n = 152)		
CRP, μg/mL	−6.7 (−30.2, 24.1)	0.63
IL-6, pg/mL	−13.3 (−30.6, 8.4)	0.21
LL-37, ng/mL	0.2 (−12.1, 14.3)	0.97

Am J Clin Nutr. 2022 Aug; 116(2): 491–499

Nutritional support

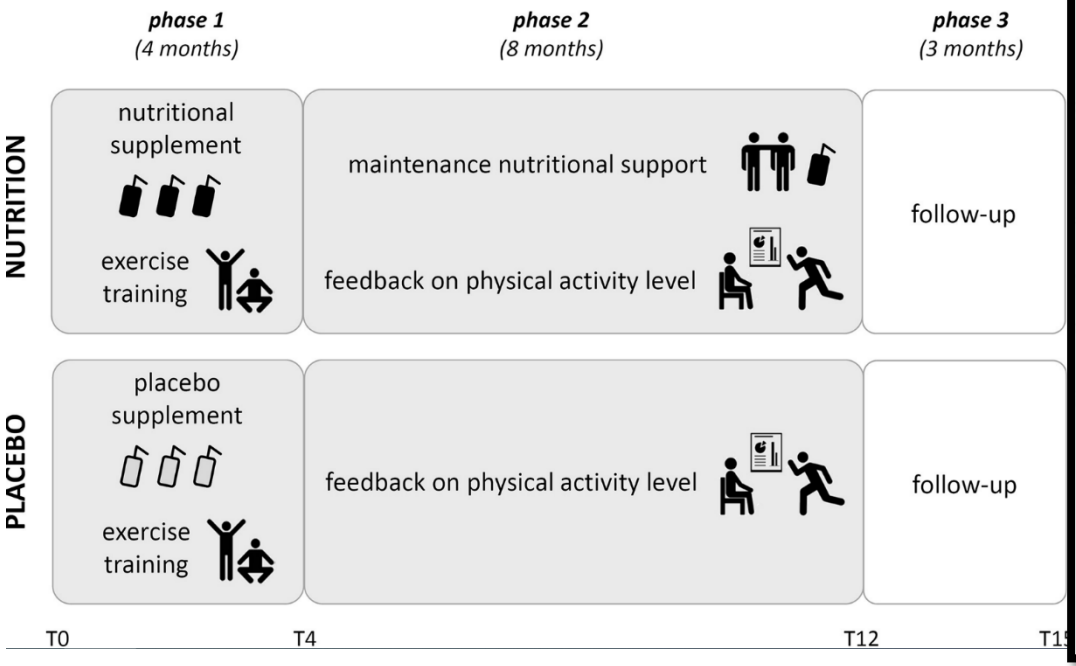
Randomized Controlled Trial > Clin Nutr. 2020 Feb;39(2):405-413.
doi: 10.1016/j.clnu.2019.03.001. Epub 2019 Mar 18.

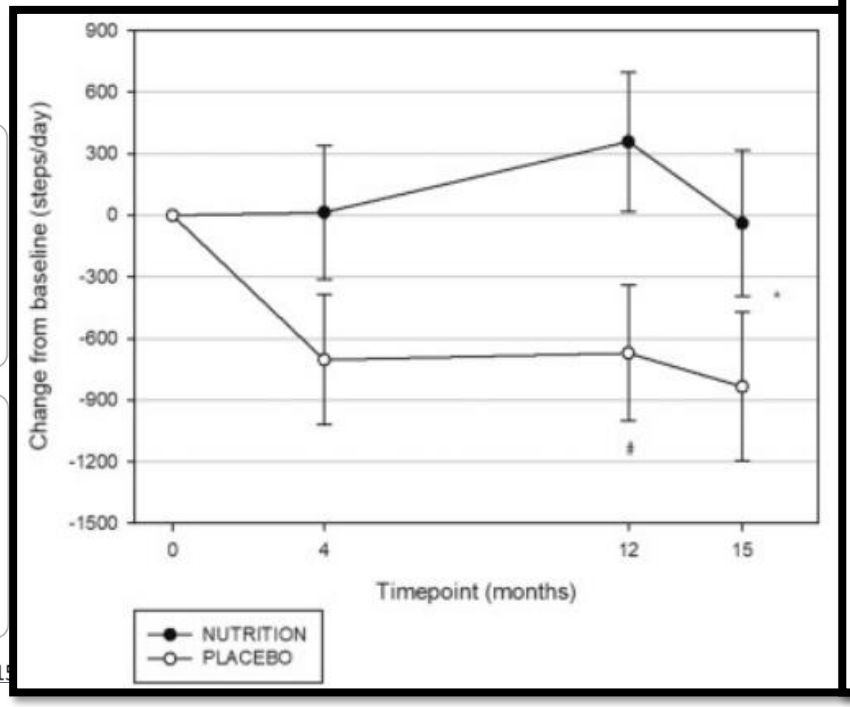
Clinical outcome and cost-effectiveness of a 1-year nutritional intervention programme in COPD patients with low muscle mass: The randomized controlled NUTRAIN trial

Martijn van Beers [1], Maureen P M H Rutten-van Mölken [2], Coby van de Bool [1], Melinde Boland [2], Stef P J Kremers [3], Frits M E Franssen [4], Ardy van Helvoort [5], Harry R Gosker [1], Emiel F Wouters [4], Annemie M W J Schols [6]

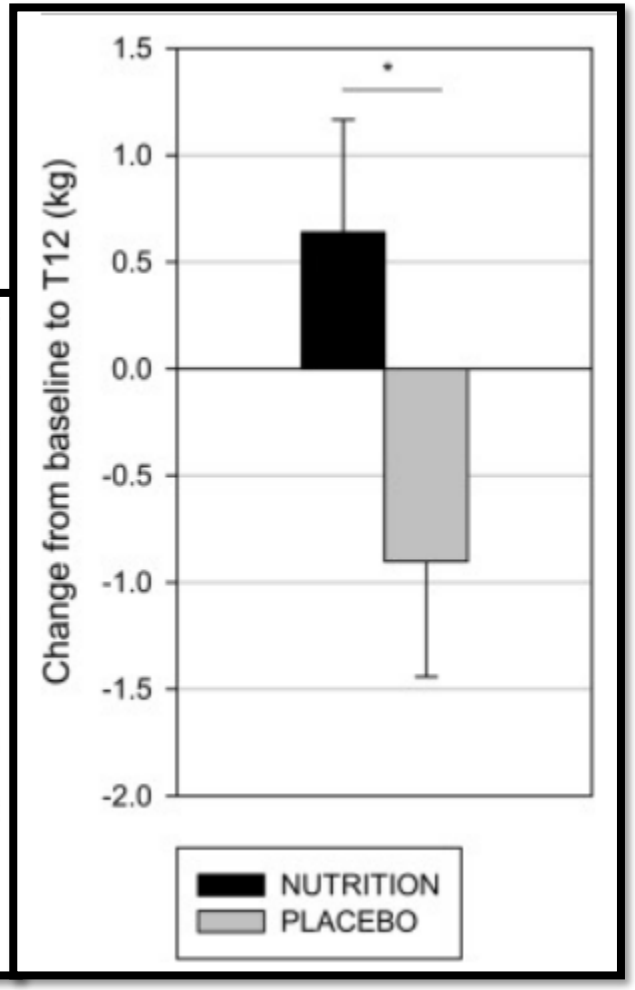
RCT, COPD pt., a fat-free mass index (FFMI) 하위 25%,
N=81 / 영양개입 프로그램의 효과

Physical activity, Weight, Cost





Physical activity



Weight

Nutritional support: 영양상담, 미량원소, 류신, 오메가-3, VitD 포함
Cost : 환자 한명 당 6000EURO(약 850만원)이상의 지불이 가능하다면 Cost effective 하다.

JAMA. 2022 Nov 22;328(20):2022-2032.

Contents

- **Non-pharmacologic Tx.**
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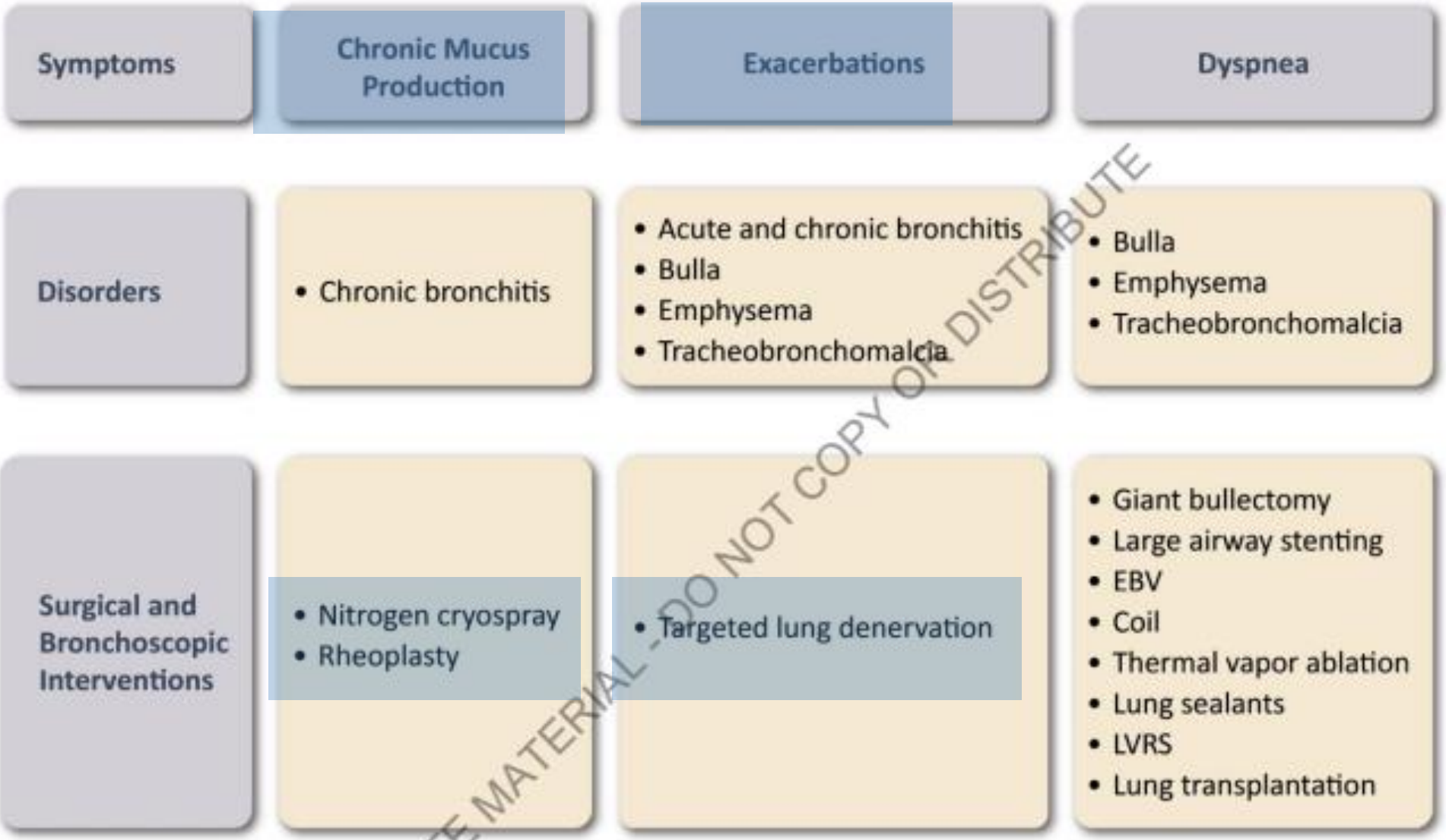
  - **Interventions**

Overview of Current and Proposed Surgical and Bronchoscopic Interventions for People with COPD

Figure 3.24



Interventions

EUROPEAN RESPIRATORY *review*

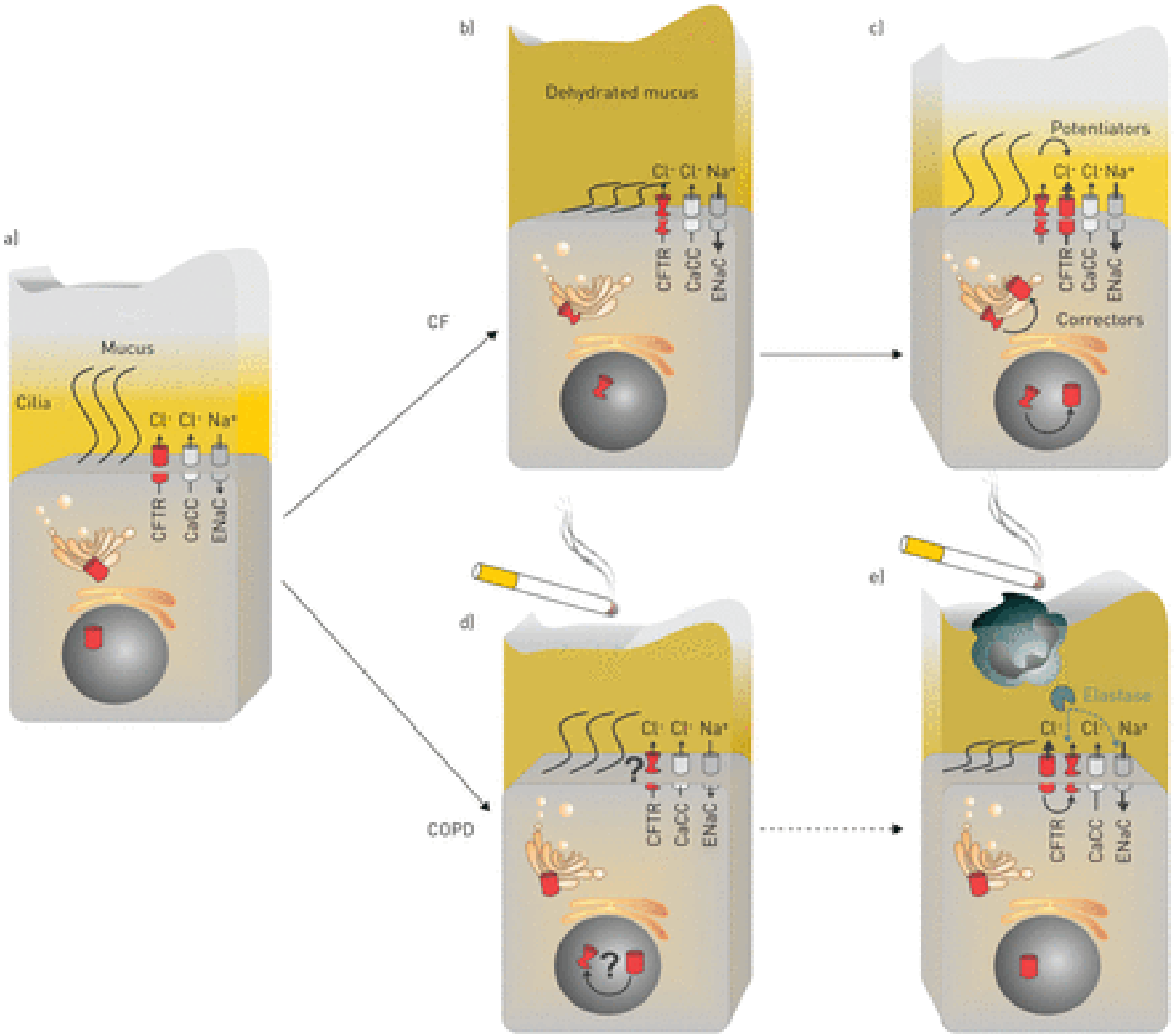
THE RESPIRATORY PROFESSIONAL'S UPDATE
ON MEDICINE, SCIENCE AND SURGERY

Eur Respir Rev. 2021 Mar 31; 30(159): 200281.
Published online 2021 Jan 20. doi: 10.1183/16000617.0281-2020

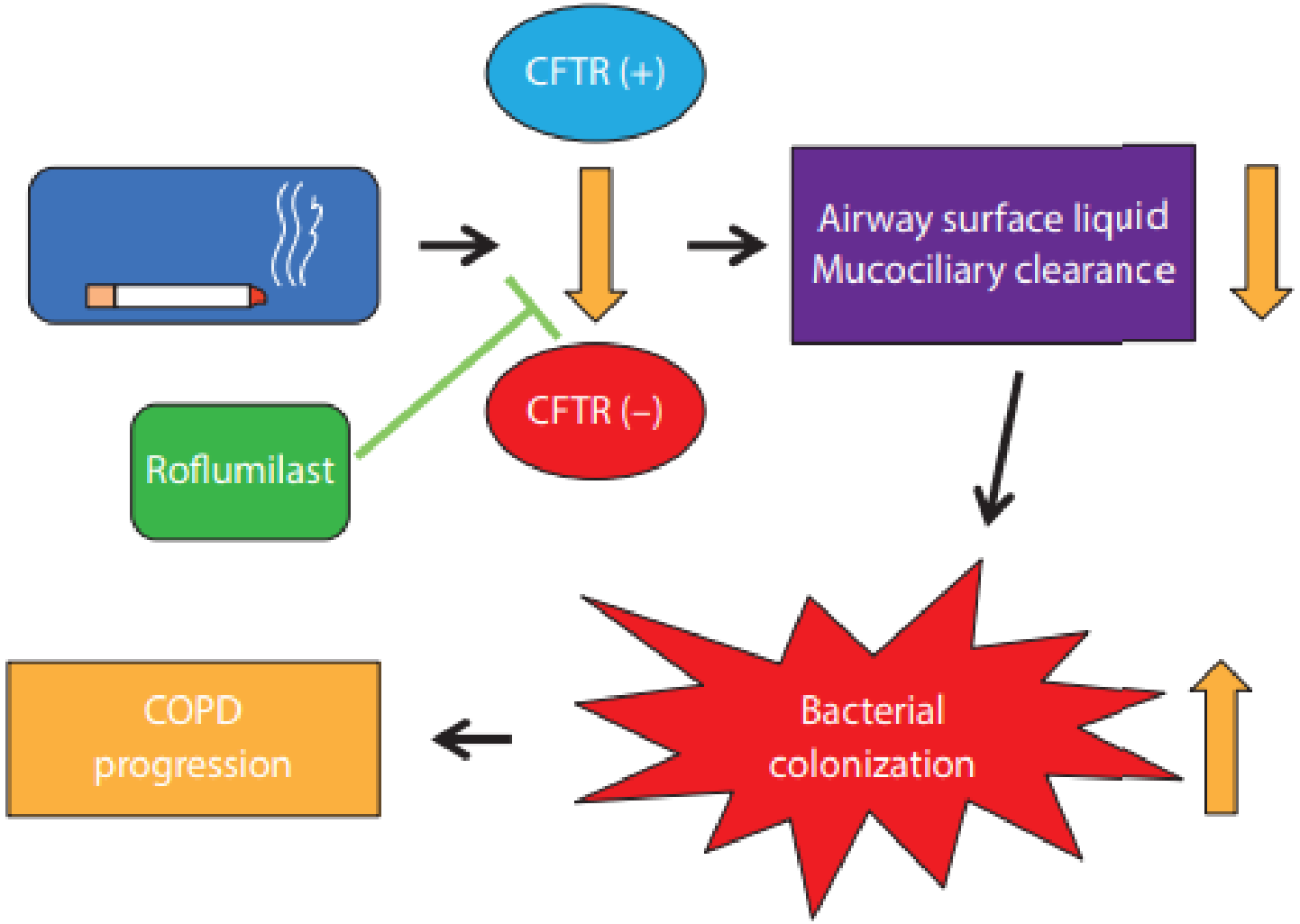
PMCID: PMC9488715
PMID: 33472961

New bronchoscopic treatment modalities for patients with chronic bronchitis

Jorine E. Hartman,[1,2] Justin L. Garner,[3,4,5] Pallav L. Shah,[3,4,5] and Dirk-Jan Slebos[1,2]

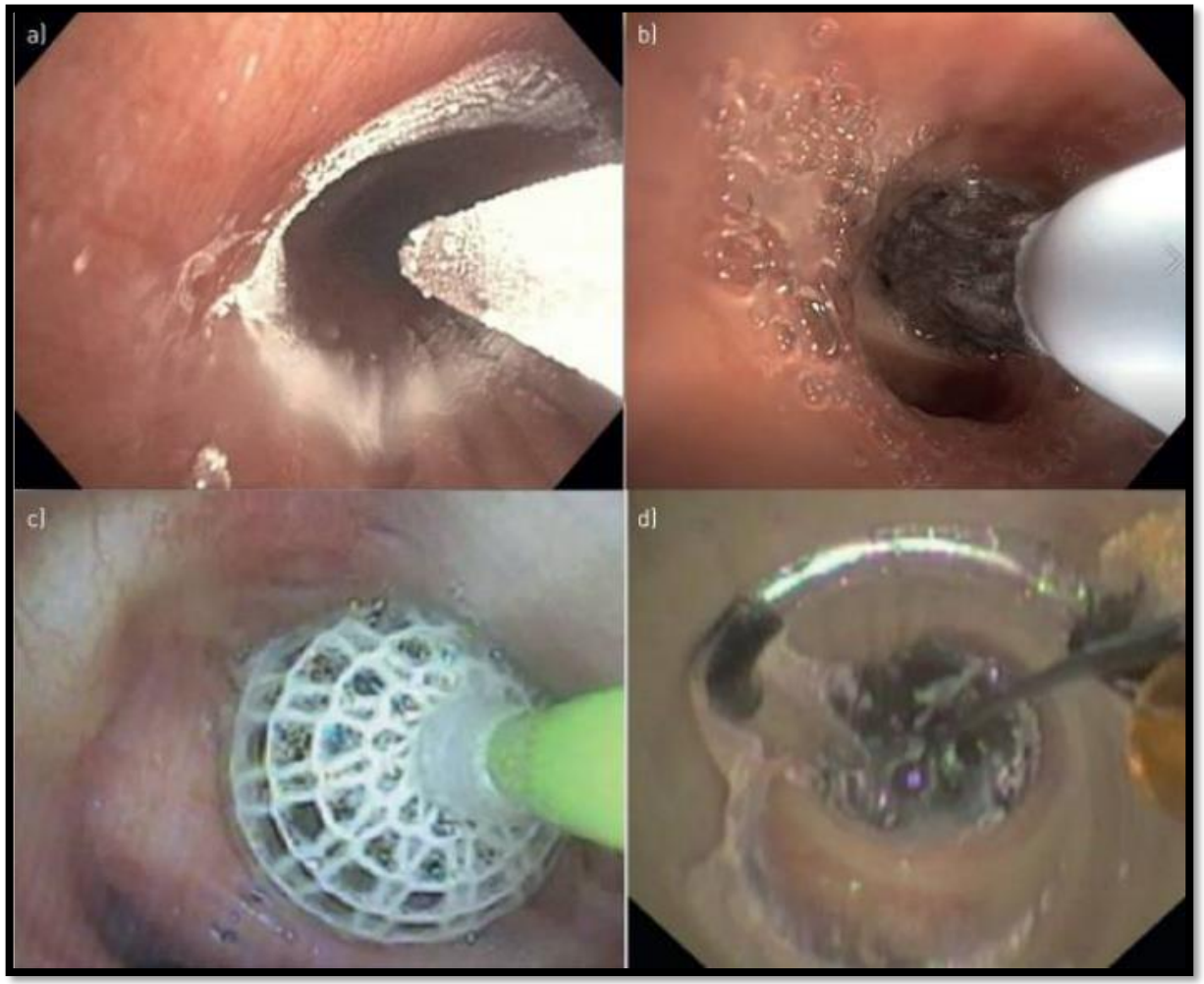


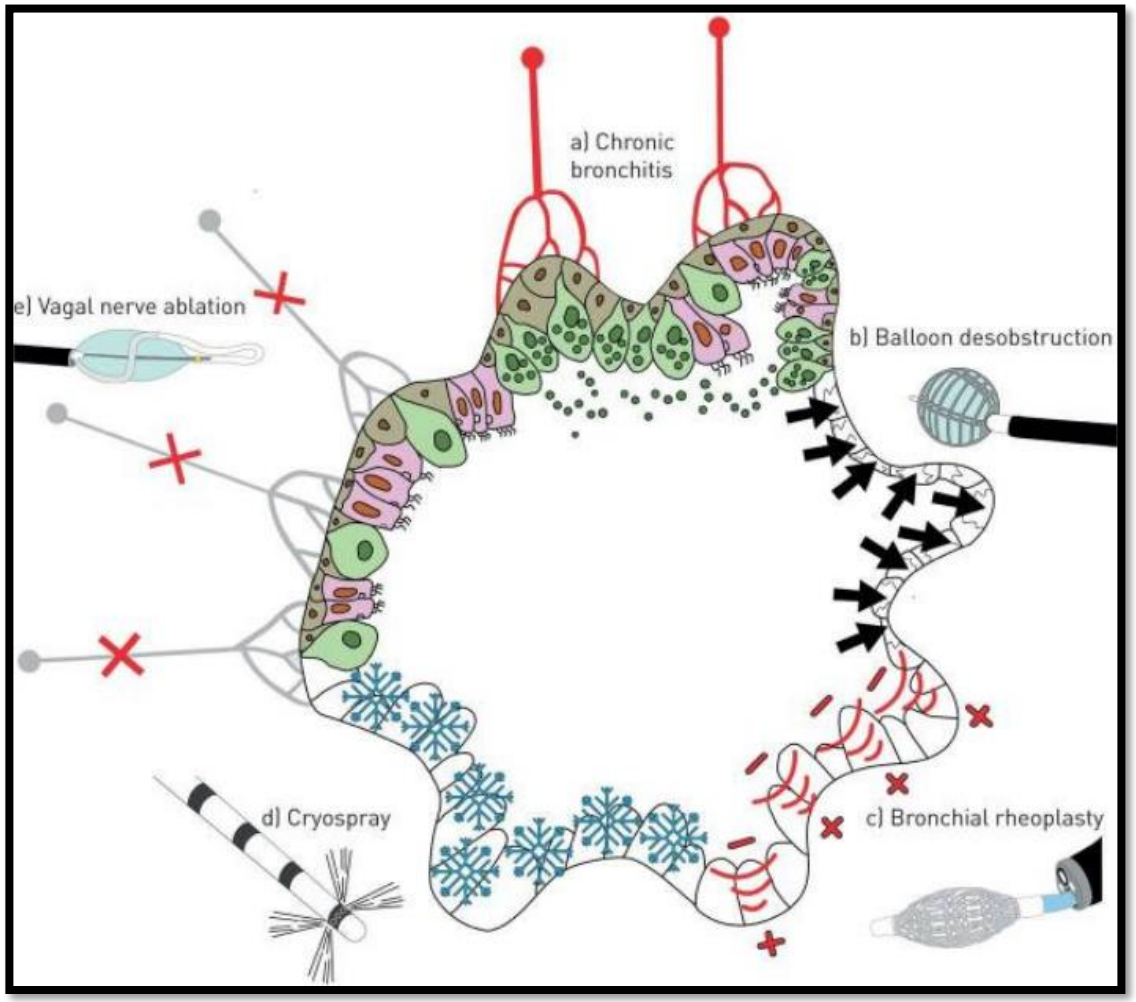
European Respiratory Journal 2014 44: 1042-1054



Korean J Intern Med 2020;35:276-283

Interventions (Mucus production ↓)





a) Cryospray b) Bronchial rheoplasty c)Balloon deobstruction
d) Targeted lung denervation

Eur Respir Rev. 2021 Mar 31; 30(159): 200281.

	Metered cryospray	Bronchial rheopalsty	Targeted lung denervation
원리	액체 질소를 이용한 Cryoablation	고주파 electrical energy-stimulation	Dual-cooled radiofrequency ablation
시술 방법	4주간격, 3단계 1. RLL main stem bronchus 2. LLL main stem bronchus 3. BUL and RML	4주간격, 2단계 1. Rt. 2. Lt. → Apporach 가능한 subsegmental lesion 전부	1단계 Both main bronchus (부교감신경 절제) → Ach. 분비 차단 → SMR → Mucus ↓
마취 방법, 시술시간	**전신마취**, 30분	**전신마취**, 30분	**전신마취**, 74분
합병증	AE Bronchospasm	Hemoptysis, AE Mucosal scarring	식도 관련 합병증 위마비
Benefit	3개월뒤 SGRQ, CAT, LCQ, FEV1 개선 9개월까지 지속	6개월뒤 SQRQ, CAT개선, Goblet cell 감소	입원이 필요한 COPD AE를 감소
Clinicaltrials.gov	NCT03893370 NCT 03892694	NCT04677465 NCT03631472	NCT03639051

Contents

- **Co-morbidities**
  - Cardiovascular disease(HTN, CHF, IHD)
  - DM
  - Dyslipidemia
  - Anxiety, Depression

Contents

- **Co-morbidities**
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  - DM
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  - Anxiety, Depression

Cardiovascular disease(CVD)

Eur Respir J. 2023 Aug 31;62(2):2202364. doi: 10.1183/13993003.02364-2022. Print 2023 Aug.

Quantifying COPD as a risk factor for cardiac disease in a primary prevention cohort

Laura C Maclagan [1], Ruth Croxford [1], Anna Chu [1], Don D Sin [2], Jacob A Udell [1 3 4 5 6], Douglas S Lee [1 4 5 6], Peter C Austin [1 4], Andrea S Gershon [7 4 6 8]

Retrospective population cohort study
2008-2016, CANADA
40세 이상의 CVD가 없는 COPD pt.(N=152,125)
MACE 발생 비율 측정

	Age- and sex-standardised rate per 1000 person-years (95% CI)		Rate ratio (95% CI)
	Persons with COPD	Persons without COPD	
Primary outcome			
MACE (composite of AMI, stroke or cardiovascular death)	9.92 (9.86–10.12)	5.02 (5.01–5.04)	1.98 (1.96–2.01)
Secondary outcomes			
AMI	4.50 (4.33–4.38)	2.39 (2.38–2.41)	1.88 (1.81–1.96)
Stroke	2.79 (2.69–2.90)	1.63 (1.62–1.64)	1.71 (1.65–1.78)
Haemorrhagic stroke	0.48 (0.44–0.54)	0.32 (0.31–0.32)	1.51 (1.36–1.69)
Ischaemic stroke	2.33 (2.24–2.44)	1.33 (1.32–1.34)	1.76 (1.70–1.84)
Heart failure	3.43 (3.32–3.53)	1.22 (1.21–1.24)	2.82 (2.70–2.91)
Atrial fibrillation	8.00 (7.83–8.20)	4.47 (4.45–4.49)	1.79 (1.75–1.83)
Unstable angina	1.17 (1.10–1.23)	0.57 (0.56–0.57)	2.05 (1.94–2.18)
CABG	1.40 (1.32–1.48)	1.13 (1.12–1.14)	1.24 (1.17–1.31)
PCI	3.74 (3.61–3.92)	2.38 (2.37–2.40)	1.57 (1.51–1.65)
Revascularisation (PCI or CABG)	4.98 (4.80–5.20)	3.38 (3.37–3.40)	1.47 (1.42–1.54)

심혈관 위험 요인(smoking, social status), 동반질환, 기타 변수 조정
COPD pt. without CVD
vs
No COPD without CVD

→ HR 1.25(95% CI, 1.23-1.27)

→ 이 위험도는 당뇨환자의 CVD 발생의 위험도와 유사하다

→ COPD 환자에서 적극적인 CVD 발생 예방이 필요하다

Eur Respir J. 2023 Aug 31;62(2):2202364.

Contents

- **Co-morbidities**
  - **Cardiovascular disease(HTN, CHF, IHD)**
  - **DM**
  - **Dyslipidemia**

  → **Cardiovascular ds. & metabolic ds.**

  - Anxiety, Depression

홈 > 학술 > 내분비/신장 > 순환기/뇌혈관

'SGLT-2 억제제', 내분비·심장·신장분야 최대 관심사 떠올라

박선혜 기자 | 입력 2021.04.19 06:16 | 댓글 0

16~17일 춘계심혈관통합학술대회 온라인으로 개최
내분비내과 전문가, '비당뇨병 성인'에게 미치는 영향 주목
심장내과 전문가, 'HFpEF 치료제'로 관심
신장내과 전문가, RAS 억제제 등과 병용요법 기대

SGLT-2 억제제의 변신은 무죄...넥스트 타깃은?

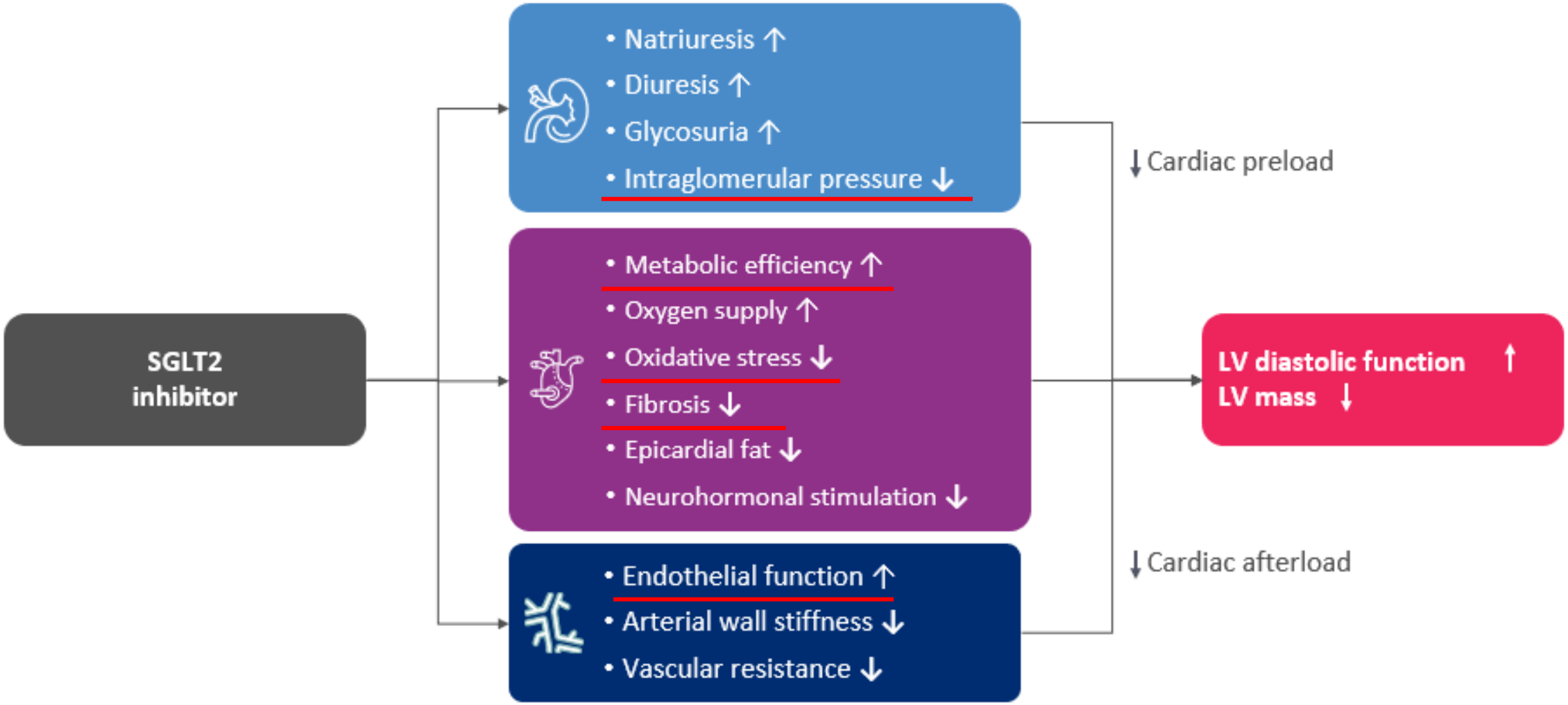
2023-02-18 05:33:06

Strong evidence
- T2DM, HTN, HF, early CKD

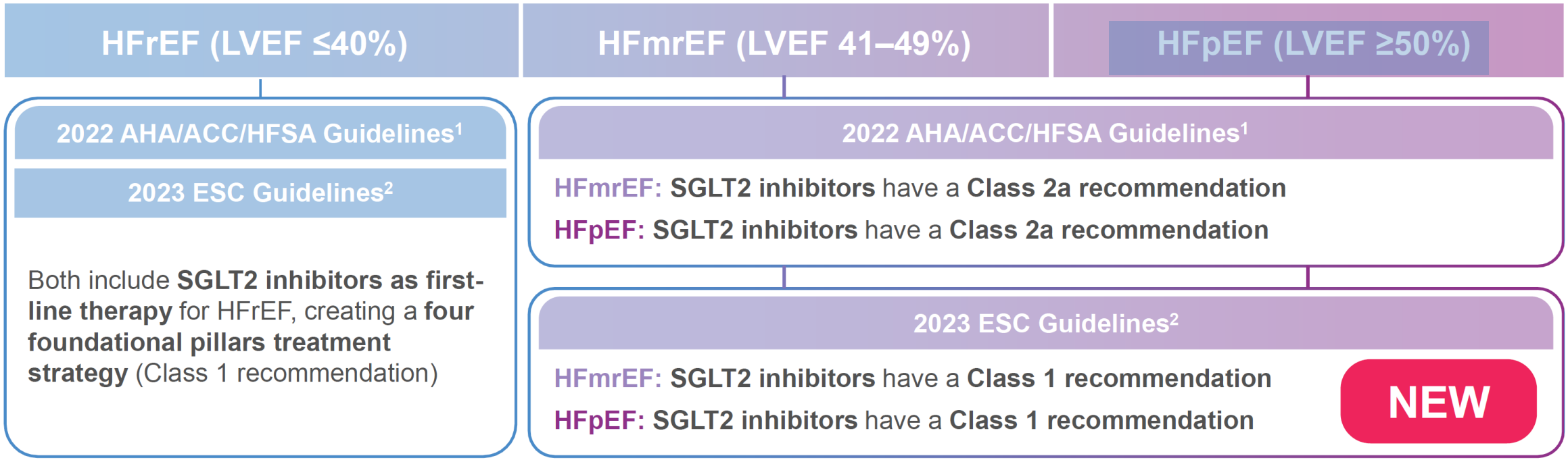
Experimental
- A.fib, NAFLD

http://www.monews.co.kr/news/articleView.html?idxno=303297
https://www.medifonews.com/mobile/article.html?no=175644

CVD and DM (SGLT-2 inhibitor)



ESC Heart Fail. 2019;6:927.



Treatment for heart failure should be started regardless of LVEF

1. J Am Coll Cardiol. 2022 May 3;79(17):e263-e421.
2. Eur Heart J. 2023 Oct 1;44(37):3627-3639

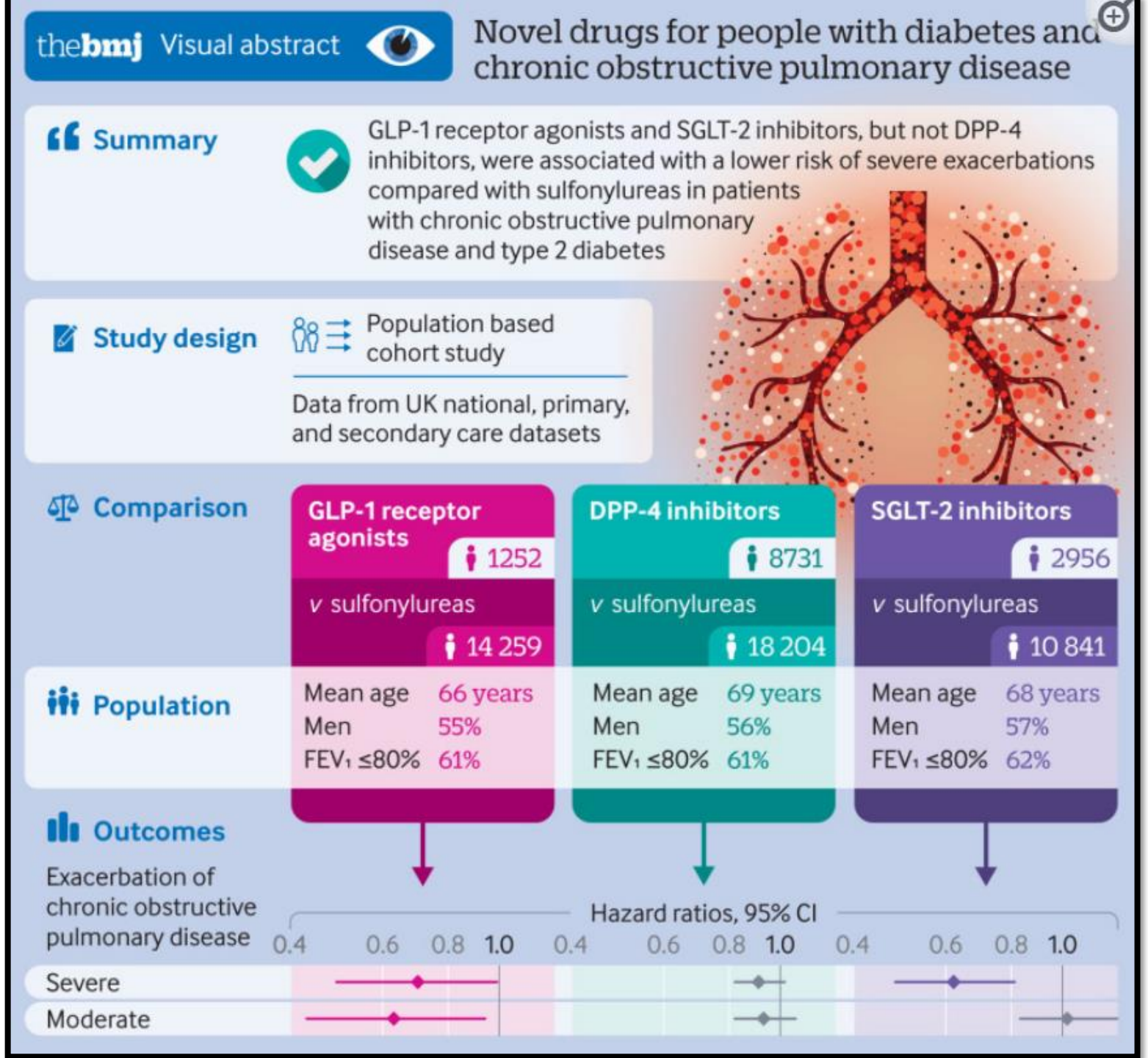
CVD and DM

BMJ. 2022; 379: e071380.
Published online 2022 Nov 1. doi: 10.1136/bmj-2022-071380
PMCID: PMC9623550
PMID: 36318979

Novel antihyperglycaemic drugs and prevention of chronic obstructive pulmonary disease exacerbations among patients with type 2 diabetes: population based cohort study

Richeek Pradhan, doctoral student,[1,2] Sally Lu, masters student,[1,2] Hui Yin, statistician,[2] Oriana H Y Yu, endocrinologist and assistant professor,[2,3] Pierre Ernst, pulmonologist and professor,[1,2,4] Samy Suissa, professor,[1,2] and Laurent Azoulay, associate professor[1,2,5]

Population based cohort study



Severe: admission
Moderate:
- OCS + antibiotics
- OPD AECOPD code

BMJ. 2022 Nov 1:379:e071380.

Original Investigation | Diabetes and Endocrinology

January 17, 2023

Association of Sodium-Glucose Cotransporter 2 Inhibitor vs Dipeptidyl Peptidase-4 Inhibitor Use With Risk of Incident Obstructive Airway Disease and Exacerbation Events Among Patients With Type 2 Diabetes in Hong Kong

Philip C. M. Au, MPhil[1]; Kathryn C. B. Tan, MD[2]; David C. L. Lam, PhD[2]; et al

Retrospective population-based cohort study
Electronic medical database in Hong Kong
15.01~18.12 SGLT2 처방군 vs DPP4I 처방군
평균 2.2년간 추적관찰
N=30,385

OAD: asthma도 포함

JAMA Netw Open. 2023 Jan 3;6(1):e2251177

OAD 발생

Association of Sodium-Glucose Cotransporter 2 Inhibitors With Risk of Incident Obstructive Airway Disease

Group	No. of patients	No. of events	Total person-years	Median follow-up (IQR), y	Hazard ratio (95% CI)	*P* value
DPP4I	22 784	1069	53 407	2.3 (1.0-3.5)	1 [Reference]	NA
SGLT2I	5696	135	10 478	1.2 (0.5-3.0)	0.65 (0.54-0.79)	<.001

AE 발생

Association of Sodium-Glucose Cotransporter 2 Inhibitors With Rate of Obstructive Airway Disease Exacerbation Events

Group	No. of patients	No. of events	Total person-years	Median follow-up (IQR), y	Count model	
					Rate ratio (95% CI)	*P* value
DPP4I	1524	526	3575	2.3 (1.0-3.5)	1 [Reference]	NA
SGLT2I	381	54	732	1.5 (0.5-3.0)	0.54 (0.36-0.83)	.01

Abbreviations: DPP4I, dipeptidyl peptidase-4 inhibitor; NA, not applicable; SGLT2I, sodium-glucose cotransporter 2 inhibitor.

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American Journal of Respiratory and Critical Care Medicine

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Association of GLP-1 Receptor Agonists with Chronic Obstructive Pulmonary Disease Exacerbations among Patients with Type 2 Diabetes

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Retrospective, observational, electronic health record based study
U.S health system 2012~2022
1,642 COPD pt. , USA
GLP1-RA group / DPP4-i group / SGLT2-I group / SU group
(n=328) (n=260) (n=353) (n=701)

Severe AE : admission
Moderate AE : OCS 처방

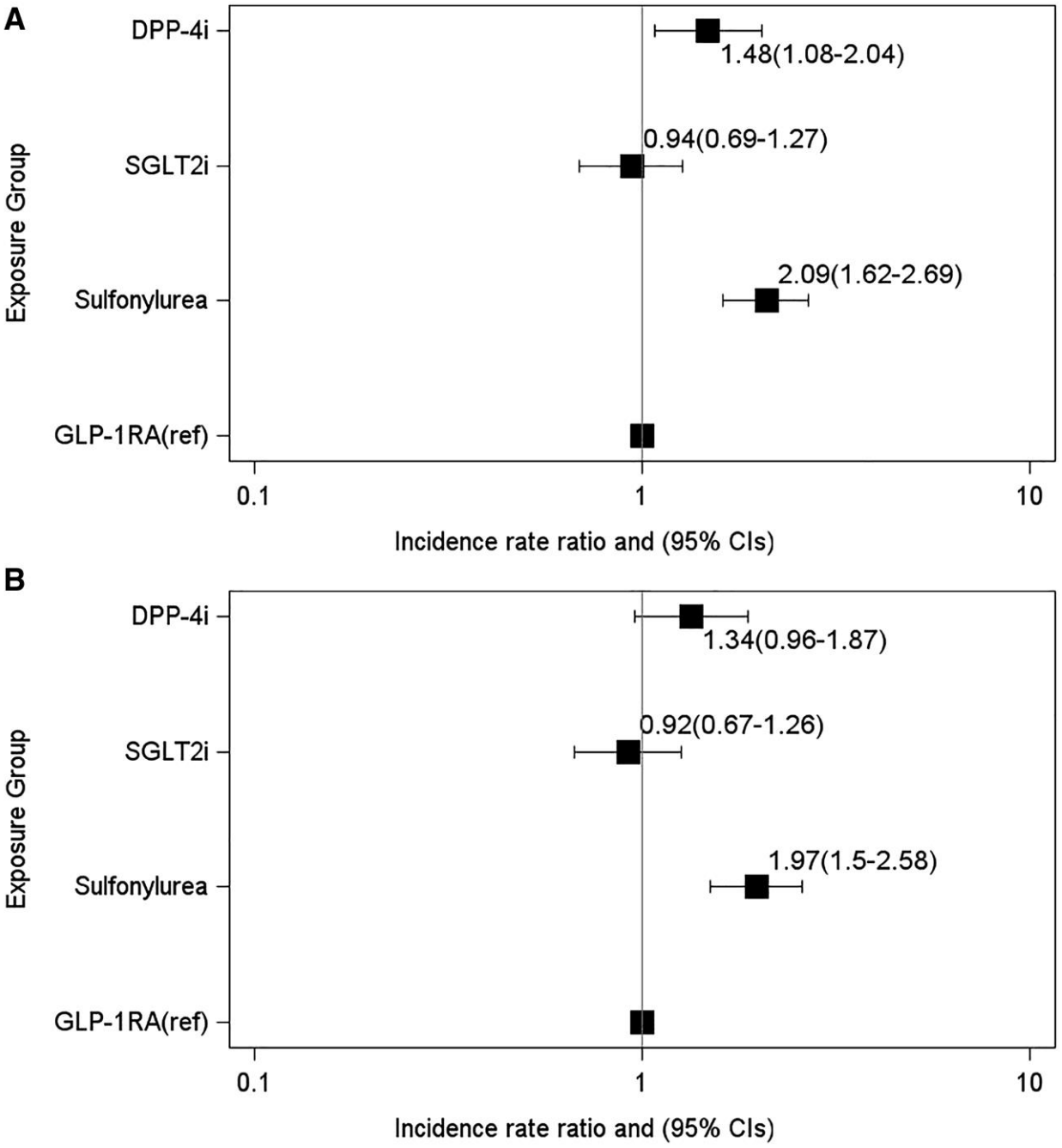

Figure 2. Incidence rate ratios of chronic obstructive pulmonary disease exacerbations and the association with GLP-1RAs or comparator treatments by six months after treatment initiation. (*A* and *B*) Negative binomial regression models adjusted for (*A*) clinical covariates (clinical model) and (*B*) metabolic covariates at baseline (metabolic model).

Am J Respir Crit Care Med. 2023 Nov 15;208(10):1088-1100.

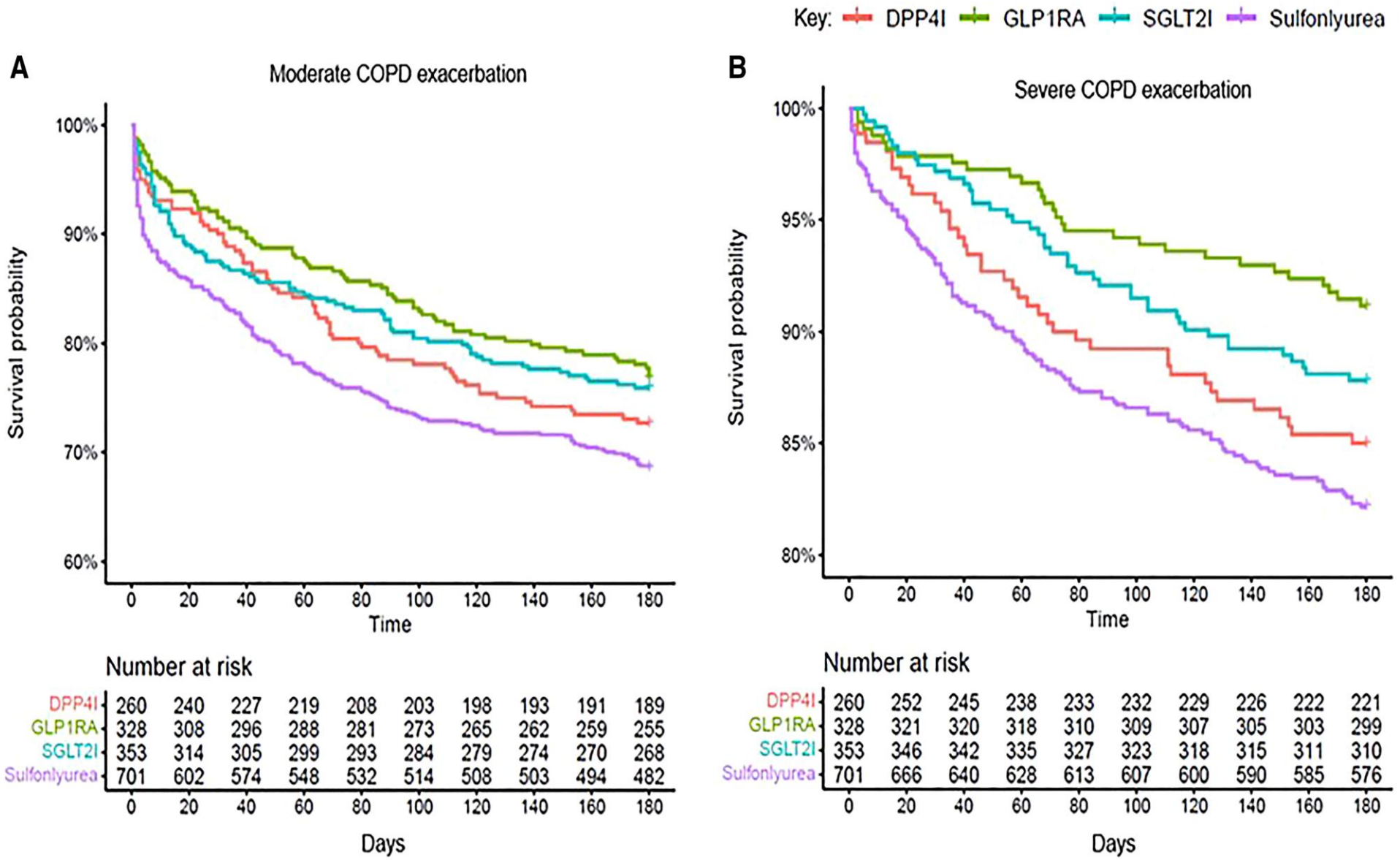

Figure 3. (*A* and *B*) Unadjusted **Kaplan-Meier survival curves indicating the time to onset** of (*A*) moderate COPD exacerbations and (*B*) severe exacerbations

Am J Respir Crit Care Med. 2023 Nov 15;208(10):1088-1100.

Table 2. Cox Proportional Hazards Models Estimating the Association of Time to First COPD Exacerbation in Patients Initiating GLP-1RAs or Comparator Medications

COPD Exacerbation Type	Drug Exposure	Unadjusted			Clinical Model*			Metabolic Model†		
		HR	95% CI	*P* Value	HR	95% CI	*P* Value	HR	95% CI	*P* Value
Moderate	DPP-4is	1.48	0.88–1.69	0.22	1.52	1.09–2.14	0.01	1.30	0.92–1.82	0.14
	SGLT2is	1.07	0.78–1.45	0.68	1.01	0.73–1.39	0.96	0.94	0.69–1.30	0.72
	Sulfonylureas	1.48	1.14–1.92	0.003	2.09	1.56–2.79	<0.0001	1.92	1.45–2.54	<0.0001
	GLP-1RAs (ref)	—	—	—	—	—	—	—	—	—
Severe	DPP-4is	1.77	1.09–2.85	0.02	1.85	1.12–3.05	0.02	2.04	1.23–3.36	0.005
	SGLT2is	1.40	0.87–2.24	0.16	1.41	0.87–2.29	0.16	1.28	0.79–2.08	0.31
	Sulfonylureas	2.15	1.43–3.22	0.002	2.21	1.42–3.44	0.0004	2.63	1.71–4.04	<0.0001
	GLP-1RAs (ref)	—	—	—	—	—	—	—	—	—

Am J Respir Crit Care Med. 2023 Nov 15;208(10):1088-1100.

Contents

- **Co-morbidities**
  - Cardiovascular disease(HTN, CHF, IHD)
  - DM
  - **Dyslipidemia**
  - Anxiety, Depression

Dyslipidemia(TG)

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PMCID: PMC9212790
PMID: 35746923

Triglyceride-Glucose Index is a Risk Marker of Incident COPD Events in Women

Suneela Zaigham, [1] Hanan Tanash, [2] Peter M Nilsson, [1,3] and Iram F Muhammad [1]

Sweden cohort / COPD 병력이 없는
N=28,282 (M:1974-1982 / F:1982-1992)
f/u duration : 31yr

TyG index = log(TG x fasting glucose/2)

Incidence of COPD Events by Quartiles of and by 1 Unit Increase in TyG Index

	Q1	Q2	Q3	Q4	Per 1 Unit Increase	p-value for 1 Unit Increase
All (n=28,282)	**3.38–4.40 (n=7060)**	**4.40–4.57 (n=7085)**	**4.57–4.75 (n=7066)**	**4.75–6.70 (n=7071)**		
COPD events n (n /1000 person-years)	719 (3.1)	874 (3.9)	891 (4.0)	885 (4.2)		
Model 1	1.00 (reference)	1.25 (1.14–1.39)	1.31 (1.19–1.44)	1.42 (1.29–1.57)	1.61 (1.43–1.82)	<0.001
Model 2	1.00 (reference)	1.20 (1.08–1.32)	1.26 (1.14–1.39)	1.29 (1.16–1.43)	1.44 (1.26–1.65)	<0.001
Model 3	1.00 (reference)	1.16 (1.05–1.29)	1.23 (1.11–1.36)	1.21 (1.09–1.35)	1.33 (1.16–1.53)	<0.001
Women (n=7390)	**3.58–4.30 (n=1845)**	**4.30–4.46 (n=1851)**	**4.46–4.62 (n=1847)**	**4.62–6.24 (n=1847)**		
COPD events n (n /1000 person-years)	174 (2.9)	235 (4.1)	270 (4.7)	340 (6.2)		
Model 1	1.00 (reference)	1.41 (1.16–1.72)	1.64 (1.36–1.99)	2.21 (1.84–2.66)	3.38 (2.66–4.28)	<0.001
Model 2	1.00 (reference)	1.29 (1.06–1.57)	1.45 (1.19–1.75)	1.86 (1.54–2.25)	2.50 (1.94–3.23)	<0.001
Model 3	1.00 (reference)	1.25 (1.03–1.53)	1.34 (1.10–1.62)	1.72 (1.41–2.09)	2.19 (1.67–2.88)	<0.001
Men (n=20,892)	**3.38–4.44 (n=5237)**	**4.44–4.60 (n=5206)**	**4.61–4.79 (n=5225)**	**4.79–6.70 (n=5224)**		
COPD events n (n /1000 person-years)	566 (3.3)	570 (3.4)	620 (3.8)	594 (3.8)		
Model 1	1.00 (reference)	1.07 (0.95–1.20)	1.19 (1.06–1.33)	1.25 (1.12–1.40)	1.50 (1.29–1.73)	<0.001
Model 2	1.00 (reference)	0.96 (0.86–1.08)	1.05 (0.93–1.18)	1.02 (0.91–1.16)	1.18 (1.01–1.39)	0.041
Model 3	1.00 (reference)	0.99 (0.88–1.11)	1.06 (0.95–1.19)	1.01 (0.89–1.14)	1.14 (0.97–1.34)	0.118

Notes: Model 1: Unadjusted. Model 2: age, sex, height, BMI, smoking status, smoking amount >20 cig/day. Model 3: age, sex, height, BMI, smoking status, smoking amount >20 cig/day, FEV_1/FVC, physical activity, prevalent CVD, prevalent diabetes, antihypertensive drugs. Adjusted for sex only in overall analysis (n=28,282).

Contents

- **Co-morbidities**
  - Cardiovascular disease(HTN, CHF, IHD)
  - DM
  - Dyslipidemia
  - **Anxiety, Depression**

Depression (COPD 진단 & 우울증)

› Respir Med. 2022 May:196:106804. doi: 10.1016/j.rmed.2022.106804. Epub 2022 Mar 12.

Incidence of depression and antidepressant prescription in patients with COPD: A large UK population-based cohort study

R A Siraj [1], T M McKeever [2], J E Gibson [3], C E Bolton [4]

UK health improvement network database
COPD pt. : 44,362명
Non-COPD pt. : 124,140명

Incidence of depression and medication

Table 2
Univariate and multivariate Cox regression models of the incidence of depression antidepressant prescription, or either for patients with COPD compared with subjects without COPD matched by age, gender, and GP practice.

	Number of events	Rate/1000 person-years	Crude HR (95% CI)	Fully adjusted HR (95%CI)	P value
Depression					
Subjects without COPD	3,400	5.7 (5.4–5.8)	1.00	1	
Patients with COPD	2,155	11.4 (10.9–11.8)	1.98 (1.87–2.10)	1.41 (1.32–1.53)	<0.001
Antidepressant prescription					
Subjects without COPD	14,561	25.7 (25.3–26.1)	1	1	
Patients with COPD	7,918	45.7 (44.6–46.7)	1.78 (1.73–1.84)	1.40 (1.35–1.45)	<0.001
Either depression or antidepressant prescription					
Subjects without COPD	22,875	27.4 (26.9–27.8)	1	1	
Patients with COPD	10,073	49.6 (48.5–50.6)	1.81 (1.76–1.86)	1.42 (1.36–1.46)	<0.001

HR – adjusted for age, gender, and GP practice.
Fully adjusted for age, gender, GP, BMI, CCI, smoking status, and socioeconomic class.
Abbreviations: BMI: body mass index; CCI, Charlson comorbidity index; CI: confidence interval; GP: general practice; HR: hazard ratio.

Respir Med. 2022 May:196:106804.

Effect of dyspnea

Table 3
Comparison of incidence of either depression or antidepressant prescription in patients with COPD according to MRC dyspnoea score (1–3 vs 4–5).

	MRC dyspnea score 1–3 (n = 20,853)	**MRC dyspnea score 4–5** (n = 2,339)	P-value
Depression			
HR (95% CI)	1	1.38 (1.12–1.71)	0.002
Fully adjusted (95% CI)	1	1.28 (1.01–1.63)	0.044
Antidepressant prescription			
HR (95% CI)	1	1.35 (1.22–1.51)	<0.001
Fully adjusted (95% CI)	1	1.29 (1.16–1.44)[a]	<0.001
Either depression or antidepressant prescription			
HR (95% CI)	1	1.38 (1.24–1.53)	<0.001
Fully adjusted (95% CI)	1	1.32 (1.19–1.46)	<0.001

Fully adjusted for age, gender, BMI, CCI, smoking status, and socioeconomic class.
Abbreviations: BMI: body mass index; CCI: Charlson comorbidity index; CI: confidence interval; HR: hazard ratio; MRC: Medical Research Council.

Respir Med. 2022 May:196:106804.

Anxiety, Depression

› Sao Paulo Med J. 2022 Mar-Apr;140(2):207-212. doi: 10.1590/1516-3180.2021.0235.R1.17062021.

Self-reported depression and anxiety among COPD patients. A case-control study

Rafael Hurtado-Ruzza [1], Óscar Álvarez-Calderón-Iglesias [1], Ricardo Becerro-de-Bengoa-Vallejo [2], César Calvo-Lobo [3], Marta San-Antolín [4], Marta Elena Losa-Iglesias [5], Carlos Romero-Morales [6], Daniel López-López [7]

Case control study at a public hospital institution in Spain
Beck's depression inventory (BDI) – self reported
State-trait anxiety inventory (STAI) – self reported

Beck Depression Inventory (BDI)

벡 우울척도(Beck Depression Inventory; BDI)

벡 우울척도는 어린이와 성인의 우울 정도를 측정하는 데 사용되는 21개의 객관식 질문으로 구성된 자가보고 설문지입니다. 지난 1주일간 겪었던 일반적인 우울 증상을 떠올리며 편한 마음으로 답변하시면 됩니다.

Beck Depression Inventory (벡우울척도)

지난 2주 동안의 당신의 기분과 상태를 생각해 보시고, 이를 가장 잘 설명하는 문장의 번호에 표시해 주십시오.

1.	슬픈 기분	0점	나는 슬프지 않다.
		1점	나는 슬프다.
		2점	나는 항상 슬퍼서 그것을 떨쳐버릴 수가 없다.
		3점	나는 너무나 슬프고 불행해서 도저히 견딜 수가 없다.
2.	비관적 사고	0점	나는 앞날에 대해 기대할 것이 아무것도 없다고 느낀다.
		1점	나는 앞날에 대해서 별로 낙심하지 않는다.
		2점	나의 앞날은 아주 절망적이고 나아질 가망이 없다고 느낀다.
		3점	나는 앞날에 대해서 비관적인 느낌이 든다.
3.	실패감	0점	나는 실패자라고 느끼지 않는다.
		1점	나는 보통 사람들보다 더 많이 실패한 것 같다.
		2점	내가 살아온 과거를 뒤돌아 보면 생각나는 것은 실패뿐이다.
		3점	나는 인간으로서 완전히 실패자인 것 같다.
4.	만족감 감소	0점	나는 전과 같이 일상 생활에 만족하고 있다.
		1점	나의 일상 생활은 전처럼 즐겁지 않다.
		2점	나는 더 이상 어떤 것에서도 참된 만족을 얻지 못한다.
		3점	나는 모든 것이 다 불만스럽고 지겹다.

STAI FORM X-1(상태불안 척도)

지침 : 아래 문장들은 사람들이 자신을 표현하는데 사용되어 지고 있는것들입니다.
각 문항을 잘 읽으시고 각 문항의 오른편에 있는 네 개의 항목중에서 당신의 지금 이 순간에 바로 느끼고 있는 상태를 가장 잘 나타내주는 항목 하나를 ✔표 또는 ○하여 주시기 바랍니다.
여기에서는 옳고 그른 답이 없습니다.
어느 한 문장에 너무 오래 머무르지 마시고, 당신이 지금 현재의 느낌을 나타내고 있다고 생각되는 문장에 바로 답을 해주십시오.

	전혀 그렇지 않다	조금 그렇다	보통으로 그렇다	대단히 그렇다
1. 마음이 차분하다.	1	2	3	4
2. 마음이 든든하다.	1	2	3	4
3. 긴장되어 있다.	1	2	3	4
4. 후회스럽고 서운하다.	1	2	3	4
5. 마음이 편하다.	1	2	3	4
6. 당황해서 어찌할 바를 모르겠다.	1	2	3	4
7. 앞으로 불행이 있을까봐 걱정하고 있다.	1	2	3	4
8. 마음이 놓인다.	1	2	3	4
9. 마음이 불안하다.	1	2	3	4
10. 유쾌한 기분이다.	1	2	3	4
11. 자신감이 있다.	1	2	3	4
12. 짜증스럽다.	1	2	3	4
13. 마음이 조마조마하다.	1	2	3	4
14. 극도로 긴장되어 있다.	1	2	3	4
15. 지금 긴장이 풀려 푸근하다.	1	2	3	4

Anxiety, Depression (Healthy vs COPD)

Depression and anxiety score differences between COPD and healthy participants

	Sample Mean ± SD (range) n = 52	Control Mean ± SD (range) n = 50	COPD Mean ± SD (range) n = 52	P-value
STAI-State	38.43 ± 11.54 (20-68)	34.88 ± 9.25 (21-66)	41.85 ± 12.55 (20-68)	**0.005** †
STAI-Trait	38.03 ± 10.20 (20-65)	34.62 ± 9.19 (20-65)	41.37 ± 10.10 (22-61)	**< 0.001** †
BDI	7.76 ± 6.86 (0-36)	5.20 ± 6.56 (0-36)	10.23 ± 6.26 (0-24)	**< 0.001** †

BDI (Depression)
국내 9점 이하 정상

Sao Paulo Med J. 2022 Mar-Apr;140(2):207-212

Anxiety, Depression (Healthy vs COPD)

Depression and anxiety score differences between COPD severity classification subgroups

	Mild COPD Mean ± SD (range) n = 13	Moderate COPD Mean ± SD (range) n = 16	Severe COPD Mean ± SD (range) n = 23	P-value
BDI score	11.15 ± 6.78 (1-21)	7.38 ± 5.12 (0-21)	11.70 ± 6.60 (2-24)	< **0.001** †
STAI-S	44.15 ± 12.63 (20-68)	38.31 ± 11.63 (20-60)	43 ± 12.21 (24-66)	< **0.001** †
STAI-T	42.92 ± 11.27 (24-59)	38.63 ± 8.72 (26-54)	42.52 ± 10.14 (22-61)	< **0.001** †

Sao Paulo Med J. 2022 Mar-Apr;140(2):207-212

Summary

- Smoking dependency는 chronic ds.로 지속적 조절이 중요하다.
- Pulmonary rehabilitation은 입원 시 시작되어야 한다.
- Low Vit. D level 및 여성에서의 high TyG index는 COPD 발생의 예측지표가 될 수 있다.
- COPD의 동반 질환은 잘 관리 되어야 하며, COPD 역시 단독으로 CVD 발생의 위험인자이므로 잘 관리 되어야 한다.
- COPD의 악화가 잦다면 DM medication도 한번 check해 볼 수 있겠다.

감사합니다.