Non-pharmacologic treatment of COPD

2025. 12. 13.

순천향대학교 부속 부천병원
호흡기알레르기내과
박 신 희

Contents

- Smoking cessation
- Vaccination
- Nutrition and physical activity
- Pulmonary rehabilitation
- Long-term oxygen therapy
- Noninvasive positive pressure ventilation
- Surgical and bronchoscopic intervention
- Telemedicine in non-pharmacologic treatment

Contents

Decídetexto: Mobile Cessation Support for Latino Adults Who Smoke

A Randomized Clinical Trial

Francisco Cartujano-Barrera, MD; Lisa Sanderson Cox, PhD; Delwyn Catley, PhD; Xueya Cai, PhD; Francisco J. Diaz, PhD; Evelyn Arana-Chicas, DrPH; Arlette Chávez-Iñiguez, MD; Chinwe Ogedegbe, MD; Kristi D. Graves, PhD; M. Patricia Rivera, MD; Arturo Ponce; Edward F. Ellerbeck, MD; and Ana Paula Cupertino, PhD

- **P:** Latino adults who smoke (n = 457)
- **I:** "Decídetexto" - a culturally accommodated mHealth intervention for smoking cessation including a tablet-based information to guide personalized quit plan followed by text messaging, 24-week text message counselling, and interactive tablet-based program for 10-15 minutes to review their reasons for quitting to encourage the participants.
- **C:** a standard care (control) including education and nicotine replacement therapy.
- **O:** Biochemically verified 7-day smoking abstinence at week 24 / self-reported 7-day smoking abstinence at weeks 12 and 24 and uptake and adherence of NRT.

TABLE 1] Baseline Characteristics by Treatment

Characteristics	Participants, No. (%)	
	Decídetexto (n = 229)	Standard Care (n = 228)
Age, mean (SD), y	48.57 (10.87)	48.83 (11.41)
Female	101 (44.1%)	106 (46.5%)
Male	128 (55.9%)	122 (53.5%)
Education ≥ high school	163 (71.2%)	167 (73.2%)
Below poverty[a]	58 (25.3%)	63 (27.6%)
Spanish as primary language	163 (71.2%)	159 (69.7%)
High Hispanic acculturation[b]	70 (30.6%)	68 (29.8%)
Country/region of birth		
Caribbean[c]	63 (27.5%)	77 (33.8%)
Central America and Mexico[d]	51 (22.3%)	46 (20.2%)
South America[e]	63 (27.5%)	50 (21.9%)
United States	51 (22.3%)	54 (23.7%)
Other[f]	1 (0.4%)	1 (0.4%)
Heavy smoking[g]	109 (47.6%)	121 (53.1%)
Attempted smoking cessation in the previous year	135 (59.0%)	127 (55.7%)
Severity of dependence scale, mean (SD)	9.08 (2.76)	9.12 (2.75)
Previous use of medications for smoking cessation[h]	117 (51.1%)	118 (51.8%)
Previous use of nicotine replacement therapies[i]	103 (45.0%)	109 (47.8%)
Self-efficacy for smoking cessation, mean (SD)[j]	24.62 (9.48)	22.70 (8.57)

TABLE 2] Biochemically Verified and Self-Reported 7-Day Smoking Abstinence Rates by Treatment

Outcome	Approach	Treatment	Week 12 (Rate)	*P*	OR (95% CI)	Difference Between Rates (95% CI)	Week 24 (Rate)	*P*	OR (95% CI)	Difference Between Rates (95% CI)
Biochemically verified 7-day smoking abstinence rates	Treating those lost to follow-up as participants who continued smoking	*Decídetexto*	NA	NA	NA	NA	14.4% (33/229)	.09	1.66 (0.93, 2.97)	5.2% (−0.70, 11.1)
		Standard care	NA	NA	NA	NA	9.2% (21/228)	NA	NA	NA
	Completers only	*Decídetexto*	NA	NA	NA	NA	17.1% (33/193)	.05	1.78 (0.99, 3.20)	6.7% (-0.075, 13.5)
		Standard care	NA	NA	NA	NA	10.4% (21/202)	NA	NA	NA
Self-reported 7-day smoking abstinence rates	Treating those lost to follow-up as participants who continued smoking	*Decídetexto*	37.1% (85/229)	**< .01**	2.77 (1.80, 4.28)	19.6% (11.6, 27.5)	34.1% (78/229)	**< .01**	1.99 (1.31, 3.03)	13.4% (5.4, 21.5)
		Standard care	17.5% (40/228)	NA	NA	NA	20.6% (47/228)	NA	NA	NA
	Completers only	*Decídetexto*	38.9% (75/193)	**< .01**	2.66 (1.69, 4.19)	19.6% (10.8, 28.3)	40.4% (78/193)	**.01**	2.77 (1.80, 4.28)	17.1% (8.1, 26.2)
		Standard care	19.3 (39/202)	NA	NA	NA	23.2% (47/202)	NA	NA	NA

- Uptake of NRT: 90.4% in Decidetexto vs. 70.2% in control
- Adherence: 64.4% vs. 59.0% used >4 weeks of NRT

Original Investigation | Substance Use and Addiction

Daily or Nondaily Vaping and Smoking Cessation Among Smokers

Natalie E. Quach, BS; John P. Pierce, PhD; Jiayu Chen, MS; Brian Dang, MS; Matthew D. Stone, PhD; David R. Strong, PhD; Dennis R. Trinidad, PhD; Sara B. McMenamin, PhD; Karen Messer, PhD

- **P:** 6,013 Smokers enrolled in 2017 from US Population Assessment of Tobacco and Health (PATH) cohort
- **E:** E-cigarette use (vaping)
- **C:** cigarette smoking without use of any electronic nicotine delivery systems (ENDS).
- **O:** 12 or more months' abstinence from cigarette smoking and 12 or more months' abstinence from both smoking and vaping after 4 years (at 2021).

JAMA Network Open. 2025;8(3):e250089.

Table 1. Vaping Among US Smokers by Baseline Characteristics, 2017[a]

Baseline characteristics	Sample size, No. (weighted %)	Weighted % (95% CI)[b]	
		Daily vaping	Nondaily vaping
Overall	6013 (100)	3.9 (3.3-5.0)	10.6 (9.7-11.0)
Age, y		N=228	N=715
<35	2379 (34.8)	5.5 (4.4-6.6)	14.8 (13.3-16.4)
≥35	3634 (65.2)	3.0 (2.3-3.7)	8.3 (7.2-9.4)
Sex			
Male	2831 (53.5)	4.0 (3.2-4.9)	10.6 (9.2-11.9)
Female	3182 (46.5)	3.7 (2.8-4.5)	10.6 (9.5-11.7)
Educational level			
<High School	1712 (26.9)	3.0 (2.0-4.0)	10.1 (8.5-11.8)
High school graduate	1524 (30.1)	3.8 (2.5-5.0)	9.5 (8.0-10.9)
Some college or more	2777 (43.1)	4.5 (3.5-5.5)	11.6 (10.4-12.7)
Race and ethnicity[c]			
Non-Hispanic White	3779 (68.0)	4.5 (3.7-5.3)	11.2 (10.0-12.3)
Other	2234 (32.0)	2.5 (1.7-3.4)	9.3 (7.9-10.6)
Income, $			
<35 000	3607 (56.3)	3.0 (2.3-3.8)	11.0 (9.8-12.2)
≥35 000	2148 (39.0)	5.0 (3.9-6.2)	10.3 (8.7-11.9)
Missing	258 (4.7)	4.1 (0.8-7.4)	7.7 (4.2-11.3)
Cigarette smoking status			
Daily	4602 (76.2)	2.1 (1.7-2.6)	10.1 (9.1-11.0)
Nondaily	1411 (23.8)	9.5 (7.7-11.3)	12.2 (10.4-13.9)
No past-year quit attempt and low interest in quitting	2791 (47.2)	2.6 (1.7-3.4)	10.0 (8.7-11.3)
No past-year quit attempt and high interest in quitting	1146 (19.8)	3.4 (2.3-4.5)	7.7 (6.1-9.3)
Past-year quit attempt	2076 (33.0)	6.0 (4.7-7.3)	13.1 (11.5-14.7)
Smoke-free home[d]			
No	2707 (43.7)	3.2 (2.4-4.0)	11.2 (9.8-12.5)
Yes	3273 (56.3)	4.4 (3.5-5.4)	10.0 (8.8-11.3)
Perceived harmfulness of cigarettes[d]			
Low	425 (6.7)	7.2 (4.4-9.9)	13.9 (10.6-17.2)
Moderate to high	5577 (93.3)	3.6 (3.0-4.3)	10.3 (9.4-11.3)
Health insurance status			
None	1267 (21.3)	4.3 (2.8-5.8)	11.1 (9.3-13.0)
Yes	4746 (78.7)	3.8 (3.1-4.4)	10.4 (9.4-11.4)
Externalizing mental health symptoms			
Low	4149 (70.5)	2.9 (2.2-3.5)	9.2 (8.2-10.3)
Moderate	1531 (24.7)	6.2 (4.6-7.7)	13.3 (11.3-15.3)
High	333 (4.8)	6.8 (3.8-9.7)	16.1 (12.2-20.1)
Internalizing mental health symptoms			
Low	2949 (51.5)	3.3 (2.5-4.0)	8.9 (7.7-10.0)
Moderate	1435 (23.5)	3.4 (2.3-4.5)	11.1 (9.4-12.7)
High	1629 (25.0)	5.6 (4.0-7.1)	13.5 (11.4-15.7)
Existence of smoking-related disease			
No	5604 (94.5)	3.9 (3.3-4.6)	10.2 (9.3-11.1)
Yes	409 (5.5)	2.6 (1.0-4.3)	16.9 (12.3-21.4)

Table 2. Abstinence Outcomes Among US Smokers in 2021 by ENDS Use Status in 2017[a]

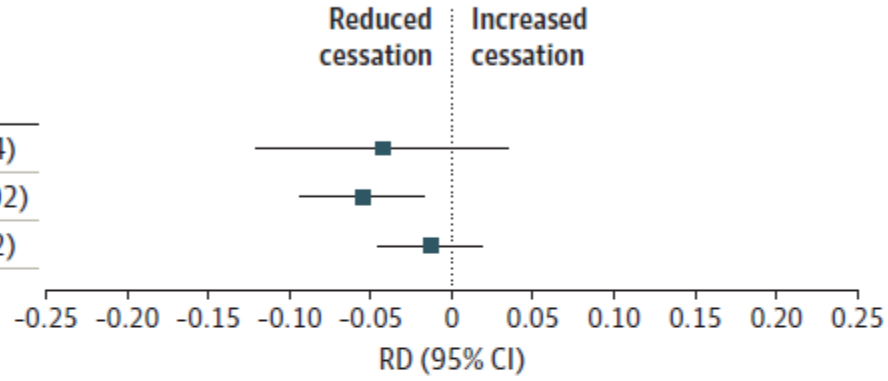
Status	ENDS use in 2017 based on wave 4 baseline frequency of use, No. (weighted %)	≥12 Months' abstinence in 2021 (wave 6), weighted % (95% CI)[b]	
		Abstinence from cigarettes	Abstinence from both cigarettes and ENDS
No use	5070 (85.6)	14.3 (13.0-15.5)	11.7 (10.5-12.8)
Nondaily vaping	715 (10.6)	12.6 (9.8-15.4)	7.1 (4.9-9.3)
Daily vaping	228 (3.9)	20.9 (15.0-26.8)	7.1 (3.2-11.0)

▶ e-cigarette use **was not** associated with increased future smoking cessation.

Figure 2. Estimated Differences in Abstinence Rates Between US Smokers Who Vape and Their Matched Controls Who Do Not Vape for Daily Vaping, Nondaily Vaping, and Any Vaping (Daily or Nondaily)

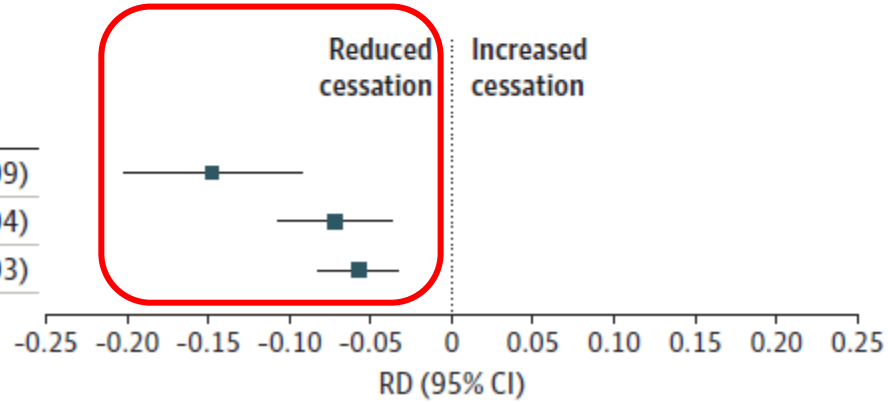
A Cigarette abstinence ≥12 mo at wave 6

Matching	RD (95% CI)
Daily ENDS vs no ENDS use	-0.04 (-0.12 to 0.04)
Nondaily ENDS vs no ENDS use	-0.05 (-0.09 to -0.02)
Any ENDS vs no ENDS use	-0.01 (-0.04 to 0.02)



B Cigarette and ENDS abstinence ≥12 mo at wave 6

Matching	RD (95% CI)
Daily ENDS vs no ENDS use	-0.15 (-0.20 to -0.09)
Nondaily ENDS vs no ENDS use	-0.07 (-0.11 to -0.04)
Any ENDS vs no ENDS use	-0.06 (-0.08 to -0.03)



Contents

Effects of Vaccination on Acute Exacerbation of Chronic Obstructive Pulmonary Disease: A Nationwide Population-Based Cohort Study

Sang Hyuk Kim[1,2,*], Hyun Lee[3,*], Min Ji Kim[4,5], Min Gu Kang[4,5], Jong Seung Kim[4,5,6], Jong Geol Jang[7], Youlim Kim[8], Hyeon-Kyoung Koo[9], Chin Kook Rhee[10], Kyung Hoon Min[2], Yong Il Hwang[11], Deog Kyeom Kim[12], Yong Bum Park[13], Ji-Yong Moon[8] and on Behalf of the Korean COPD Study Group

- **P:** COPD patients by ICD-10 code from the Korean National Health Insurance System-severe acute respiratory syndrome coronavirus 2 (NHIS SARS-CoV-2) database between 2020 and 2021.
- **E:** COVID-19 vaccination (n=1,801)
- **C:** unvaccinated individuals with COPD (n=1,801), propensity score matched
- **O:** acute exacerbation of COPD (AECOPD)

Tuberc Respir Dis. 2025;88:526-534.

Figure 1. Flow chart of the study population. NHIS-SARS-CoV-2: National Health Insurance System-Severe Acute Respiratory Syndrome Coronavirus 2; COVID-19: coronavirus disease 2019; COPD: chronic obstructive pulmonary disease; PS: propensity score.

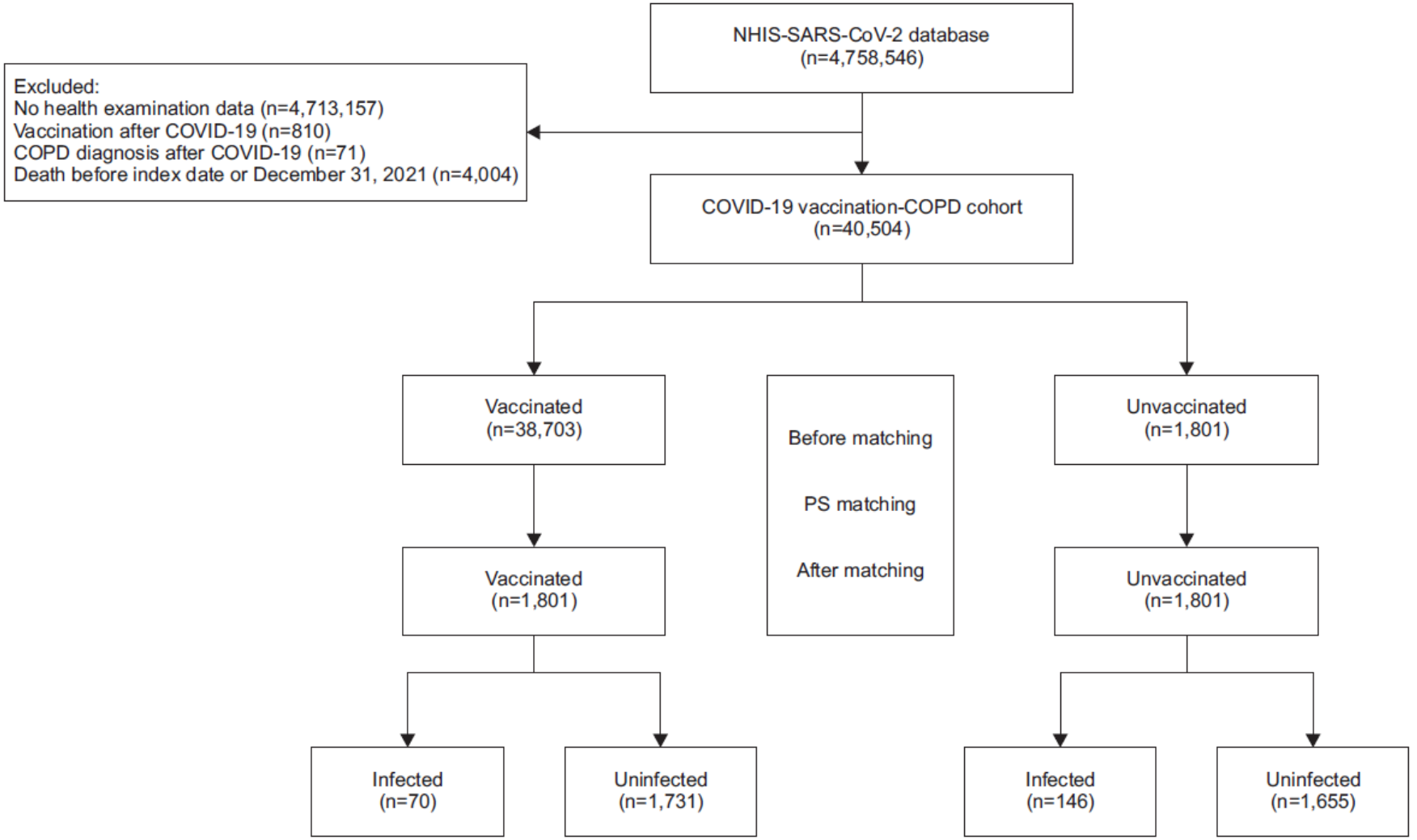


Table 1. Baseline characteristics of the study population (step 1)

Characteristic	Vaccinated (n=1,801)	Unvaccinated (n=1,801)	SMD
Alcohol consumption			
None	1,450 (80.5)	1,370 (76.1)	0.112
1–2 times	195 (10.8)	233 (12.9)	
3–4 times	86 (4.8)	117 (6.5)	
Almost every day	70 (3.9)	81 (4.5)	
Economic status			0.090
Low	532 (29.5)	468 (26.0)	
Middle	775 (43.0)	781 (43.4)	
High	494 (27.4)	552 (30.6)	
Residential area			
Rural areas	278 (15.4)	284 (15.8)	0.016
Mid-size and small cities	496 (27.5)	504 (28.0)	
Metropolitan cities	1,027 (57.0)	1,013 (56.2)	
Regular physical activity	406 (22.5)	439 (24.4)	0.043
One or more severe exacerbations in the previous year	456 (25.3)	350 (19.4)	0.142
Comorbidities			
Hypertension	687 (38.1)	739 (41.0)	0.059
Diabetes mellitus	405 (22.5)	424 (23.5)	0.025
CKD	78 (4.3)	90 (5.0)	0.052
Dyslipidemia	235 (13.0)	278 (15.4)	0.068
Asthma	752 (41.8)	732 (40.6)	0.023

Table 2. Risk of AECOPD based on COVID-19 vaccination status

COVID-19 vaccination	Number	Number of AECOPD	AECOPD, /10,000 population	HR (95% CI)
No	1,801	144	3,410	Reference
Yes	1,801	73	1,683	0.55 (0.41–0.72)

AECOPD: acute exacerbation of chronic obstructive pulmonary disease; COVID-19: coronavirus disease 2019; HR: hazard ratio; CI: confidence interval.

Figure 2. Kaplan-Meier curves for acute exacerbation of chronic obstructive pulmonary disease (AECOPD) based on coronavirus disease 2019 (COVID-19) vaccination status.

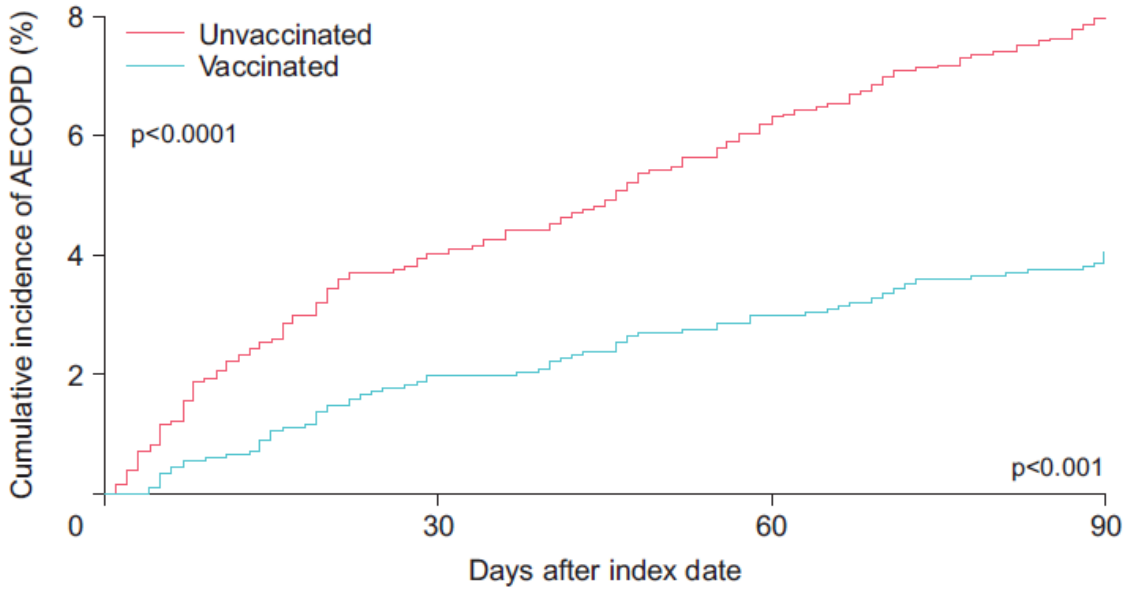


Table 3. *Post hoc* analysis for risk of AECOPD based on COVID-19 status

Population	COVID-19	Number	Number of AECOPD	AECOPD, /10,000 population	HR (95% CI)	Adjusted HR (95% CI)
Vaccinated	No	1,731	70	1,679	Reference	Reference
	Yes	70	3	1,781	1.06 (0.33–3.36)	1.35 (0.42–4.36)
Unvaccinated	No	1,655	124	3,190	Reference	Reference
	Yes	146	20	5,966	1.86 (1.16–2.98)	2.06 (1.28–3.33)

AECOPD: acute exacerbation of chronic obstructive pulmonary disease; COVID-19: coronavirus disease 2019; HR: hazard ratio; CI: confidence interval.

Contents

- Smoking cessation
- Vaccination
- **Nutrition and physical activity**
- Pulmonary rehabilitation
- Long-term oxygen therapy
- Noninvasive positive pressure ventilation
- Surgical and bronchoscopic intervention
- Telemedicine in non-pharmacologic treatment

Original research

Adherence to the EAT-Lancet diet, plasma proteomics and the risk of chronic obstructive pulmonary disease

Xujia Lu,[1] Yalong Pei,[1] Yang Geng,[1] Yulong Fan,[1] Xinmei Lu,[1] Lan Jiang,[1] Yan Borné,[2] Chaofu Ke [1]

- **P:** 202,340 participants free of COPD at baseline from the UK Biobank.
- **E:** the adherence to EAT-Lancet diet (encourages intake of vegetables, fruits, whole grains and nuts, moderate amounts of seafood and poultry and strictly limits the intake of red meat, added sugar and saturated fat)
- **C:** the lowest adherence group determined by 4 different diet indices (the Willett score, the Knuppel score, the Stubbendorff score and the Kesse-Guyot score).
- **O:** the risk of incident COPD and the plasma proteins potentially underlying the association of EAT-Lancet diet and COPD.

Lu X, et al. Thorax 2025;**0**:1–10.

Table 1 Baseline characteristics of the study participants according to categories of the Willett EAT-Lancet index

Characteristics	Total	Categories of the Willett EAT-Lancet index				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
N	202 340	40 470	40 466	40 468	40 468	40 468
Age (years)	57 (50–62)	56 (48–62)	57 (49–63)	57 (50–63)	58 (51–63)	58 (51–63)
Sex (male, %)	90 354 (44.65)	22 989 (56.81)	19 821 (48.98)	17 999 (44.48)	16 057 (39.68)	13 488 (33.33)
Ethnic (%)						
White	193 191 (95.48)	38 695 (95.61)	38 791 (95.86)	38 732 (95.71)	38 674 (95.57)	38 299 (94.64)
Mixed	1193 (0.59)	264 (0.65)	224 (0.55)	217 (0.54)	218 (0.54)	270 (0.67)
Asian or British	2772 (1.37)	458 (1.13)	445 (1.10)	555 (1.37)	602 (1.49)	712 (1.76)
Black or black British	2436 (1.20)	581 (1.44)	511 (1.26)	422 (1.04)	436 (1.08)	486 (1.20)
Other	2006 (0.99)	307 (0.76)	363 (0.90)	388 (0.96)	401 (0.99)	547 (1.35)
Townsend score	−2.33 (−3.74 to 0.03)	−2.23 (−3.67 to 0.25)	−2.38 (−3.75 to −0.085)	−2.39 (−3.77 to −0.12)	−2.40 (−3.78 to −0.12)	−2.23 (−3.70 to 0.23)
Smoking status (%)						
Never smoked	115 107 (56.89)	21 261 (52.54)	22 700 (56.10)	23 364 (57.73)	23 835 (58.90)	23 947 (59.18)
People who formerly smoked	71 274 (35.22)	14 069 (34.76)	14 282 (35.29)	14 234 (35.17)	14 205 (35.10)	14 484 (35.79)
People who currently smoke	15 424 (7.62)	5012 (12.38)	3368 (8.32)	2765 (6.83)	2322 (5.74)	1957 (4.84)
Passive smoking exposure (%)	54 639 (27.00)	10 428 (25.77)	10 898 (26.93)	11 060 (27.33)	11 260 (27.82)	10 993 (27.16)
Alcohol intake (%)						
Never	12 558 (6.21)	2437 (6.02)	2549 (6.30)	2404 (5.94)	2407 (5.95)	2761 (6.82)
Special occasions only	19 901 (9.84)	4003 (9.89)	3913 (9.67)	3955 (9.77)	3837 (9.48)	4193 (10.36)
One to three times a month	22 291 (11.02)	4601 (11.37)	4463 (11.03)	4417 (10.91)	4384 (10.83)	4426 (10.94)
Once or twice a week	50 389 (24.90)	10 125 (25.02)	10 216 (25.25)	10 259 (25.35)	9914 (24.50)	9875 (24.40)
Three or four times a week	50 803 (25.11)	9529 (23.55)	10 045 (24.82)	10 161 (25.11)	10 638 (26.29)	10 430 (25.77)
Daily or almost daily	46 232 (22.85)	9729 (24.04)	9245 (22.85)	9241 (22.84)	9257 (22.87)	8760 (21.65)
Physical activity (%)						
None	2821 (1.39)	909 (2.25)	626 (1.55)	524 (1.29)	432 (1.07)	330 (0.82)
Low	28 365 (14.02)	6811 (16.83)	6105 (15.09)	5711 (14.11)	5215 (12.89)	4523 (11.18)
Moderate	91 416 (45.18)	16 998 (42.00)	17 880 (44.19)	18 458 (45.61)	18 972 (46.88)	19 108 (47.22)
High	48 985 (24.21)	9000 (22.24)	9430 (23.30)	9563 (23.63)	9903 (24.47)	11 089 (27.40)
Body mass index (kg/m^2)	26.23 (23.73–29.27)	27.16 (24.59–30.35)	26.68 (24.15–29.73)	26.23 (23.83–29.29)	25.91 (23.51–28.87)	25.15 (22.88–27.97)
Total energy intake (kcal/day)	1995 (1669–2368)	2089 (1729–2508)	2020 (1684–2395)	1988 (1667–2350)	1970 (1659–2322)	1924 (1619–2271)
$PM_{2.5}$ (μg/m^3)	9.94 (9.28–10.42)	9.95 (9.32–10.41)	9.92 (9.27–10.41)	9.93 (9.27–10.40)	9.92 (9.25–10.42)	9.97 (9.30–10.48)
PM_{10} (μg/m^3)	19.11 (17.92–20.46)	19.09 (17.95–20.33)	19.06 (17.90–20.34)	19.08 (17.90–20.41)	19.10 (17.88–20.49)	19.17 (17.95–20.76)
NO_2 (μg/m^3)	28.00 (22.62–34.07)	27.86 (22.82–33.56)	27.75 (22.55–33.47)	27.88 (22.52–33.72)	27.92 (22.37–34.18)	28.74 (22.82–35.57)
NO_x (μg/m^3)	41.92 (33.79–49.76)	42.04 (34.22–49.36)	41.60 (33.61–49.20)	41.70 (33.64–49.48)	41.71 (33.44–49.82)	42.59 (34.05–51.02)

Data were presented as frequency (%) or median (P_{25}-P_{75}).
NO_2, nitrogen dioxide; NO_x, nitrogen oxides; PM_{10}, particulate matter 10; $PM_{2.5}$, particulate matter 2.5.

HR 0.607 for incident COPD in the higher quintile of Willet index compared to the lowest quintile.

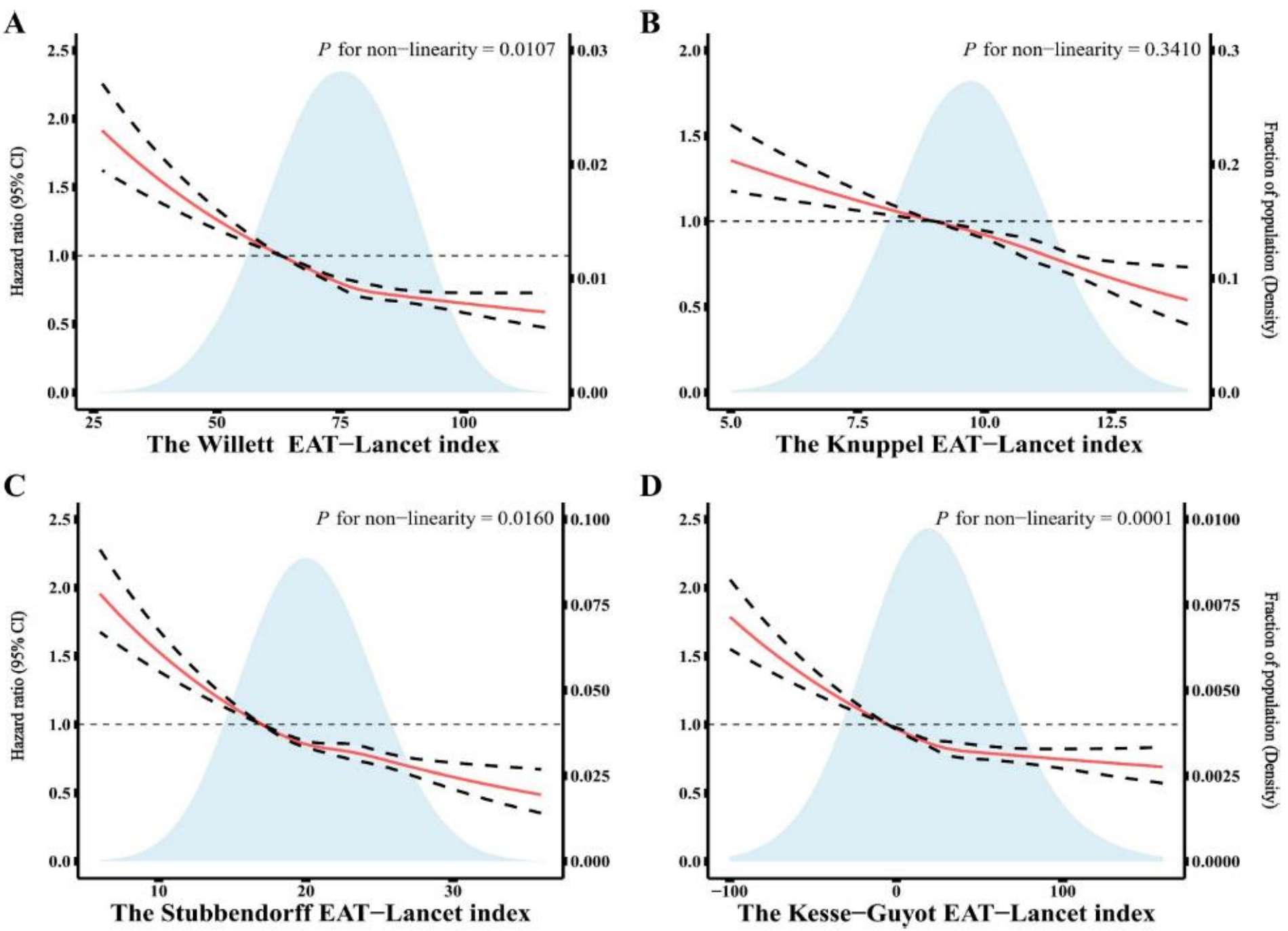


Figure 1 The dose-response associations between the Willett, Knuppel, Stubbendorff or Kesse-Guyot EAT-Lancet index and the risk of COPD.

Association of Nutritional Intake with Physical Activity and Handgrip Strength in Individuals with Airflow Limitation

I Re Heo, M.D.[1], Tae Hoon Kim, M.D, Ph.D.[1], Jong Hwan Jeong, M.D.[2], Manbong Heo, M.D.[2], Sun Mi Ju, M.D.[2], Jung-Wan Yoo, M.D.[2], Seung Jun Lee, M.D., Ph.D.[2], Yu Ji Cho, M.D., Ph.D.[2], Yi Yeong Jeong, M.D., Ph.D.[2], Jong Deog Lee, M.D., Ph.D.[2] and Ho Cheol Kim, M.D., Ph.D.[1]

[1]Department of Internal Medicine, Gyeongsang National University Changwon Hospital, Gyeongsang National University College of Medicine, Changwon, [2]Department of Internal Medicine, Gyeongsang National University Hospital, Gyeongsang National University College of Medicine, Jinju, Republic of Korea

- **P:** 662 patients with airflow limitation was included among participants aged ≥40 years who underwent spirometry measurements in Korean National Health and Nutrition Examination Survey from 2014 to 2016.
- **E:** physical activity levels (active aerobic PA) and had grip strength (HGS)
- **C:** no active PA and low HGS
- **O:** difference in nutritional intake

Tuberc Respir Dis. 2025;88:120-129.

Table 1. Baseline characteristics of the participants

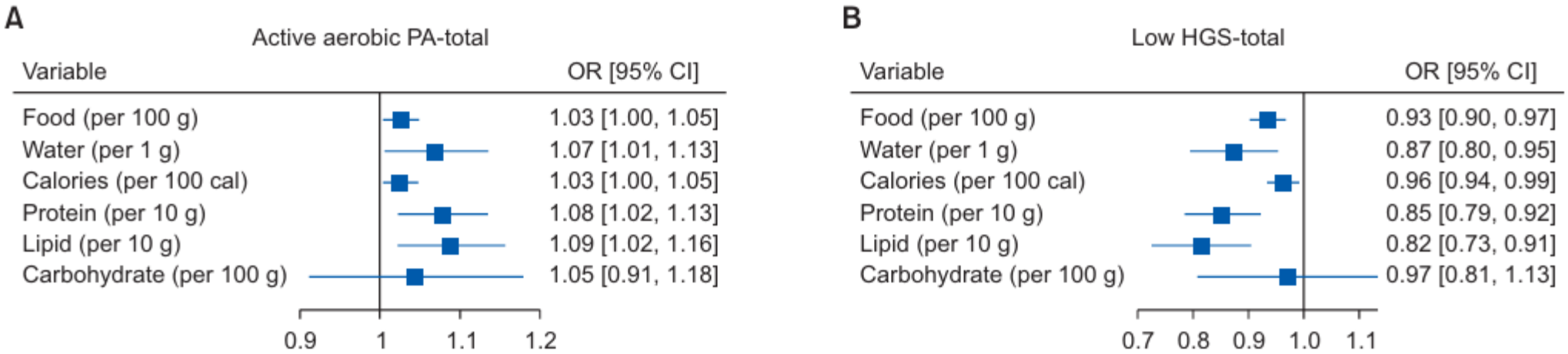
Characteristic	Total subjects	Active aerobic PA			Low HGS		
		Yes (n=299)	No (n=323)	p-value	Yes (n=113)	No (n=509)	p-value
Age, yr	66.8±9.19	65.9±9.15	67.7±9.16	0.013	72.8±6.73	65.5±9.24	0.000
Male sex	456 (73.3)	232 (77.6)	224 (69.3)	0.023	87 (70.2)	369 (72.5)	0.328
BMI, kg/m^2	23.8±2.99	23.6±2.76	24.0±3.19	0.065	23.2±2.99	24.0±2.98	0.015
Current smoker	158 (25.4)	76 (25.5)	81 (25.5)	0.993	20 (17.6)	138 (25.5)	0.114
Alcohol ingestion (n=616)	332 (53.4)	176 (53.0)	156 (47.0)	0.013	42 (37.8)	290 (57.4)	0.000
Pulmonary function test							
FEV_1, L	2.2±0.62	2.3±0.60	2.1±0.63	0.001	1.94±0.50	2.27±0.63	0.000
FEV_1, % predicted	77.9±16.17	77.9±15.99	77.9±16.36	0.972	77.2±17.20	78.0±15.94	0.621
FEV_1/FVC, %	62.9±6.73	62.7±6.90	63.0±6.49	0.502	61.6±6.97	63.1±6.65	0.030
GOLD stage III/IV	32 (5.1)	16 (5.4)	16 (5.0)	0.499	7 (6.2)	25 (4.9)	0.186
Underlying disease							
Hypertension	273 (43.9)	126 (42.1)	147 (45.5)	0.372	56 (49.6)	217 (42.6)	0.007
Diabetes	102 (16.4)	42 (14.0)	60 (18.6)	0.192	15 (13.3)	87 (17.1)	0.543
Arthritis	93 (15.0)	46 (15.4)	48 (14.6)	0.590	21 (18.6)	72 (14.1)	0.433
Ischemic heart disease	29 (4.7)	10 (3.3)	19 (5.9)	0.055	6 (5.3)	23 (4.5)	0.603
Stroke	16 (2.5)	7 (2.3)	9 (2.8)	0.851	1 (0.9)	15 (2.9)	0.437
Pulmonary TB history	62 (10)	27 (9.0)	35 (10.8)	0.453	14 (12.4)	48 (9.4)	0.342
Laboratory Finding (n=596)							
Glucose, mg/dL	105.9±23.89	105.1±21.51	106.7±25.90	0.415	103.3±20.27	106.5±24.60	0.213
Cholesterol (total), mg/dL	185.4±36.00	187.6±36.78	183.5±35.22	0.171	186.1±42.00	185.1±34.58	0.694
Hb, g/dL	14.3±1.42	14.5±1.32	14.1±1.49	0.008	14.20±1.45	14.3±1.41	0.292
BUN, mg/dL	16.2±4.55	15.9±4.49	16.5±4.59	0.675	16.1±4.26	17.1±5.62	0.070
Creatinine, mg/dL	0.91±0.21	0.91±0.22	0.90±0.21	0.092	0.93±0.27	0.90±0.20	0.311
Weight loss over a year	85 (13.1)	41 (13.7)	42 (13.0)	0.785	18 (15.9)	65 (12.8)	0.492
EQ-5D index	0.92±0.12	0.94±0.09	0.91±0.13	0.001	0.93±0.10	0.88±0.16	0.002
PHQ-9 score (n=615)	2.15±3.49	2.15±3.53	2.15±3.45	0.997	2.09±3.42	2.56±3.95	0.360
Physical activity							
Activity limitation	61 (9.8)	24 (8.0)	37 (11.5)	0.151	17 (15.0)	44 (8.6)	0.039
Vigorous activity in the workplace	12 (1.9)	11 (3.7)	1 (0.3)	0.002	0	12 (2.4)	0.137
Moderate activity in the workplace	53 (8.5)	47 (15.7)	6 (1.9)	0.000	8 (7.1)	45 (8.8)	0.729
Vigorous activity for leisure	52 (8.4)	47 (15.7)	5 (1.5)	0.000	1 (0.9)	51 (10.0)	0.000
Moderate activity for leisure	133 (21.4)	116 (38.8)	17 (5.3)	0.000	11 (9.7)	122 (24.0)	0.001
Aerobic physical activity in a week	299 (48.1)	-	-	-	40 (35.4)	259 (50.9)	0.003
HGS (sum of right and left), kg	61.61±17.09	64.76±16.05	58.7±17.53	0.000	45.1±11.97	65.28±15.86	0.000
HGS (dominant hand), kg	31.4±8.99	33.1±8.4	29.8±9.1	0.000	22.3±5.8	33.4±8.28	0.000
HGS/BMI	2.60±0.73	2.76±0.69	2.46±0.74	0.000	1.96±0.56	2.74±0.69	0.000
Low HGS (<28.6 in men, <16.4 kg in women)	113 (18.2)	40 (13.4)	73 (22.6)	0.003	-	-	-

Table 2. Comparison of nutritional intake according to aerobic physical activity and handgrip strength

Variable	Total subjects	Active aerobic PA			Low HGS		
		Yes (n=299)	No (n=323)	p-value	Yes (n=113)	No (n=509)	p-value
Food total, g	1,501.9±749.93	1,576.9±732.83	1,432.5±759.96	0.016	1,253.3±686.5	1,557.1±752.4	0.000
Water, g	1,051.0±649.72	1,112.7±634.11	993.8±659.68	0.022	833.5±580.8	1,092.3±654.8	0.000
Calories, kcal	1,953.1±753.84	2,026.8±769.09	1,884.9±734.06	0.019	1,793.3±795.4	1,988.6±740.4	0.018
Protein, g	64.7±31.67	68.6±31.43	61.2±31.51	0.003	54.2±29.4	67.14±31.69	0.000
Lipid, g	34.6±27.01	37.7±27.85	31.6±25.92	0.005	26.23±30.69	36.4±25.95	0.001
Carbohydrate, g	320.1±124.25	324.9±124.46	318.2±122.81	0.496	317.8±138.5	322.2±120.0	0.729

Values are presented as mean±standard deviation.
PA: physical activity; HGS: handgrip strength.

Figure 3. Forest plots illustrating the relationship between nutritional intake and physical activity (PA) and handgrip strength (HGS). (A) The association of nutritional intake with active aerobic PA), where odds ratios (ORs) above 1 indicate a positive correlation with increased activity levels. (B) The correlation of nutritional intake with low HGS, with ORs below 1 suggesting a negative association, meaning higher nutritional intake is associated with a lower incidence of low HGS. Each plot provides 95% confidence intervals (CIs) for a clearer statistical interpretation.



Contents

- Smoking cessation
- Vaccination
- Nutrition and physical activity
- **Pulmonary rehabilitation**
- Long-term oxygen therapy
- Noninvasive positive pressure ventilation
- Surgical and bronchoscopic intervention
- Telemedicine in non-pharmacologic treatment

Multidisciplinary, non-pharmacological breathlessness intervention service for patients with moderately severe to severe COPD: a randomised controlled trial

Tracy A Smith ,[1,2] Mary M Roberts,[1,2,3,4] Tim Luckett ,[4] Jin-Gun Cho,[1,2,3] Ester Klimkeit,[1] Heather Stephenson,[1] Nicola McCaffery,[5] Adrienne Kirby,[6] John R Wheatley[1,2,3]

- **P:** 113 participants with moderate/severe COPD (FEV_1/FVC <0.70 and FEV_1 ≤60% pred.) and mMRC score ≥2
- **I:** Breathlessness intervention services (BIS), an 8-week intervention involving breathing techniques, handheld fan use, exercise, energy conservation, dietetic advice. (n=54)
- **C:** 8-week wait-list control group (n=59)
- **O:** Change in patient reported dyspnea scale, Chronic Respiratory Questionnaire (CRQ) Mastery of breathlessness subscale.

Smith TA, et al. Thorax 2025;0:1–10

Table 1 Baseline demographic and clinical variables

Characteristic	Value	Breathlessness intervention, n=54	Wait-list control, n=59	Total, n=113
Age (years)		71.8±7.9	70.1±9.0	70.9±8.5
Sex	Female	21 (39%)	36 (61%)	57 (50%)
	Male	33 (61%)	23 (39%)	56 (50%)
Living arrangements	Aged care facility	1 (2%)	·	1 (1%)
	Alone	16 (30%)	17 (29%)	33 (29%)
	With a carer	37 (69%)	42 (71%)	79 (70%)
Country of birth	Australia/New Zealand	44 (81%)	52 (88%)	96 (85%)
	Europe	9 (17%)	7 (12%)	16 (14%)
	Asia	1 (1%)	0 (0)%)	1 (1%)
Aboriginal or Torres Strait Islander		1 (1.8%)	2 (3.3%)	3 (2.6%)
Had not completed pulmonary rehabilitation in the previous 12 months		38 (70%)	40 (68%)	78 (69%)
Prescribed supplementary oxygen ≥16 hours/day		8 (15%)	13 (22%)	21 (19%)
Smoking status	Never smokers	2 (4%)	1 (1.7%)	3 (3%)
	Ex-smokers	39 (72%)	47 (78%)	84 (74%)
	Current smokers	13 (24%)	11 (20%)	24 (21%)
Pack years		59.1±40.3	59.5±32.8	59.3±36.4
COPD assessments				
Spirometry				
Mean FEV_1 (L)		54, 0.9±0.3	47, 0.8±0.3	0.8±0.3
Mean FEV_1 (% predicted)		54, 34.6±10.3	47, 33.4±14.2	33.7±12.2
Mean FVC (L)		54, 2.1±0.7	47, 2.1±0.9	2.1±0.8
Mean FVC (% predicted)		54 64.4±14.8	47, 66.4±22.5	65.0±18.2
Mean FEV_1:FVC (ratio)		54, 0.4±0.1	47, 0.4±0.2	0.4±0.1
FEV_1 (% predicted) group				
	50–60%	4 (7)	7 (12%)	11 (10%)
	30–49%	31 (57%)	27 (46%)	58 (51%)
	<30%	19 (35%)	25 (42%)	44 (39%)
Patient-reported exacerbations requiring either prednisone or antibiotics during 8 weeks		32 (59%)	27 (46%)	59 (52%)

Characteristic	Value	Breathlessness intervention, n=54	Wait-list control, n=59	Total, n=113
Outcome data				
CRQ				
Mastery		4.2±1.3	4.2±1.4	4.2±1.4
Emotion		4.1±1.3	4.2±1.3	4.2±1.3
Fatigue		3.2±1.0	3.2±1.0	3.2±1.0
Dyspnoea		2.9±0.9	2.8±0.9	2.8±0.9
CAT total		23.0 (19.0–26.0)	25.0 (21.0–28.0)	23.0 (19.0–28.0)
mMRC Breathlessness Score		3.0 (3.0–4.0)	4.0 (3.0–4.0)	3.0 (3.0–4.0)
Number of participants reporting any breathlessness at rest		5 (10%)	5 (8%)	10 (9%)
Breathlessness (NRS) on exertion				
Intensity		7.4±1.6	7.6±1.7	7.5±1.6
Unpleasantness		8.0±1.8	8.1±1.8	8.1±1.8
Confidence in managing breathlessness		6.2±2.3	6.5±2.2	6.4±2.2
Median number of exacerbations in the 12 months prior to randomisation		5.0 (4.0–5.0)	5.0 (3.0–5.0)	5.0 (3.0–5.0)
HADS anxiety		7.8±4.4	8.3±4.9	8.1±4.6
HADS depression		7.0±3.8	6.9±3.7	7.0±3.7
EQ-5D-5L VAS		59.9±20.6	56.7±20.2	58.2±20.4
Mean EQ-5D-5L Index		0.5±0.3	0.5±0.3	0.5±0.3

Data are mean±SD, median (IQ range) or N (% total). All outcome data scales are in arbitrary units.
CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease; CRQ, Chronic Respiratory Questionnaire; EQ-5D-5L, EuroQol-5 Dimensions-5 Levels; FEV_1, forced expiratory volume in 1 s; FVC, forced vital capacity; HADS, Hospital Anxiety and Depression Scale; mMRC, modified Medical Research Council; NRS, Numerical Rating Scale; VAS, Visual Analog Scale.

Table 2 Effect of breathlessness intervention on the change (week 0 and week 8), adjusted for baseline, in continuous secondary outcomes

	Mean change (SD)			
Change in	**Breathlessness intervention**	**Wait-list control**	**Difference (95% CI)**	**Adjusted p value**
HADS anxiety	−0.4 (2.5)	0.1 (3.7)	−0.7 (−1.8 to 0.4)	0.240
HADS depression	−0.1 (3.0)	0.9 (2.8)	−1.0 (−2.1 to 0.0)	0.083
CAT total	−0.3 (6.0)	0.2 (5.0)	−1.2 (−3.1 to 0.7)	0.321
Breathlessness on exertion NRS intensity	−0.3 (1.8)	0.3 (1.9)	−0.8 (−1.4 to 0.2)	0.013
Breathlessness on exertion NRS unpleasantness	−0.9 (2.0)	0.2 (2.0)	−1.2 (−1.7 to 0.6)	0.001
Confidence in managing breathlessness NRS	0.8 (2.6)	0.1 (2.4)	0.5 (−0.2, 1.3)	0.196
EQ-5D-5L	0.045 (0.2)	−0.028 (0.3)	0.1 (0.0 to 0.1)	0.090

Statistical comparison undertaken using ANCOVA.
CAT, COPD assessment test; EQ-5D-5L, EuroQol-5 Dimensions-5 Levels; HA

Table 3 Proportion of participants achieving an improvement at least as large as the MCID

	N (%)			
Improvement as large as MCID	**Breathlessness intervention**	**Wait-list control**	**Absolute difference (95% CI)**	**Relative difference (95% CI)**
CRQ Mastery	15 (28%)	8 (14%)	14.2 (−5.4 to 33.8)	2.05 (0.94 to 4.44)
CRQ Fatigue	18 (33%)	10 (17%)	16.4 (−2.8 to 35.6)	1.97 (1.00 to 3.88)
CRQ Emotion	10 (19%)	8 (14%)	5.0 (−14.3 to 24.2)	1.37 (0.58 to 3.21)
CRQ Dyspnoea	13 (24%)	6 (10%)	13.9 (−6.3 to 34.1)	2.37 (0.97 to 5.79)
HADS anxiety	16 (30%)	19 (32%)	−2.6 (-20.9 to 15.8)	0.92 (0.53 to 1.60)
HADS depression	13 (24%)	10 (17%)	7.1 (−12.0 to 26.2)	1.42 (0.68 to 2.97)
CAT total	22 (41%)	21 (36%)	4.5 (−14.0 to 23.1)	1.13 (0.70 to 1.80)
mMRC Breathlessness Score	8 (15%)	4 (7%)	8.0 (−12.7 to 28.7)	2.19 (0.70 to 6.85)
NRS breathlessness intensity at rest	1 (50%)	1 (33%)	16.7 (−70.8 to 104.1)	1.50 (0.18 to 12.46)
NRS breathlessness unpleasantness at rest	1 (50%)	1 (33%)	16.7 (−70.8 to 104.1)	1.50 (0.18 to 12.46)
NRS breathlessness intensity on exertion	19 (35%)	18 (31%)	4.7 (−13.9 to 23.2)	1.15 (0.68 to 1.96)
NRS breathlessness unpleasantness on exertion	29 (54%)	17 (29%)	24.9 (6.9 to 42.9)	1.86 (1.16 to 2.99)
NRS confidence	29 (54%)	25 (42%)	11.3 (−7.0 to 29.7)	1.27 (0.86 to 1.87)

CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease; CRQ, Chronic Respiratory Questionnaire; HADS, Hospital Anxiety and Depression Scale; MCID, minimal clinically important difference; mMRC, modified Medical Research Council; NRS, Numerical Rating Scale.

Short-term effects of home-based pulmonary rehabilitation during outpatient-managed exacerbations of COPD: a randomised controlled trial

Ana Machado,[1,2,3,4,5] Cíntia Dias,[1,2] Cátia Paixão ,[1,2,4] António Pedro Gonçalves,[6] Chris Burtin,[3,5] Alda Marques [1,2]

- **P:** Fifty participants with **outpatient-managed** exacerbated COPD
- **I:** 3-week home-based PR (n=24)
- **C:** usual care, pharmacotherapy alone (n=26)
- **O:** the impact of the disease assessed with the COPD assessment test (CAT)

Machado A, et al. Thorax 2025;80:218–226.

Table 1 Sociodemographic, anthropometric and general clinical characteristics of participants with an exacerbation of chronic obstructive pulmonary disease (n=50)

	Experimental group (n=24)	Control group (n=26)
Sex (male), n (%)	22 (91.7%)	17 (65.4%)
Age, years	72.5±9.8	67.1±11.1
Body mass index, kg/m^2	24.9±4.6	25±4
Lung function (stable)		
FEV$_1$, %predicted	48.7±15.3	46.4±17.5
FVC, %predicted	70.1±15.3	69.7±17.3
GOLD grade (stable), n (%)		
1	2 (8.3%)	0 (0%)
2	8 (33.3%)	10 (38.5%)
3	10 (41.7%)	11 (42.3%)
4	4 (16.7%)	5 (19.2%)
GOLD group (stable), n (%)		
A	3 (18.8%)	2 (13.3%)
B	6 (37.5%)	6 (40%)
E	7 (43.8%)	7 (46.7%)
Smoking status		
Never smoker	2 (8.3%)	2 (7.7%)
Current smoker	5 (20.8%)	13 (50%)
Former smoker	17 (70.8%)	11 (42.3%)
Pack-years	52.8±42.1	42.3±29.2
N° hospitalisations last year	0 (0; 0.5)	0 (0; 1)
N° hospitalisations due to ECOPD last year	0 (0; 0.5)	0 (0; 0)
N° ECOPD last year	1 (0; 1)	2 (1; 3)
Long-term oxygen therapy	2 (8.3%)	6 (23.1%)
Non-invasive ventilation	2 (8.3%)	5 (19.2%)
Charlson comorbidity index, total score	4.5 (4; 5)	4 (3; 5)
Comorbidities, n (%)		
Diabetes	5 (20.8%)	4 (15.4%)
Dyslipidaemia	12 (50%)	8 (30.8%)
Controlled arterial hypertension	15 (62.5%)	13 (50%)
Arrhythmia	4 (16.7%)	5 (19.2%)
Peripheral vascular disease	4 (16.7%)	5 (19.2%)
Heart failure	3 (12.5%)	1 (3.8%)
Other cardiovascular disease	7 (29.2%)	12 (46.2%)
Anxiety	2 (8.3%)	5 (19.2%)
Depression	2 (8.3%)	4 (15.4%)
Medication (stable), n (%)		
SABA	5 (20.8%)	6 (23.1%)
SAMA	4 (16.7%)	3 (11.5%)
LABA	2 (8.3%)	0 (0%)
LAMA	7 (29.2%)	3 (11.5%)
ICS	4 (16.7%)	3 (11.5%)
LABA+LAMA	10 (41.7%)	12 (46.2%)
Triple therapy	3 (12.5%)	7 (26.9%)
Medication (ECOPD), n (%)		
SABA	11 (45.8%)	16 (61.5%)
SAMA	10 (41.7%)	14 (53.8%)
Antibiotic	13 (54.2%)	16 (61.5%)
Oral corticosteroid	17 (70.8%)	19 (73.1%)
Mucolytic	7 (29.2%)	9 (34.6%)

Table 2 Baseline characteristics (primary and secondary outcomes) of participants with an exacerbation of chronic obstructive pulmonary disease (n=50)

	Experimental group (n=24)	Control group (n=26)
BPAAT, total score	0 (0; 0)	0 (0; 0)
mMRC, grade	3 (2; 3)	2 (2; 3)
CAT, total score	23.1±7.1	23.2±7.1
LCADL, total score	23 (17.5; 39)	24.5 (19; 39)
LCADL, % score	45.2 (35.9; 57,3)	39.3 (31.4; 56)
FACIT-F, total score	30 (22; 34)	25 (21; 34)
CASA-Q, score		
Cough symptoms	37.8±28.8	47.4±29.3
Cough impact	44.5±23.1	52.3±29.5
Sputum symptoms	29.2 (8.3; 58.3)	29.2 (16.7; 66.7)
Sputum impact	56.4±29.8	52.1±30.5
CIS-8, total score	44.5 (39; 50.5)	46 (38; 52)
Handgrip strength, kg	23.3±10.1	25.2±10.5
Handgrip strength, %pred	71.1±27.2	79.3±25
Biceps muscle strength, kgf	15±4.3	16.9±5
Biceps muscle strength, %pred	65.2±17.1	81.4±20.3
Quadriceps muscle strength, kgf	22±6	23.4±7.3
Quadriceps muscle strength, %pred	67±15.7	72±22.4
5-repetitions sit-to-stand test, s	12.4 (11; 17.3)	11.3 (7.7; 17.1)
SPPB, total score	9 (7.5; 10)	9 (8; 11)
1 min sit-to-stand test, repetitions	17.3±6	17.9±9.4
1 min sit-to-stand test, %pred	50 (41.4; 66.2)	49.3 (35.3; 64)
Chester step test, n° of steps	14 (6.5; 31.5)	30 (16; 42)

Table 3 Effects of a 3-week home-based pulmonary rehabilitation programme during exacerbations of chronic obstructive pulmonary disease (n=50)

	Experimental group (n=24)	Control group (n=26)	Group×Time interaction
	Mean Δ (95% CI)	Mean Δ (95% CI)	
BPAAT, total score	3.5 (2.7; 4.3)*	−0.4 (−1.2; 0.3)	**<0.001**
mMRC, grade	−0.5 (−0.8; −0.3)*	0 (−0.3; 0.3)	**0.006**
CAT, total score	−12.5 (−15.4; −9.5)*	−5.8 (−8.7; −3)*	**0.002**
LCADL, total score	−5.4 (−8.1; −2.7)*	0.1 (−2.5; 2.7)	**0.006**
LCADL, % score	−9.1 (−13.1; −5.2)*	0 (−3.8; 3.9)	**0.001**
FACIT-F, total score	11.2 (8.3; 14.1)*	3.4 (0.6; 6.2)	**0.001**
CASA-Q, score			
Cough symptoms	46.7 (33.4; 60)*	23.1 (10.3; 35.9)*	**0.006**
Cough impact	43.8 (32.2; 55.4)*	23.7 (12.5; 34.8)*	**0.047**
Sputum symptoms	46.5 (32.3; 60.8)*	31.1 (17.4; 44.8)*	0.081
Sputum impact	36.6 (23.6; 49.5)*	28.7 (16.2; 41.1)*	0.948
CIS-8, total score	−11.8 (−15.8; −7.8)*	−4.3 (−8.2; −0.5)	**0.003**
Handgrip strength, kg	2.1 (0.9; 3.3)*	−0.5 (−1.8; 0.7)	**0.003**
Handgrip strength, %pred	6.9 (3; 10.7)*	−1.4 (−5.4; 2.6)	**0.004**
Biceps muscle strength, kgf	2.3 (1.1; 3.5)*	−0.1 (−1.2; 1.1)	**0.004**
Biceps muscle strength, %pred	10.4 (5; 15.8)*	−0.5 (−6.1; 5)	**0.006**
Quadriceps muscle strength, kgf	3.9 (2; 5.9)*	−0.4 (−1.7; 0.9)	**<0.001**
Quadriceps muscle strength, %pred	12.4 (6.5; 18.2)*	−1.3 (−5.3; 2.8)	**<0.001**
5-repetitions sit-to-stand test, s	−2.6 (−5.1; −0.2)*	−0.4 (−2.7; 1.8)	**0.002**
SPPB, total score	1.4 (0.8; 2)*	0.6 (−0.1; 1.2)	**0.049**
1 min sit-to-stand test, repetitions	4.4 (2.5; 6.3)*	2 (0.3; 3.8)	0.061
1 min sit-to-stand test, %pred	13.7 (7.8; 19.7)*	7.1 (0.8; 13.4)	0.086
Chester step test, n° of steps	23.4 (6.2; 40.5)*	11.6 (1; 22.3)*	**0.047**
N° ECOPD-related unscheduled healthcare visits (at Post)	0 (0; 0)	0 (0; 2)	**0.025†**

Contents

- Smoking cessation
- Vaccination
- Nutrition and physical activity
- Pulmonary rehabilitation
- **Long-term oxygen therapy**
- Noninvasive positive pressure ventilation
- Surgical and bronchoscopic intervention
- Telemedicine in non-pharmacologic treatment

Optimised oxygenation improves functional capacity during daily activities in patients with COPD on long-term oxygen therapy: a randomised crossover trial

Linette Marie Kofod ,[1,2] Ejvind Frausing Hansen,[3] Barbara Christina Brocki,[4] Morten Tange Kristensen,[5,6] Nassim Bazeghi Roberts,[7] Elisabeth Westerdahl[8]

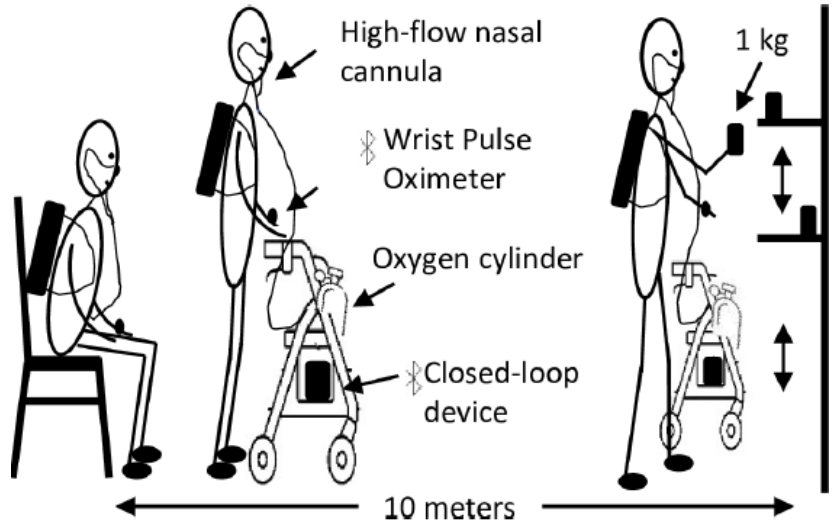


Figure 1 The GlittreADL test setup was identical in both arms. The patients carried a backpack, a pulse oximeter on the wrist and used a rollator. A high-flow nasal cannula was connected to the closed-loop device, which was attached to an oxygen cylinder. The patients rose from a chair, walked 10 m to a shelf, moved three 1 kg cartons, turned, walked back and sat down. This was repeated five times in each arm.

- **P:** Clinically stable COPD patients (n=31) who receive LTOT.

  (cross-over design, 20-min washout period)
- **I:** Oxygenation optimized using closed loop device, target SpO2 90-94%
- **C:** Fixed oxygen dose
- **O:** The patient's ability to perform ADL was assessed using the GlittreADL test

Kofod LM, et al. Thorax 2025;80:803–809

Table 1 Characteristics of the study patients with COPD on LTOT

Variables, n=31	
Gender, male/female, no.	17/14
Age, years	72.8±5.9
Body mass index, Kg/m^2	27.6±7.1
LTOT dose, fixed dose, L/min	1.6±1.0
SpO_2 at rest with LTOT, %	92.7±2.0
Borg CR10 dyspnoea at rest, 0–10	1.1±1.1
CAT score, 0–40	17.0±6.3
mMRC, 0–4, median score (IQR)	3.0 (3–3)
mMRC, 0/1/2/3/4, no.	0/1/5/20/5
GOLD classification A/B/E, no.	0/19/12
FEV_1, litre	0.9±0.4
FEV_1, % of predicted	36.7±12.7
FVC, litre	1.9±0.7
FVC, % of predicted	61±18
FEV_1/FVC, ratio	0.48±14
Hospital admissions the last year, no.	1.48±1.5
Smoking status, no. (%)	
Tobacco user	1 (3.2)
Former tobacco user	30 (96.8)
Pack years	52.9 (33.7)
Rollator dependent, no. (%)	18 (58.1)
Comorbidities, no. (%)	
None	3 (9.7)
Heart failure	10 (32.3)
Ischaemic heart disease	1 (3.2)
Diabetes	4 (12.9)
Osteoarthritis (hip or knee)	9 (29)
Osteoporosis	14 (45.2)

Table 2 Differences in outcomes between arms

Performance in the GlittreADL test, n=31				
Variables	**Fixed oxygen dose**	**Automated oxygen titration**	**Difference**	**P value**
Time to complete GlittreADL, seconds	427 (365–569)	409 (300–502)	38 (12–73)	<0.001
Dyspnoea, Borg CR10, score from 0 to 10	6 (4–8)	5 (3–7)	1 (0–2)	<0.001
Time within target SpO_2 during ADL test, %	18.7 (10.8–29.9)	49.2 (20.3–72.4)	21.4 (-3.2–52.6)	<0.001
Median SpO_2 during test %	86.6 (84.5–88.4)	91.0 (86.9–92.0)	3.4 (1.4–5.6)	<0.001
Oxygen flow, L/min	1.6±1.0	5.2±1.9	3.4±1.7	<0.001
Heart rate, bpm	97.6±14.9	93.7±13.5	2.1±8.3	0.06

Primary and secondary outcome measures during the GlittreADL test, when using usual fixed oxygen dose versus automated oxygen titration based on the peripheral oxygen satura
Target SpO_2: 90–94%. Data presented as median with (IQR) or mean±SD. Borg Dyspnoea Scale CR10 at the end of the test. SpO_2, oxygen flow and heart rate are presented as mean throughout the test (n=28 in these three values).
ADL, activities of daily living; bpm, beats per minute; L/min, litre per minutes.

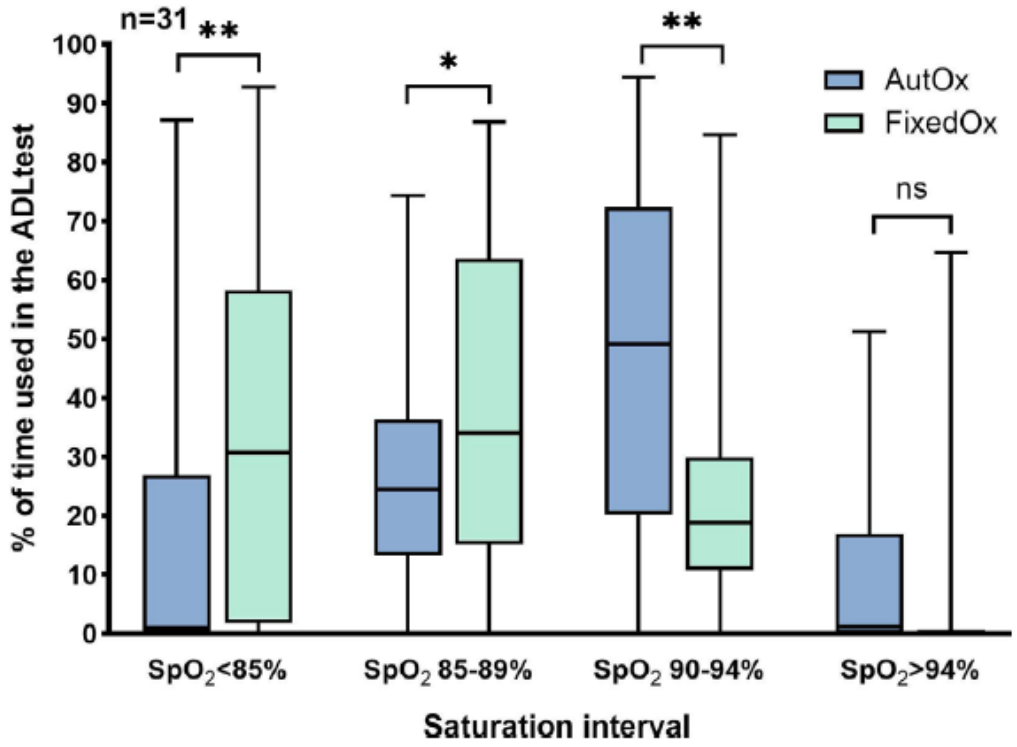


Figure 3 Percentage of time spent within saturation intervals.

Facial airflow enhances the benefits of exercise training in people with chronic lung disease: A randomized controlled trial

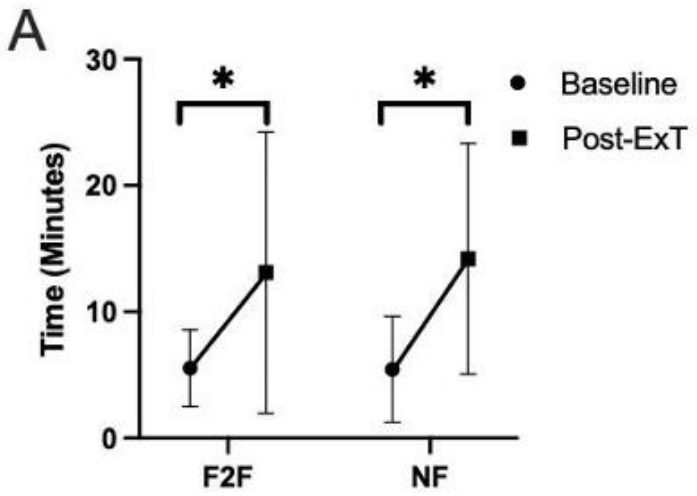
Rachelle Aucoin, Dan Nguyen, Bryan Ross, Jean Bourbeau, Hayley Lewthwaite, Magnus Ekström, Andreas von Leupoldt, Dennis Jensen

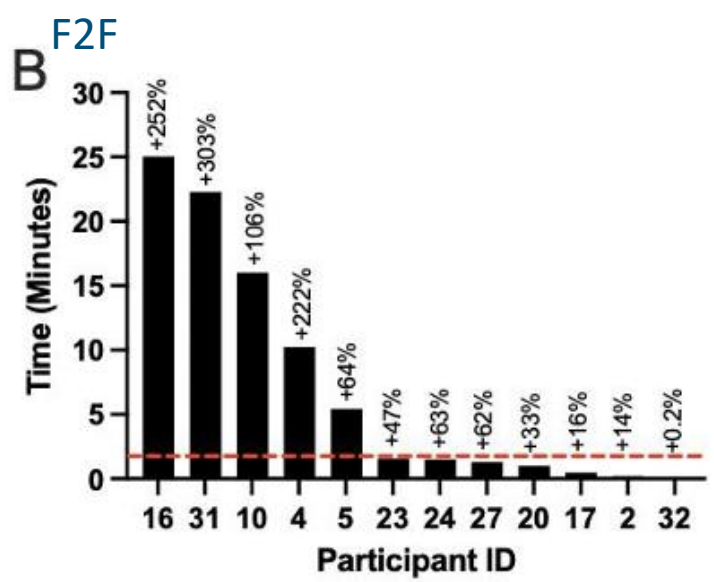
- **P:** 23 patients with COPD (n=19) or ILD (n=4)
- **I:** 5 weeks of thrice weekly supervised exercise training (ExT) with fan-to-face (F2F) therapy (facial airflow)
- **C:** Ext without fan
- **O:** baseline to post-ExT change in exercise endurance time (EET) and iso-time breathlessness intensity ratings assessed using constant work-rate cardiopulmonary treadmill exercise testing.

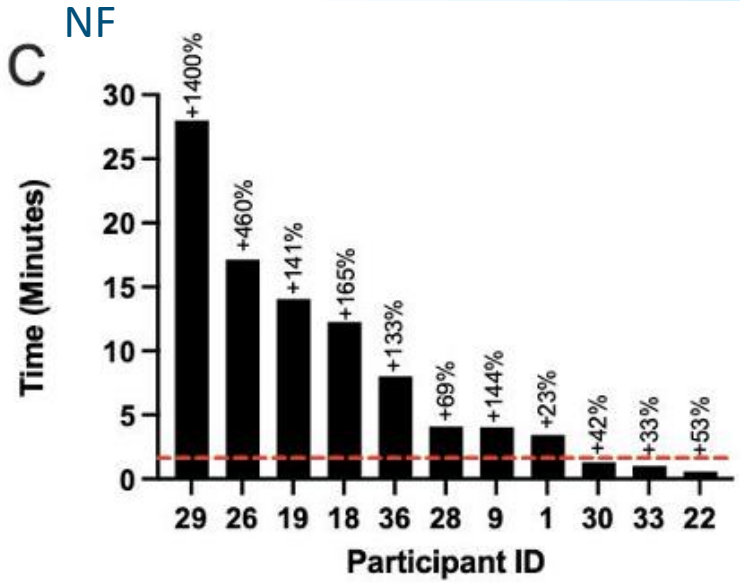
Eur Respir J. 2025; in press (https://doi.org/10.1183/13993003.01109-2025)

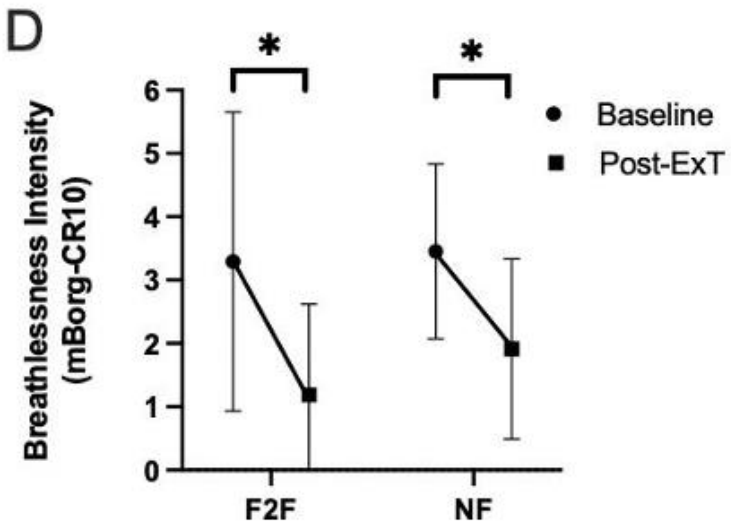
Table 1. Baseline characteristics of participants.

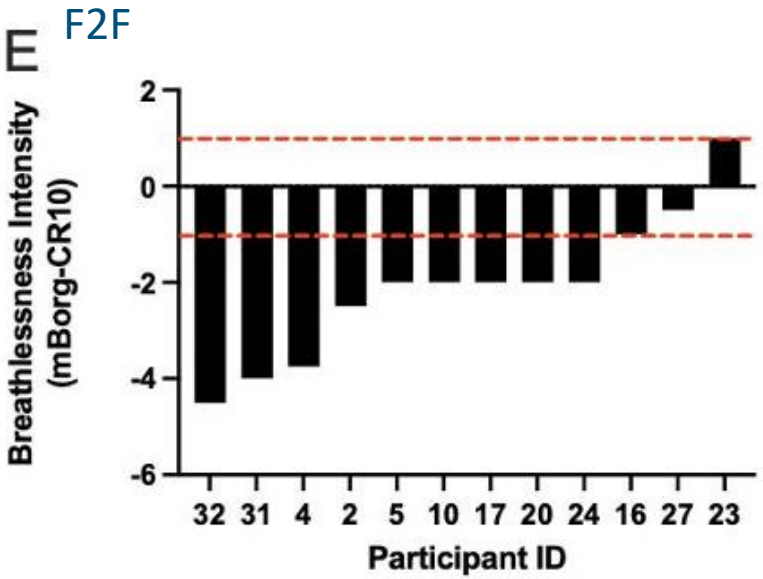
	F2F group (n=12)		NF group (n=11)	
Variables	**Value**	**% Predicted**	**Value**	**% Predicted**
LAMA	2 (16)	-	4 (36)	-
LABA + LAMA	6 (50)	-	5 (54)	-
ICS	2 (16)	-	3 (27)	-
LABA + ICS	3 (25)	-	7 (63)	-
LABA + LAMA + ICS	3 (25)	-	0 (0)	-
Anti-Fibrotic	0 (0)	-	1 (9)	-
Domiciliary Oxygen	1 (8)	-	1 (9)	-
Breathlessness and health status				
mMRC dyspnea score, 0-4	2.5 ± 1.4	-	1.7 ± 0.9	-
mMRC ≥ 2, n (%)	9 (75)	-	5 (45)	-
CAT total score, 0-40[#]	21.6 ± 11.1	-	15.9 ± 7.7	-
CAT ≥ 10, n (%)[#]	7 (58)	-	6 (54)	-
Baseline Dyspnea Index, 0-12	4.4 ± 1.9	-	6.3 ± 2.5	-
HADS Anxiety score, 0-21	8.0 ± 4.2	-	5.6 ± 3.4	-
HADS Depression score, 0-21	6.2 ± 4.7	-	4.1 ± 1.7	-
Post-bronchodilator lung function				
FEV_1/FVC	41.2 ± 14.9	-	58.0 ± 18.1*	-
FEV_1, L	1.1 ± 0.5	46 ± 22	1.5 ± 0.8	66 ± 26
Total Lung Capacity, L	6.3 ± 1.1	113 ± 19	5.3 ± 1.4	99 ± 18
Inspiratory Capacity, L	2.0 ± 0.6	75 ± 15	2.6 ± 0.8	81 ± 24
Residual Volume, L	3.5 ± 0.9	176 ± 56	2.6 ± 0.8*	139 ± 49

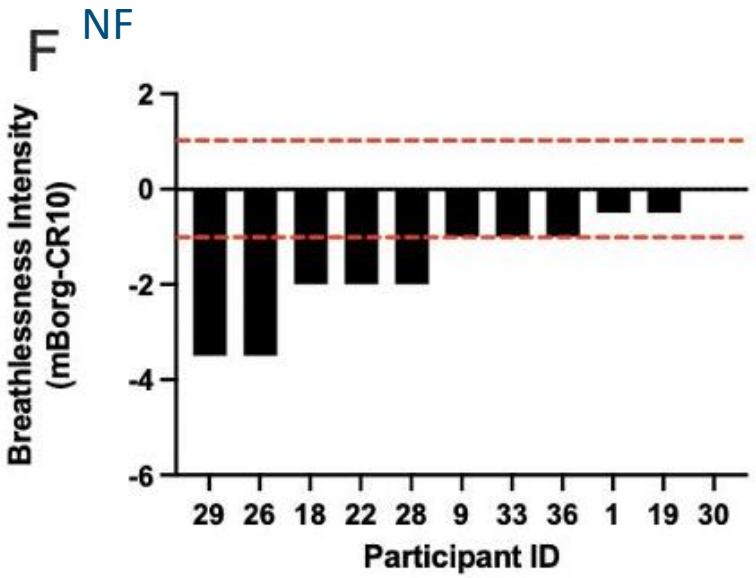

A
Time (Minutes)
30
20
10
0
*
*
Baseline
Post-ExT
F2F
NF


B
F2F
Time (Minutes)
+252%
+303%
+106%
+222%
+64%
+47%
+63%
+62%
+33%
+16%
+14%
+0.2%
16 31 10 4 5 23 24 27 20 17 2 32
Participant ID


C
NF
Time (Minutes)
+1400%
+460%
+141%
+165%
+133%
+69%
+144%
+23%
+42%
+33%
+53%
29 26 19 18 36 28 9 1 30 33 22
Participant ID


D
Breathlessness Intensity (mBorg-CR10)
6
5
4
3
2
1
0
*
*
Baseline
Post-ExT
F2F
NF


E
F2F
Breathlessness Intensity (mBorg-CR10)
2
0
-2
-4
-6
32 31 4 2 5 10 17 20 24 16 27 23
Participant ID


F
NF
Breathlessness Intensity (mBorg-CR10)
2
0
-2
-4
-6
29 26 18 22 28 9 33 36 1 19 30
Participant ID

- F2F group and NF groups showed significant decreases from baseline to post-ExT in breathlessness unpleasantness and leg discomfort ratings at iso-time during CWR CPET, with similar magnitudes of change observed between groups.
- The proportion of participants who showed increased EET above MCID (absolute and relative) was **50% and 81%** in F2F group vs. 72% and 58% in NF group.
- The proportion of participants who showed decrease in iso-time breathlessness intensity ratings by the MCID was **83%** in F2F group vs. 72% in NF group.

Preventing oxygen desaturation during bronchoscopy in COPD patients using high-flow oxygen *versus* standard management: the randomised controlled PROSA 2 trial

Andrei M. Darie[1], Leticia Grize[2], Kathleen Jahn[1], Anna Salina[2,3,4], Jonathan Röcken[1], Matthias J. Herrmann[1], Maria Pascarella[5], Vivian Suarez[1], Werner Strobel[1], Michael Tamm[1] and Daiana Stolz[2,6]

- **P:** 600 patients with COPD, undergoing bronchoscopy
- **I:** high-flow nasal oxygen (n=295)
- **C:** conventional low flow oxygen (n=305)
- **O:** cumulative hypoxaemia time

Eur Respir J 2025; in press (https://doi.org/10.1183/13993003.01109-2025)

TABLE 1 Demographic and clinical characteristics stratified by treatment

	High flow (n=295)	Low flow (n=305)	p-value
Age (years)	69.0 (62.0–76.0)	68.0 (62.0–76.0)	0.415
Male	193 (65.4)	210 (68.9)	0.371
Body mass index ($kg \cdot m^{-2}$)	24.0 (21.0–27.5)	25.4 (21.4–29.0)	0.006
Smoking status			0.934
Current smoker	125 (42.4)	126 (41.3)	
Ever-smoker	166 (56.3)	174 (57.0)	
Never-smoker	4 (1.3)	5 (1.7)	
Pack-years[#]	49.0 (30.0–60.0)	46.5 (30.0–60.0)	0.895
Mallampati score[¶]			0.151
1	45 (16.9)	29 (10.5)	
2	66 (24.8)	80 (29.0)	
3	96 (36.1)	99 (35.9)	
4	59 (22.2)	68 (24.6)	
ASA classification[+]			0.278
I	1 (0.3)	2 (0.7)	
II	21 (7.6)	28 (9.7)	
III	246 (88.5)	255 (88.2)	
IV	10 (3.6)	4 (1.4)	
Immunosuppression	33 (11.2)	33 (10.8)	0.874
Inhaled therapy			
Bronchoscopy			
Duration (min)	23 (13–40)	20 (14–40)	0.917
Duration of monitoring (min)	39.5 (27.3–59.1)	42.4 (27.7–65.6)	0.306
Propofol ($mg \cdot kg^{-1} \cdot min^{-1}$)	134.3 (101.7–165.6)	119.5 (94.4–156.5)	0.016
Hydrocodone (mg)	2.0 (0.0–4.0)	2.0 (0.0–4.0)	0.735
Bronchoalveolar lavage	254 (86.1)	268 (87.9)	0.520
Bronchial washing	63 (21.4)	44 (14.4)	0.027
Endobronchial biopsy	55 (18.6)	49 (16.1)	0.404
Transbronchial biopsy	34 (11.5)	36 (11.8)	0.916
Transbronchial needle aspiration	11 (3.7)	11 (3.6)	0.937
Bronchial brushing	35 (11.9)	48 (15.7)	0.169
Linear endobronchial ultrasound	71 (24.1)	77 (25.2)	0.738
Radial endobronchial ultrasound	44 (14.9)	41 (13.4)	0.605
Endoscopic lung volume reduction	10 (3.4)	7 (2.3)	0.419
GOLD IV	18 (6.9)	15 (5.4)	

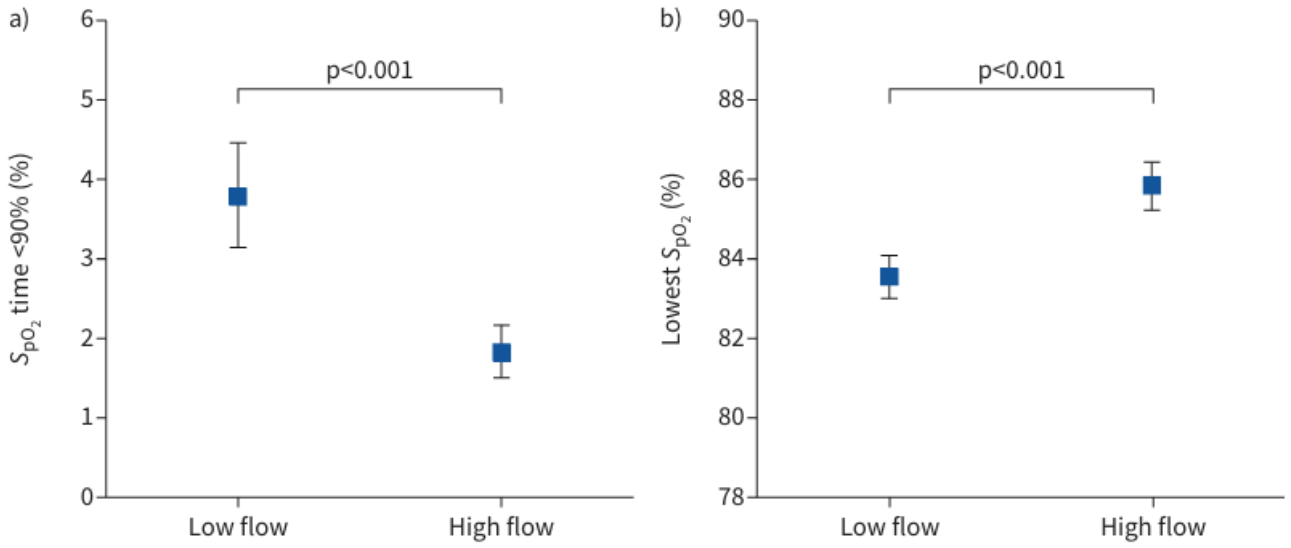


FIGURE 2 Parameters describing transient hypoxaemia in patients undergoing bronchoscopy stratified by treatment group: a) cumulative hypoxaemia (peripheral oxygen saturation (S_{pO_2}) <90%) time as percentage of bronchoscopy monitoring time and b) mean of lowest S_{pO_2} during bronchoscopy. Error bars indicate 95% confidence intervals.

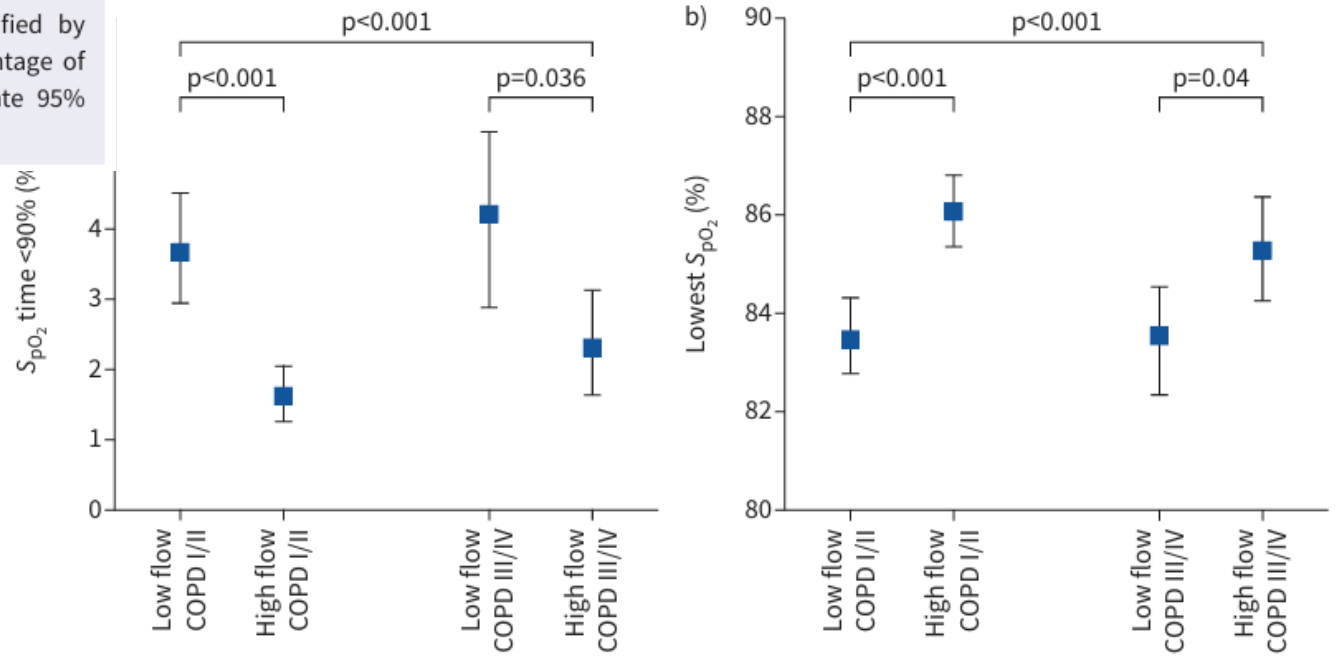


FIGURE 3 Parameters describing transient hypoxaemia in patients undergoing bronchoscopy stratified by treatment group and COPD (Global Initiative for Chronic Obstructive Lung Disease) severity: a) cumulative hypoxaemia (peripheral oxygen saturation (S_{pO_2}) <90%) time as percentage of bronchoscopy time and b) mean of lowest S_{pO_2} during bronchoscopy. Error bars indicate 95% confidence intervals.

Contents

- Smoking cessation
- Vaccination
- Nutrition and physical activity
- Pulmonary rehabilitation
- Long-term oxygen therapy
- **Noninvasive positive pressure ventilation**
- Surgical and bronchoscopic intervention
- Telemedicine in non-pharmacologic treatment

Clinical benefit of chronic non-invasive ventilation in severe stable COPD: a matter of persistent hypercapnia improvement

Tim Raveling [1,2], Renzo Boersma,[1,2] Peter J Wijkstra,[1,2] Marieke L Duiverman [1,2]

- **P:** 177 participants with COPD who initiated non-invasive ventilation (NIV)
- **E:** Nocturnal NIV for 6 months with monitoring of PtcCO2(transcutaneous pCO2) at home
- **C: group 1** = target **not** reached based on both nocturnal PtcCO2 and daytime PaCO2; **group 2** = target reached based on both nocturnal PtcCO2 and daytime PaCO2; and group 3 = target reached only based on PtcCO2.
- **O:** change in PtcCO2, PaCO2, 6MWT and FEV1 at 3 months and change in The Severe Respiratory Insufficiency questionnaire (SRI) at 6 months

Raveling T, et al. Thorax 2025;80:202–208.

Table 2 Baseline characteristics, NIV settings and treatment effect on gas exchange for the participants who did not reach the nocturnal and daytime pCO_2 target (group 1), that reached both nocturnal and daytime pCO_2 target (group 2) and that reached only the nocturnal pCO_2 target (group 3)

	Group 1 (–/–) n=60	Group 2 (+/+) n=30	Group 3 (+/–) n=87	P value
Baseline characteristics				
Age (years)	63.9±8.2	63.0±6.4	63.2±7.0	0.85
BMI (kg/m^2)	25.3±4.9	26.4±5.2	26.2±6.2	0.58
aeCOPD (n)	3 (1–5)	3.0 (1–5)	3 (1–4)	0.61
Haemoglobin (mmol/l)	9.1±1.0	9.4±1.2	9.0±1.1	0.12
Assistance with ADL	24 (40)	10 (33)	22 (25)	0.17
Sleep apnoea	6 (10)	4 (13)	10 (12)	0.89
CHF	12 (20)	5 (17)	12 (14)	0.61
Diuretic use	30 (50)	14 (47)	39 (45)	0.83
Benzodiazepine use	14 (27)	4 (13)	15 (21)	0.34
Opioid use	12 (24)	6 (21)	18 (25)	0.91
FEV_1 (l)	0.59±0.16	0.63±0.18	0.61±0.21	0.67
FEV_1/FVC (%)	27 (23–24)	29 (24–37)	30 (26–35)	0.061
RV/TLC (%)	65.6±7.7	65.2±6.9	65.9±7.9	0.91
MIP (kPa)	5.3±1.9	5.9±1.8	5.3±1.5	0.40
6MWT (m)	221±95	218±110	249±109	0.24
LTOT	48 (81)	23 (77)	66 (76)	0.73
pH	7.41 (7.39–7.43)	7.41 (7.38–7.42)	7.41 (7.39–7.43)	0.19
PaO_2 (kPa)	7.4±1.4	6.7±1.4	7.2±1.2	0.059
$PaCO_2$ (kPa)	7.0 (6.7–7.6)	7.6 (6.6–8.4)	7.0 (6.6–7.7)	0.073
HCO_3^- (mmol/l)	33.8±3.4	35.5±5.1	34.2±3.3	0.12
$PtcCO_2$ (kPa)	7.4±0.7[2]	8.2±1.9[1]	7.7±1.2	0.015
SRI-SS*	51.5±14.0	50.8±11.8	50.7±13.0	0.94

Table 2 Baseline characteristics, NIV settings and treatment effect on gas exchange for the participants who did not reach the nocturnal and daytime pCO_2 target (group 1), that reached both nocturnal and daytime pCO_2 target (group 2) and that reached only the nocturnal pCO_2 target (group 3)

	Group 1 (–/–) n=60	Group 2 (+/+) n=30	Group 3 (+/–) n=87	P value
NIV†				
IPAP (cmH_2O)	22.7±3.7	24.1±3.4	22.7±3.8	0.19
EPAP (cmH_2O)	5.0 (4.3–6.0)	6.0 (5.0–7.3)	5.0 (4.0–6.0)	0.13
Adherence (hours/day)	6.2±2.8[2]	8.3±2.4[1,3]	6.7±2.0[2]	0.013
3 months change CO_2				
$\Delta PtcCO_2$ (kPa)	–0.8 (–1.3 to –0.2)[2,3]	–2.2 (–3.3 to –1.7)[1,3]	–1.7 (–2.5 to –1.1)[1,2]	<0.001
$\Delta PtcCO_2$(%)	–8.3±10.0[2,3]	–31.1±13.0[1,3]	–22.3±10.5[1,2]	<0.001
$\Delta PaCO_2$ (kPa)	–0.3±0.6[2]	–1.7±0.9[1,3]	–0.5±0.6[2]	<0.001
$\Delta PaCO_2$(%)	–4.1±9.4[2]	–21.2±8.5[1,3]	–6.9±8.4[2]	<0.001

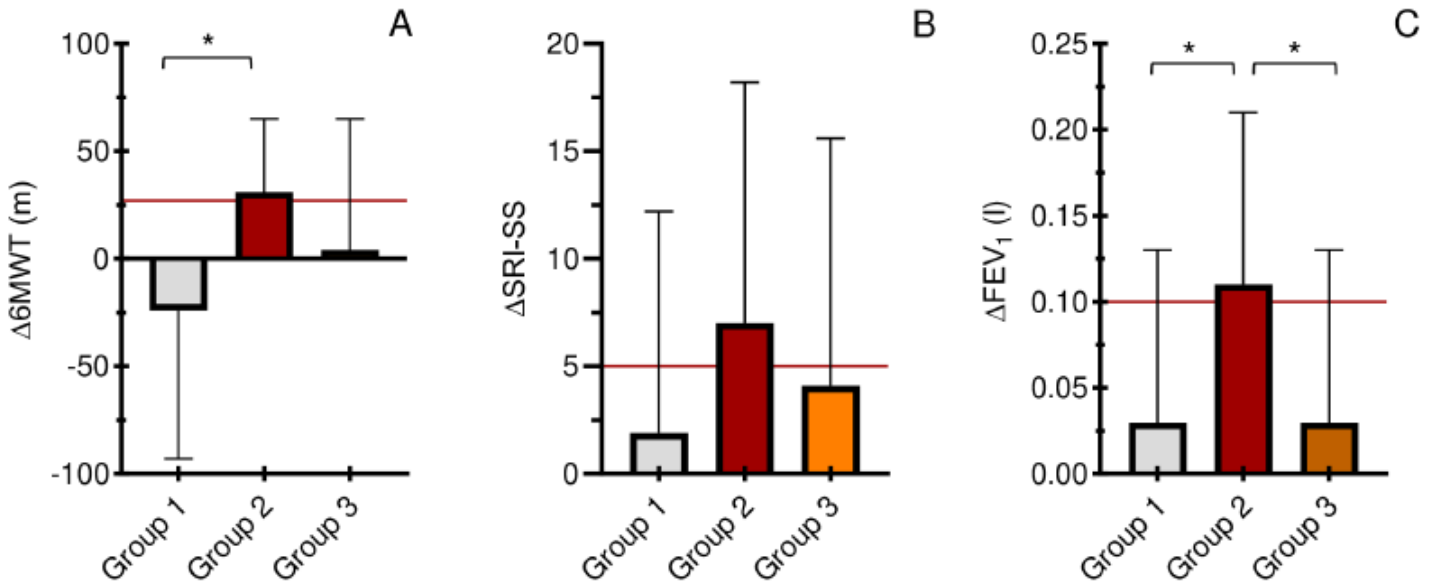


Figure 3 The change in the (A) 6-min walk distance test (Δ6MWT) at 3 months; (B) Severe Respiratory Insufficiency questionnaire—sum (ΔSRI-SS) at 6 months; and (C) forced expiratory volume in 1 s (ΔFEV_1) at 3 months. * indicates a $p<0.05$ on the analysis of variances (ANO hoc test. The solid horizontal lines are set at the minimal clinical important difference of 27 m for the 6MWT, 5 units for the SRI-SS and 100 FEV_1.

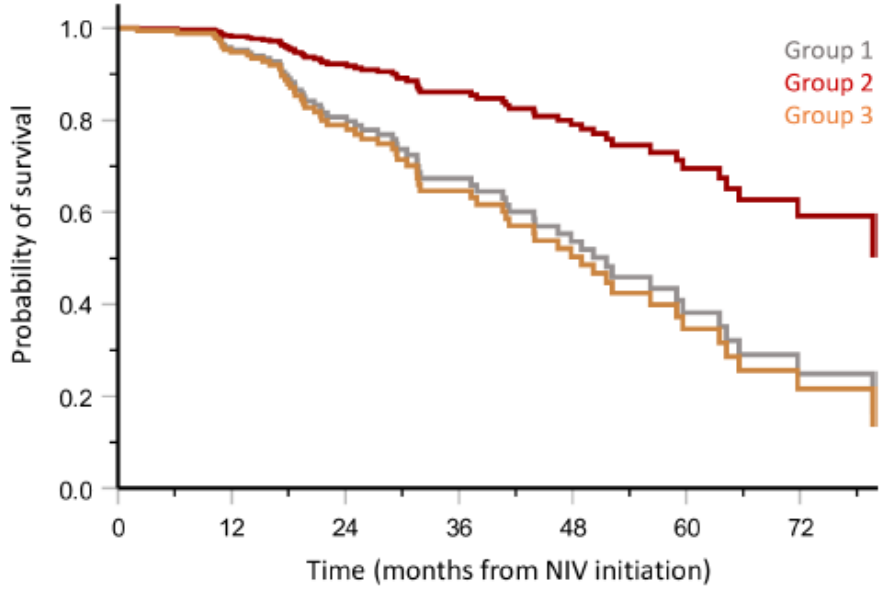


Figure 4 Survival curves separate for the participants who did not reach the nocturnal and daytime pCO_2 target (group 1, grey line), that reached both nocturnal and daytime pCO_2 target (group 2, red line) and that reached only the nocturnal pCO_2 target (group 3, orange line). NIV, non-invasive ventilation.

▶ Patients with COPD who can maintain improved ventilation by nocturnal NIV during daytime spontaneous breathing are most likely to experience relevant benefits on HRQL, exercise capacity, lung function and survival.

Impact of long-term non-invasive ventilation on severe exacerbations and survival in COPD: a French nationwide cohort study using multistate models

Jean Louis Pépin ,[1,2] Eleonore Herquelot,[3] Helene Denis,[3] Anne Josseran,[4] Florent Lavergne,[4] Adam Benjafield,[5] Atul Malhotra,[6] Janna Raphelson,[6] Peter Cistulli ,[7] Aurelie Schmidt,[3] Sebastien Bailly ,[8] Alain Palot,[9] Arnaud Prigent ,[10] on behalf of the medXcloud group

- **P:** Data of 49,503 patients from the French national health insurance reimbursement system database for individuals aged ≥40 years with COPD and ≥1 NIV reimbursement in 2015–2019. - the MONTANA (HoMe NOn INvasive VenTilAtioniN FrAnce) cohort.
- **I:** Long term NIV (NIV continuation), multistate model analysis.
- **C:** NIV cessation
- **O:** Severe COPD exacerbations, mortality

Pépin JL, et al. Thorax 2025;80:616–623.

Table 1 Baseline demographics and characteristics of the study population

	Participants (n=49 503)
Age, years	70 (62, 79)
Male sex, n (%)	25 337 (51.2)
Number of exacerbations requiring hospitalisation in the year before NIV initiation	1 (0–2)
Received bronchodilator, corticosteroids, LABA and/or LAMA*, n (%):	
In the 6 months either side of the index date	39 164 (79)
Any time in the pre-index or follow-up periods	48 572 (89)
Medical history within the previous 5 years*, n (%)	
Undernutrition	13 821 (28)
Morbid obesity	23 280 (47)
Obstructive sleep apnoea	17 209 (35)
Hypertension or cardiovascular disease	37 576 (76)
Diabetes	14 854 (30)
Psychiatric diseases, anxiety or depression	18 640 (38)
Charlson comorbidity index, n (%)	
0	3464 (7)
1–2	38 698 (78)
3–4	6884 (14)
≥5	457 (1)

Values are median (IQR) or number of patients (%).
*Based on drug/disease coding, as detailed in the online supplemental file 1.
LABA, long-acting β-agonist; LAMA, long-acting muscarinic antagonist; NIV, non-invasive ventilation.

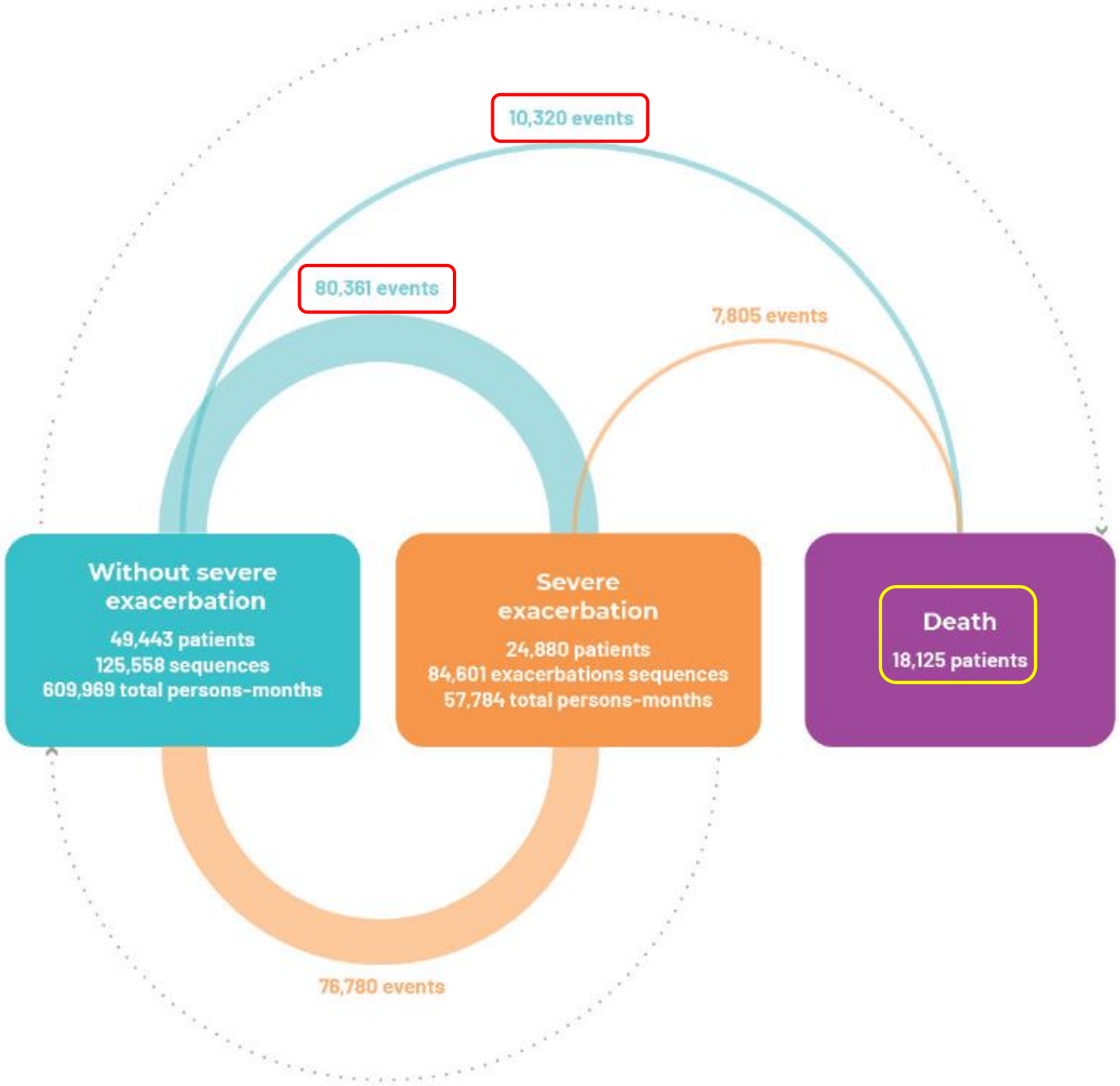
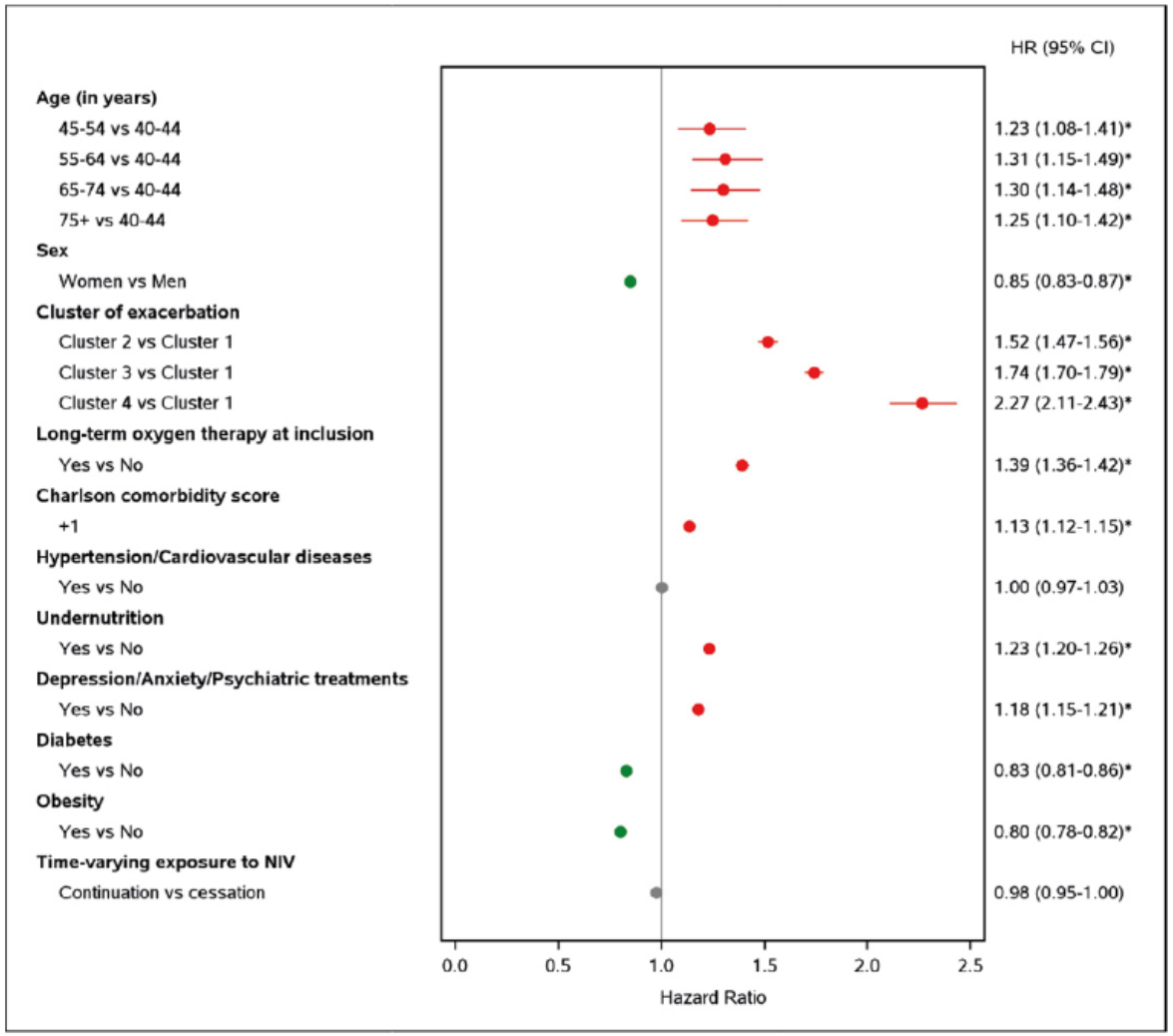


Figure 2 Number of events and transitions.

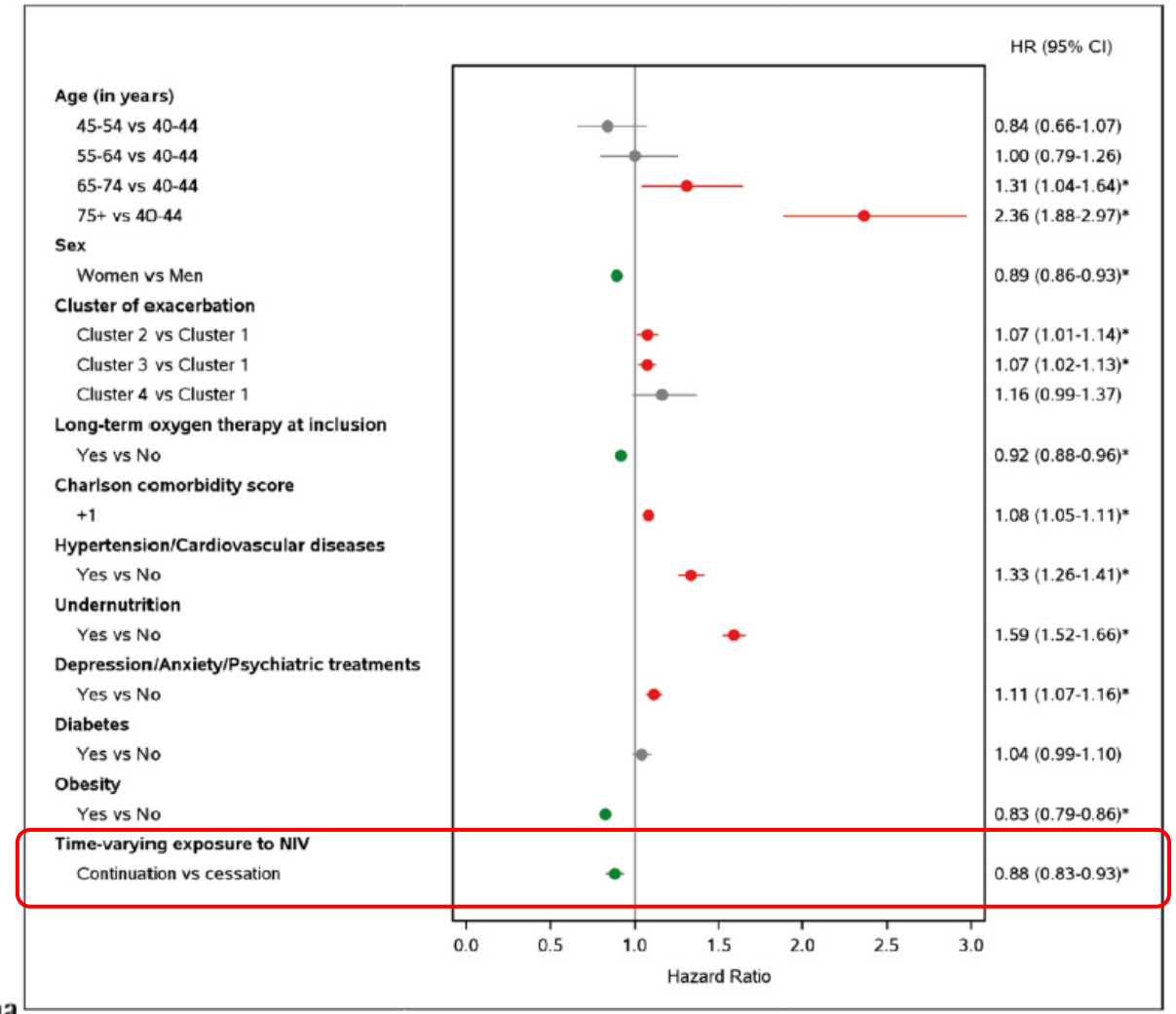
without severe exacerbation to severe exacerbation

A



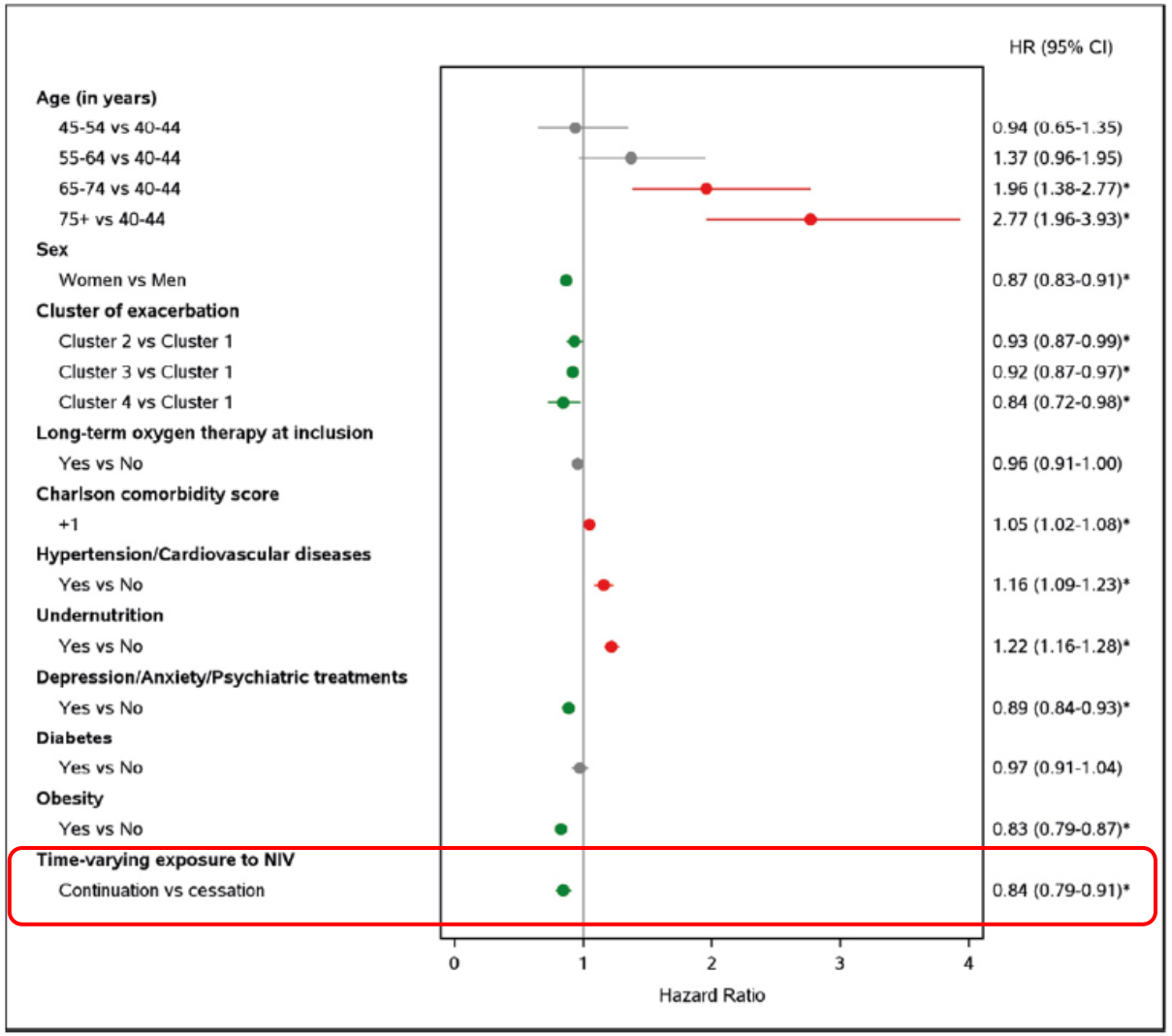
without severe exacerbation to death

B

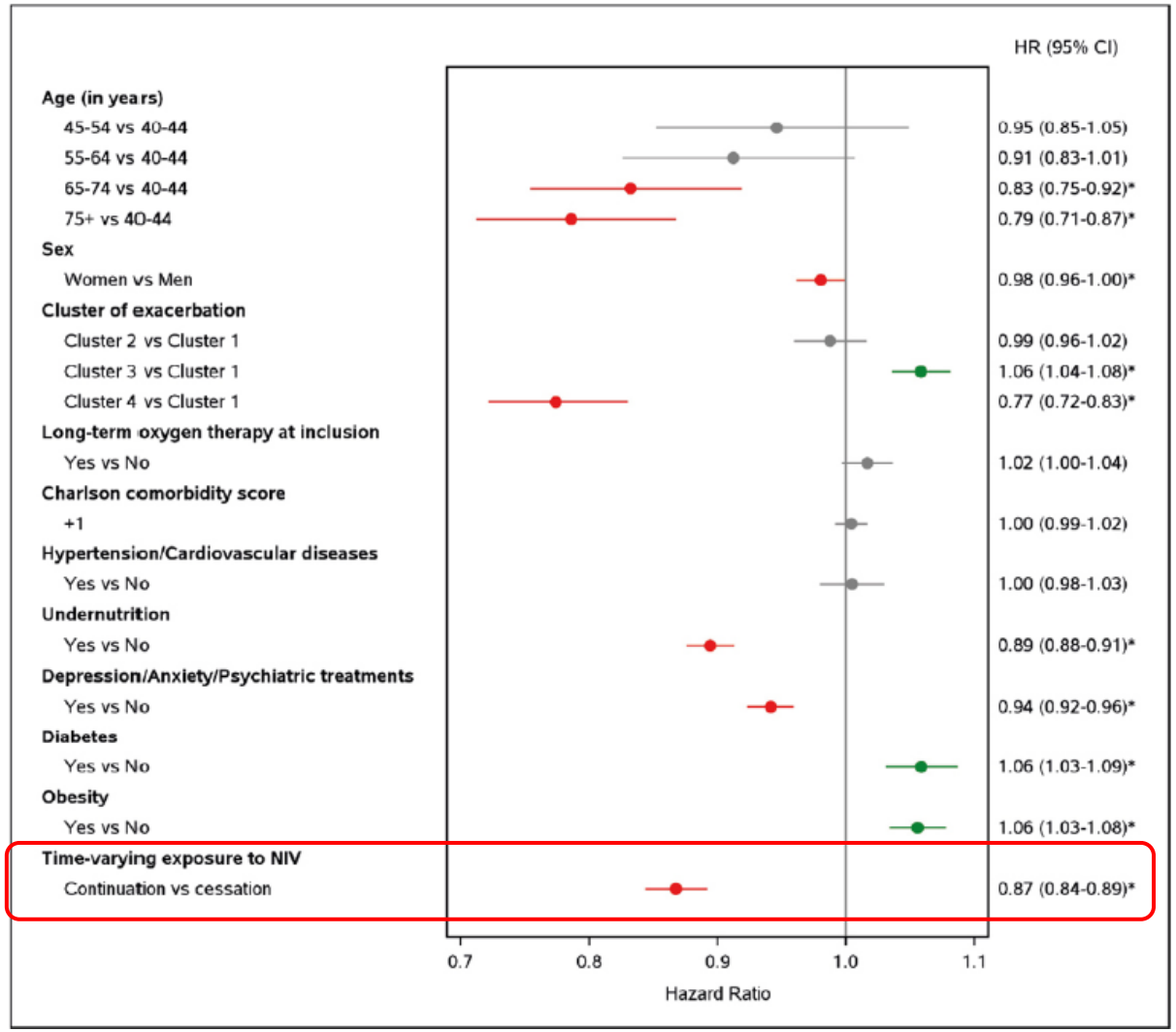


comorbidities. Four clusters were generated. Cluster 1 (n = 35,975/54,545; 66%) had NIV initiated in ambulatory settings or after the first acute event/exacerbation. Cluster 2 (6653/54,545; 12%) started NIV after ≥2 severe exacerbations in the previous 6 months. Cluster 3 (11,375/54,545; 21%) started NIV after frequent severe COPD-related exacerbations in the previous year. Cluster 4 (652/54,545; 1%) started NIV after many long-lasting severe exacerbations. The four clusters differed in age, sex, comorbidities, pre-NIV investigations, and prescriber/location

C severe exacerbation to death



D severe exacerbation to without severe exacerbation (recovery)



▶ NIV cessation was associated with exacerbation and mortality

Contents

- Smoking cessation
- Vaccination
- Nutrition and physical activity
- Pulmonary rehabilitation
- Long-term oxygen therapy
- Noninvasive positive pressure ventilation
- **Surgical and bronchoscopic intervention**
- Telemedicine in non-pharmacologic treatment

Randomized Sham-controlled Trial of Targeted Lung Denervation in Patients with Chronic Obstructive Pulmonary Disease (AIRFLOW-3)

Pallav L. Shah[1], Dirk-Jan Slebos[2], Richard Sue[3], Surya P. Bhatt[4], Christian Ghattas[5], Charlie Strange[6], Bruno Degano[7], Arschang Valipour[8], Stephan Eisenmann[9], Jose De Cardenas[10], Charles-Hugo Marquette[11], Jose Soto-Soto[12], Frank C. Sciurba[13], Francesca Conway[1], James Tonkin[1], Anand Tana[1], Nathaniel Marchetti[15], Jorine E. Hartman[2], Valentin Heluain[14], Nicolas Guibert[14], and Gerard J. Criner[15]; for the AIRFLOW-3 Study Group

- **P:** total of 388 patients from AIRFLOW-3 was 1:1 randomized between September 2019 and August 2023.

  - Symptomatic (CAT ≥ 10) COPD patients with moderate to very severe airflow obstruction (FEV1 ≥ 25% but ≤80% predicted) and GOLD E status

- **I:** the D'Nerva targeted lung denervation(TLD) system during bronchoscopy

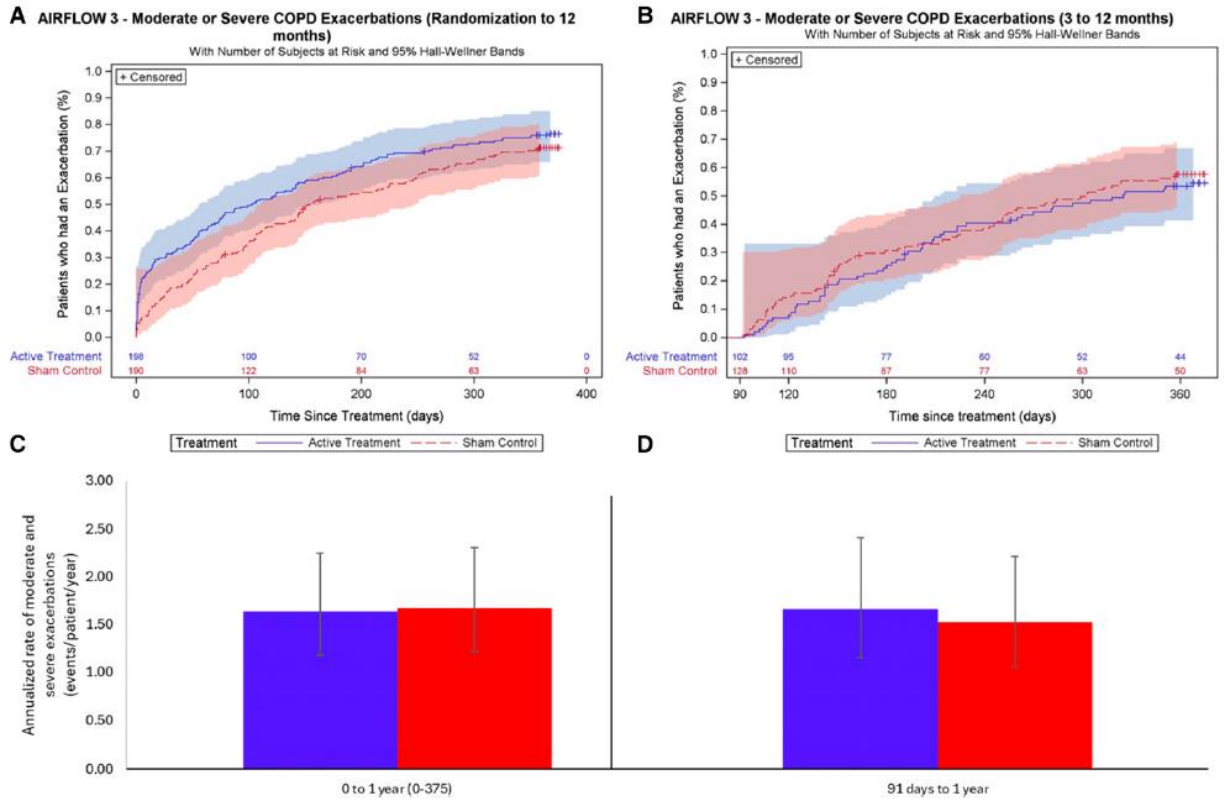
- **C:** sham group (usual bronchoscopy procedure)

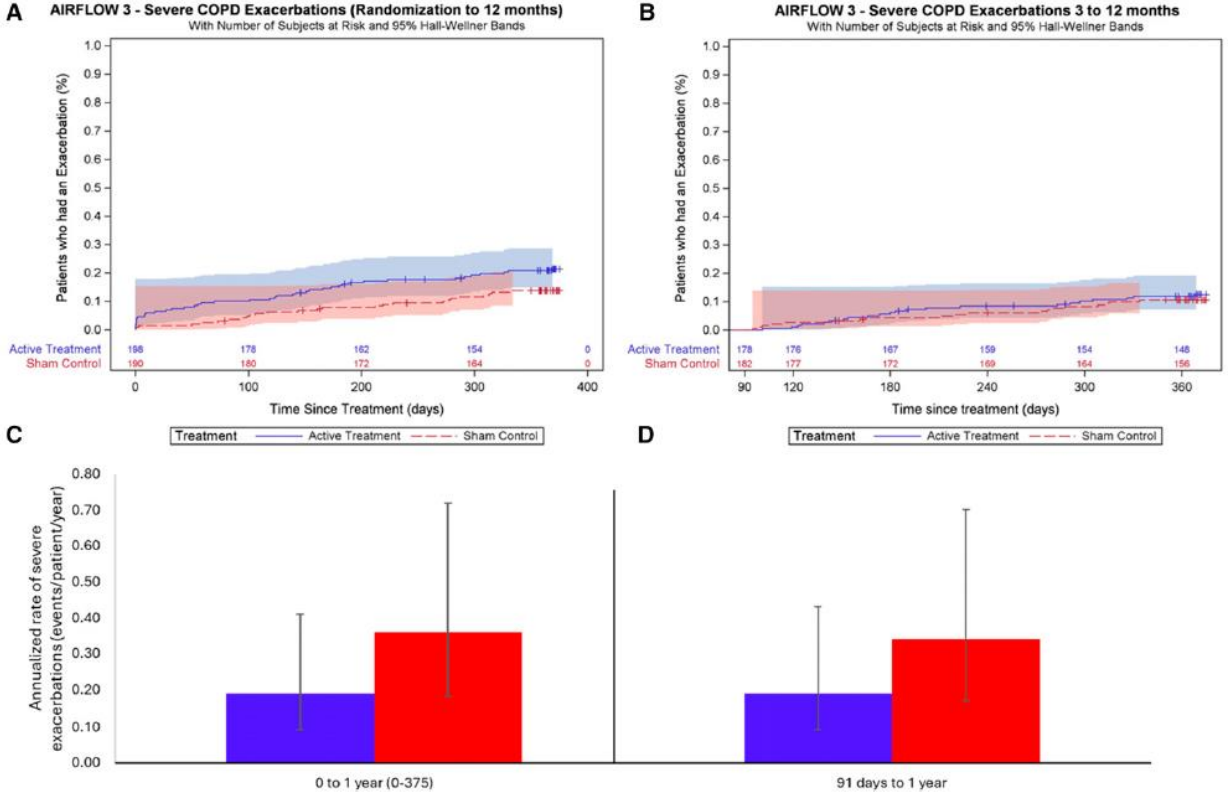
- **O:** time to the first moderate or severe COPD exacerbation through 12 months

Shah et al. *Am J Respir Crit Care Med*. 2025;211(12):2318-2329.

Table 1. Baseline Demographic and Clinical Characteristics

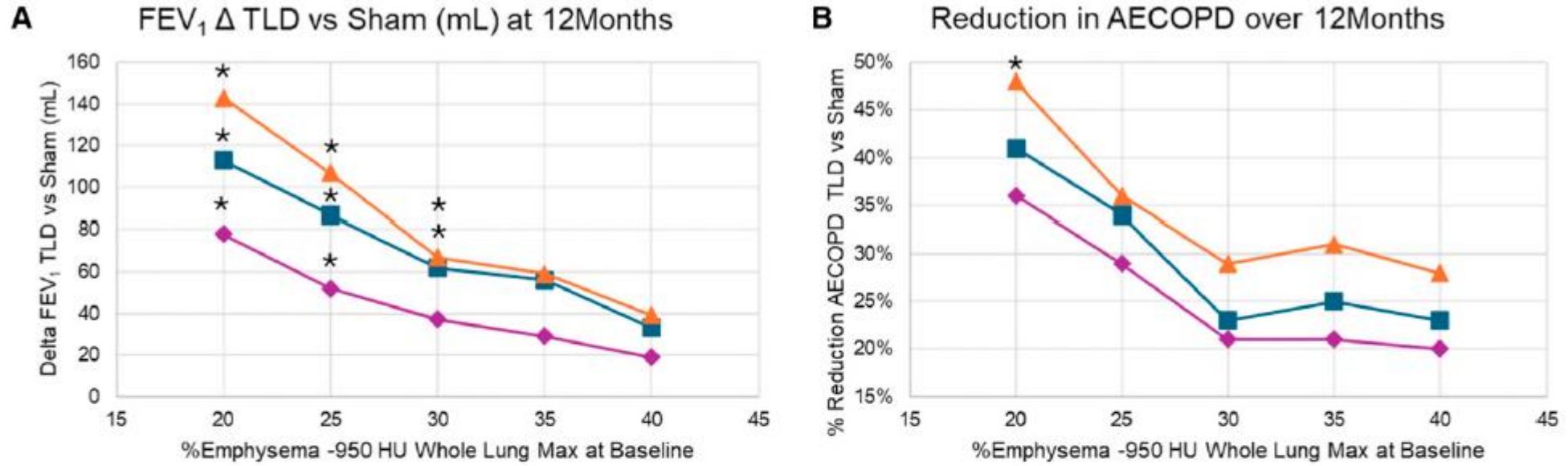
Characteristic	TLD	Sham
Age, yr		
Mean ± SD (*n*)	67.8 ± 7.2 (198)	67.7 ± 7.0 (190)
Median (range)	68.0 (45.0–89.0)	69.0 (42.0–84.0)
Female sex	111/198 (56.1%)	103/190 (54.2%)
Body mass index, kg/m^2		
Mean ± SD (*n*)	26.9 ± 4.6 (198)	27.1 ± 4.6 (190)
Median (range)	27.0 (4.0–35.0)	27.0 (18.0–35.0)
Pack-years smoking		
Mean ± SD (*n*)	47.6 ± 21.5 (198)	45.8 ± 22.5 (190)
Median (range)	44.0 (10.0–201.0)	43.0 (10.0–128.0)
Lung function (postbronchodilator)		
FEV_1, L		
Mean ± SD (*n*)	1.07 ± 0.37 (198)	1.07 ± 0.39 (190)
Median (range)	0.98 (0.55–2.71)	1.00 (0.49–2.59)
FEV_1, % predicted		
Mean ± SD (*n*)	41.6 ± 11.9 (198)	40.5 ± 11.8 (190)
Median (range)	39.0 (25.0–80.0)	38.0 (25.0–78.0)
FEV_1/FVC		
Mean ± SD (*n*)	0.39 ± 0.10 (198)	0.39 ± 0.11 (190)
Median (range)	0.37 (0.18–0.68)	0.37 (0.18–0.70)
GOLD stage (postbronchodilator FEV_1)		
I	2/198 (1.0%)	0/190 (0.0%)
II	44/198 (22.2%)	30/190 (15.8%)
III	127/198 (64.1%)	133/190 (70.0%)
IV	25/198 (12.6%)	27/190 (14.2%)
% Emphysema score −950 HU		
Mean ± SD (*n*)	22.1 ± 12.1 (198)	21.5 ± 11.1 (190)
Median (range)	22.4 (0.2–47.3)	20.9 (0.5–48.3)
Patient-reported outcomes		
CAT score		
Mean ± SD (*n*)	23.5 ± 6.2 (198)	23.8 ± 6.5 (190)
Median (range)	24.0 (10.0–39.0)	24.0 (10.0–40.0)
SGRQ-C, total score		
Mean ± SD (*n*)	59.0 ± 14.6 (198)	59.8 ± 16.0 (190)
Median (range)	60.0 (19.4–91.4)	61.2 (19.5–92.3)
GCSI score		
Mean ± SD (*n*)	0.65 ± 0.61 (198)	0.60 ± 0.59 (190)
Median (range)	0.50 (0.00–2.25)	0.50 (0.00–2.25)
mMRC score		
Mean ± SD (*n*)	2.58 ± 0.84 (198)	2.58 ± 0.99 (190)
Median (range)	3.00 (0.00–4.00)	3.00 (0.00–4.00)
Baseline dyspnea index		
Mean ± SD (*n*)	4.6 ± 2.2 (194)	4.5 ± 2.1 (187)
Median (range)	5.0 (0.0–12.0)	4.0 (0.0–10.0)
Prior-year exacerbation history		
Mean no. of moderate/severe exacerbations		
Mean ± SD (*n*)	2.9 ± 1.5 (198)	3.0 ± 1.5 (190)
Median (range)	3.0 (1.0–12.0)	3.0 (1.0–10.0)
Mean no. severe (hospitalized) exacerbations		
Mean ± SD (*n*)	0.6 ± 0.9 (198)	0.7 ± 0.9 (190)
Median (range)	0.0 (0.0–7.0)	0.0 (0.0–5.0)
Baseline COPD maintenance medication use		
LABA monotherapy	0/198	0/190
LAMA monotherapy	0/198	0/190
LABA + LAMA	14/198 (7.1%)	12/190 (6.3%)
LABA + ICS*	1/198 (0.5%)	1/190 (0.5%)
LAMA + ICS	1/198 (0.5%)	0/190
LABA + LAMA + ICS	182/198 (91.9%)	177/190 (93.2%)
Other COPD maintenance medications	174/198 (87.9%)	161/190 (84.7%)

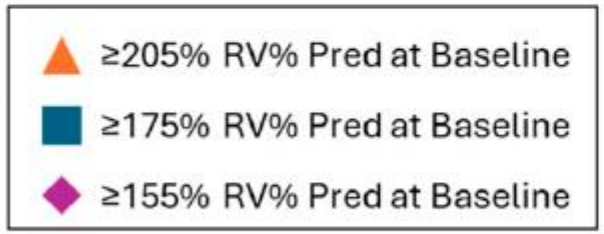




No significant reduction in the time to first exacerbation and
the probability of participants having a moderate or severe COPD exacerbation

AIRFLOW-3: Post-Hoc Responder Analysis





	≤20% Emphysema		≤25% Emphysema		≤30% Emphysema		≤35% Emphysema		≤40% Emphysema	
n	TLD	Sham	TLD	Sham	TLD	Sham	TLD	Sham	TLD	Sham
≥205%	25	22	34	32	45	46	53	55	62	59
≥175%	44	41	55	53	70	71	55	53	40	38
≥155%	48	53	69	68	89	88	106	101	118	114

Figure 4. AIRFLOW-3 *post hoc* responder analysis: (*A*) difference in change in FEV_1 between targeted lung denervation (TLD) treatment and sham groups at 12 months after randomization as a function of baseline levels of hyperinflation (residual volume percent predicted [RV% pred]) and emphysema (percent low-attenuation area <−950 HU). (*B*) Percent reduction in moderate and severe chronic obstructive pulmonary disease (exacerbations in the TLD treatment group vs. the sham group as a function of baseline levels of hyperinflation [RV% pred] and

Patients with **airway-dominant pathology (persistent hyperinflation with less emphysema)** showed a response to TLD with a decrease in RV, an increase in FEV1, and fewer COPD exacerbations.

Airway Scaffolds for Emphysema-related Hyperinflation
Six-Month Results from the BREATHE Trial

Anand Tana[1,2], Arschang Valipour[3], Alvin Ing[4], Daniel P. Steinfort[5,6], Christopher M. Orton[1,2], Karin Klooster[7], Theresa Klemm[3], Jonathan P. Williamson[4], Jemma J. Christie[5], Justin L. Garner[1,2], T. David Koster[7], Kelly Welz[3], Marlies van Dijk[7], Martin L. Mayse[8], Pallav L. Shah[1,2], and Dirk-Jan Slebos[7]; for the BREATHE Study Group*

- **P:** 60 patients from the BREATHE-1 and -2.
  COPD patients with emphysema with baseline FEV1, 20–50% pred. (BREATHE-1) and 15–50% pred. (BREATHE-2) without 3 or more exacerbation history in the prior year.
- **I:** the airway scaffold (Apreo Health) procedure under fluoroscopy guided bronchoscopy
- **C:** -
- **O:** **Safety**, measured by procedure- and/or device-related serious adverse events over 6 months.
  + technical feasibility, pulmonary function, quality of life, symptoms, exercise capacity at 3 and 6 months, and airway patency assessment by HRCT

Tana, Valipour, Ing et al. *Am J Respir Crit Care Med*. 2025;211(7):1175-1184.

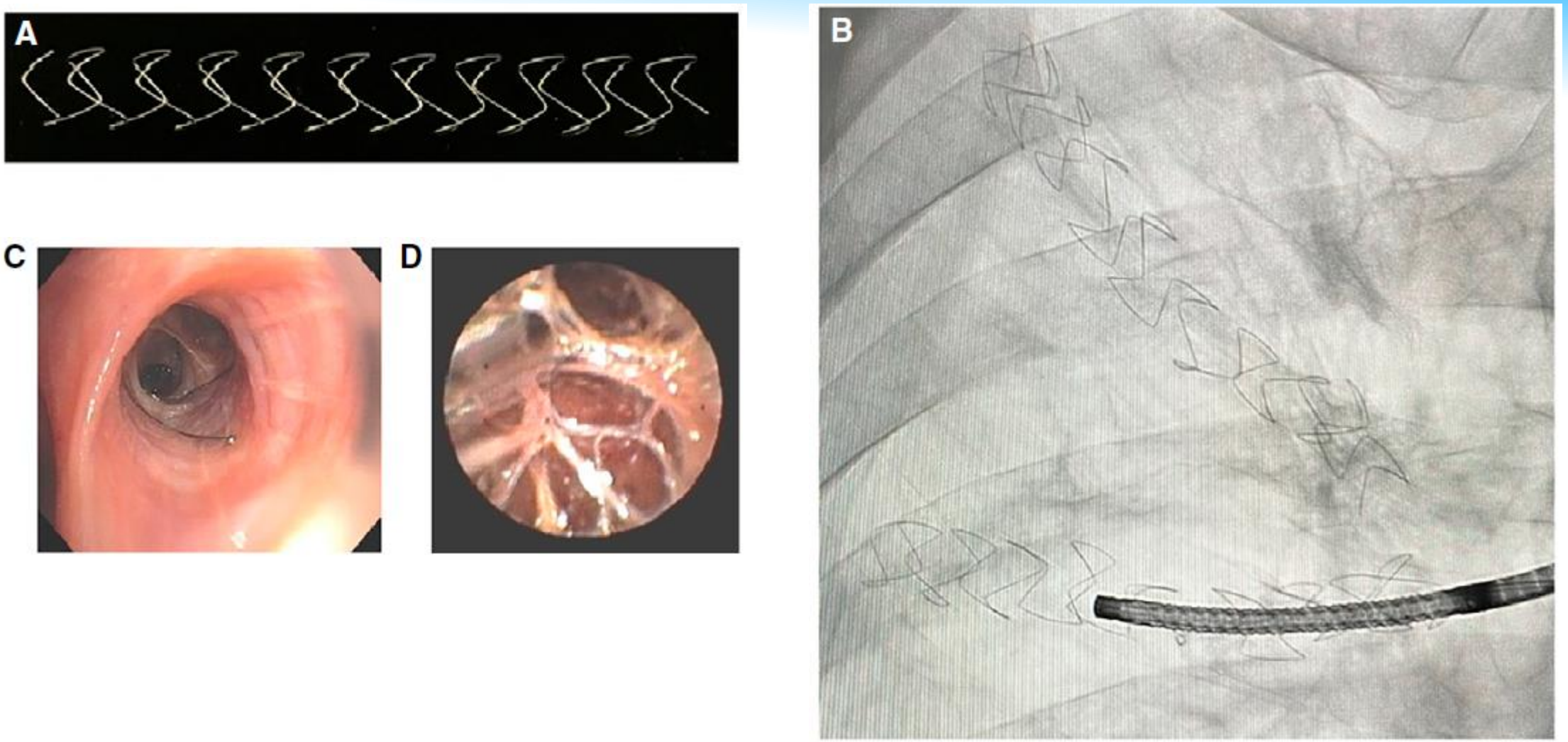


Figure 1. The airway scaffold. (*A*) A single airway scaffold. The airway scaffold is available in four lengths varying from 55 to 100 mm. (*B*) Fluoroscopic image of two airway scaffolds *in situ*. A bronchoscope is visible in the lumen in one implanted airway. (*C*) Bronchoscopic image of the proximal end of a deployed airway scaffold. (*D*) Bronchoscopic image obtained at the distal end of an airway scaffold where emphysematous parenchyma is visible.

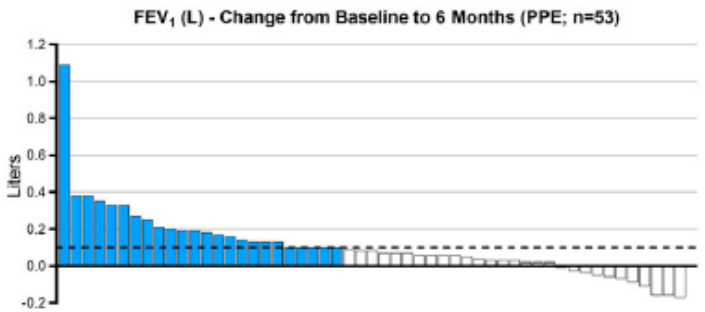
Table 1. Baseline Characteristics of Intention-to-Treat Population

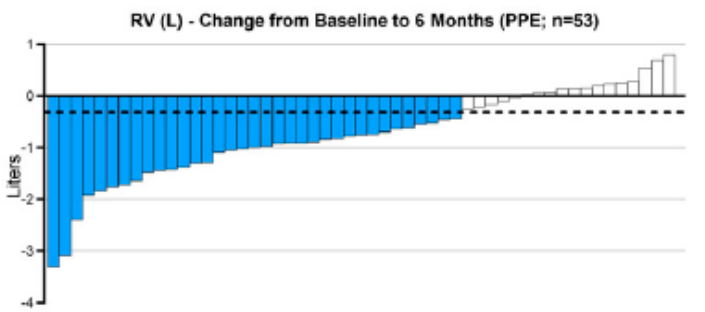
Characteristics	BREATHE-1 and BREATHE-2 (*N* = 60)
Female sex, *n* (%)	33 (55)
Age, yr	66 ± 8
Body mass index, kg/m^2	23.3 ± 4.5
Smoking history	
Ever smoked, *n* (%)	60 (100)
Pack-years, mean (SD)	40.5 ± 19.8
Lung function	
FEV_1	
Liters	0.70 ± 0.22
Percent predicted value	26 ± 8
FVC	
Liters	2.6 ± 0.9
% of predicted value	75 ± 21
RV	
Liters	5.3 ± 1.2
% of predicted value	255 ± 47
TLC	
Liters	8.1 ± 1.6
% of predicted value	140 ± 15
Ratio of RV to TLC, %	66 ± 8
D_{LCO}	
Milliliters of carbon monoxide/min/mm Hg	7.9 ± 2.2
% of predicted value	35 ± 7
Arterial blood gas, mm Hg	
Partial pressure of oxygen	71 ± 9
Partial pressure of carbon dioxide	40 ± 6
Distance on 6-min-walk test, m	299 ± 91
Quality-of-life scores, no. of points	
St. George's Respiratory Questionnaire for COPD	64.8 ± 14.7
Modified Medical Research Council dyspnea scale	3.0 ± 0.8
COPD Assessment Test	21.0 ± 5.6
HRCT findings	
Emphysema destruction*, %	37.5 ± 10.0
Emphysema distribution†, *n* (%)	
Homogeneous	31 (52)
Heterogeneous	29 (48)
Fissure integrity‡, *n* (%)	
Incomplete	49 (82)
Complete	11 (18)

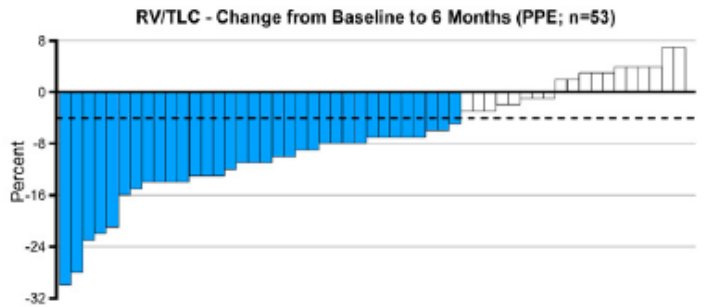
Table 2. Serious Adverse Events Related to Procedure and/or Device during 6 Months of Follow-Up (Intention-to-Treat Population)

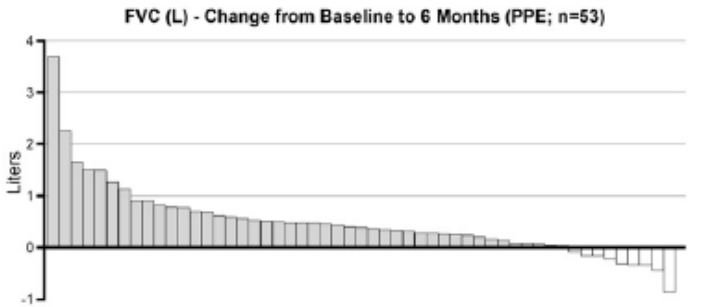
Event	BREATHE-1 and BREATHE-2 (*N* = *60*) *N* (%) of Patients [*N* Events]
Related serious events	13 (21.7) [21]
Pneumonia	6 (10.0) [6]
COPD exacerbation	3 (5.0) [4]
Respiratory tract infection	2 (3.3) [1]
Respiratory failure	1 (1.7) [1]
Lower respiratory tract infection	1 (1.7) [1]
Pulmonary hemorrhage	1 (1.7) [1]
Bronchitis	1 (1.7) [1]
Bronchospasm	1 (1.7) [1]
Hemoptysis	1 (1.7) [1]
Hypoxia	1 (1.7) [1]
Sputum retention	1 (1.7) [1]
Rib fracture	1 (1.7) [1]
Angina pectoris	1 (1.7) [1]
Pneumothorax	0 (0.0) [0]

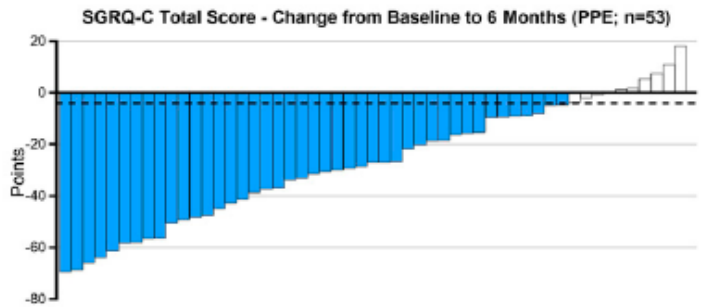
Definition of abbreviation: COPD = chronic obstructive pulmonary disease.
Serious adverse events were adverse events that were fatal, required prolonged hospitalization, caused substantial risk of death at the time of the event, resulted in permanent impairment of a body function, or required medical or surgical intervention to prevent permanent impairment of a body function.

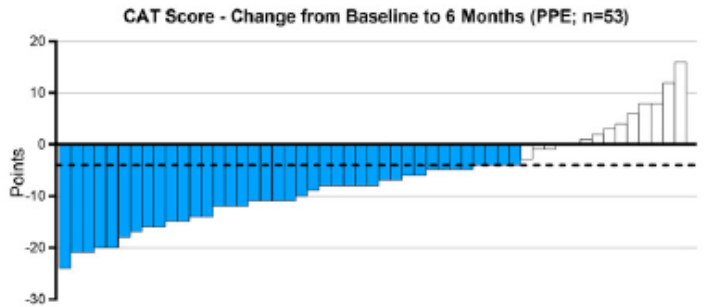


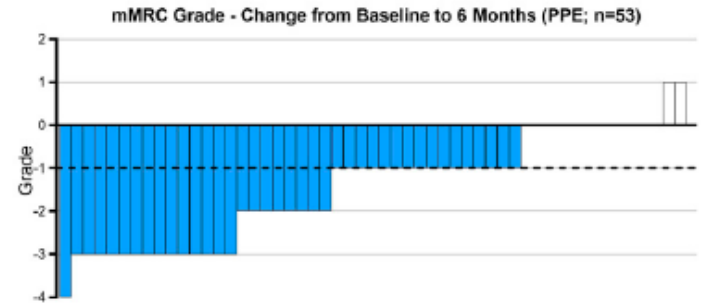


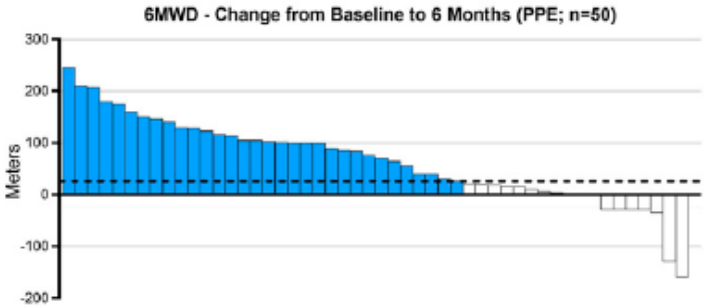












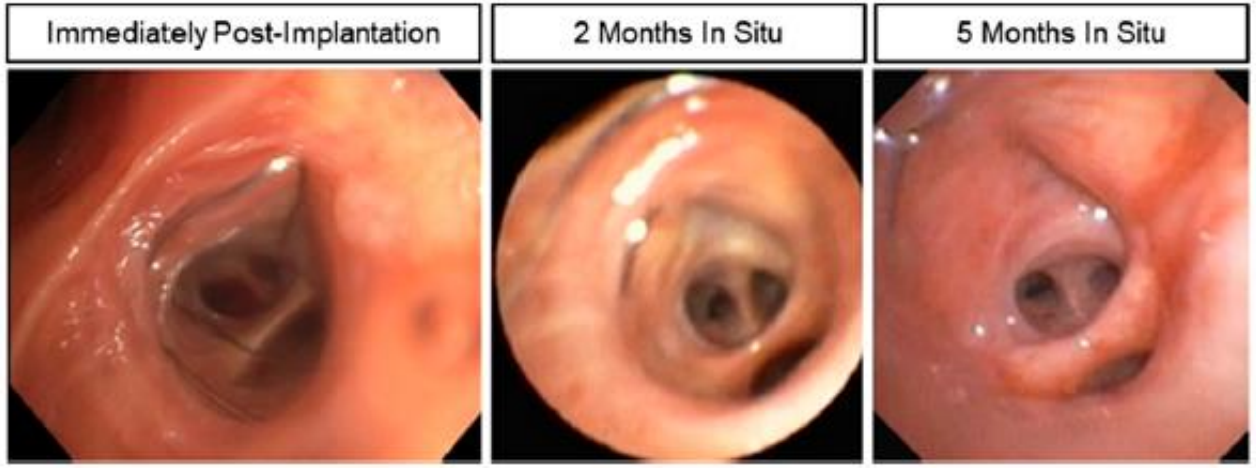


Figure 4. Post-treatment bronchoscopic images from a study patient. The same airway is shown immediately after implantation and at 2 and 5 months postimplantation. The airway is patent with no evidence of narrowing or obstruction.

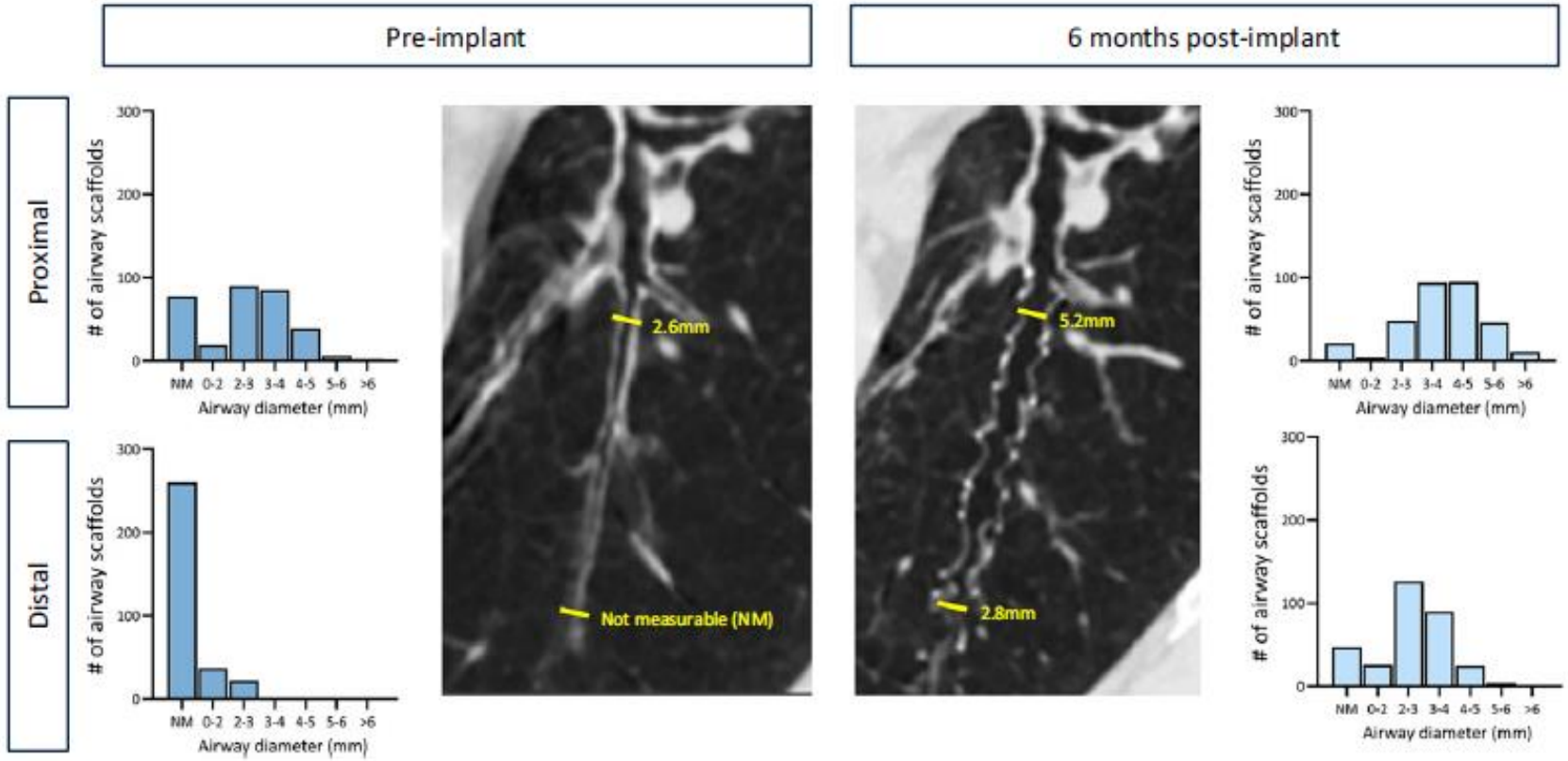


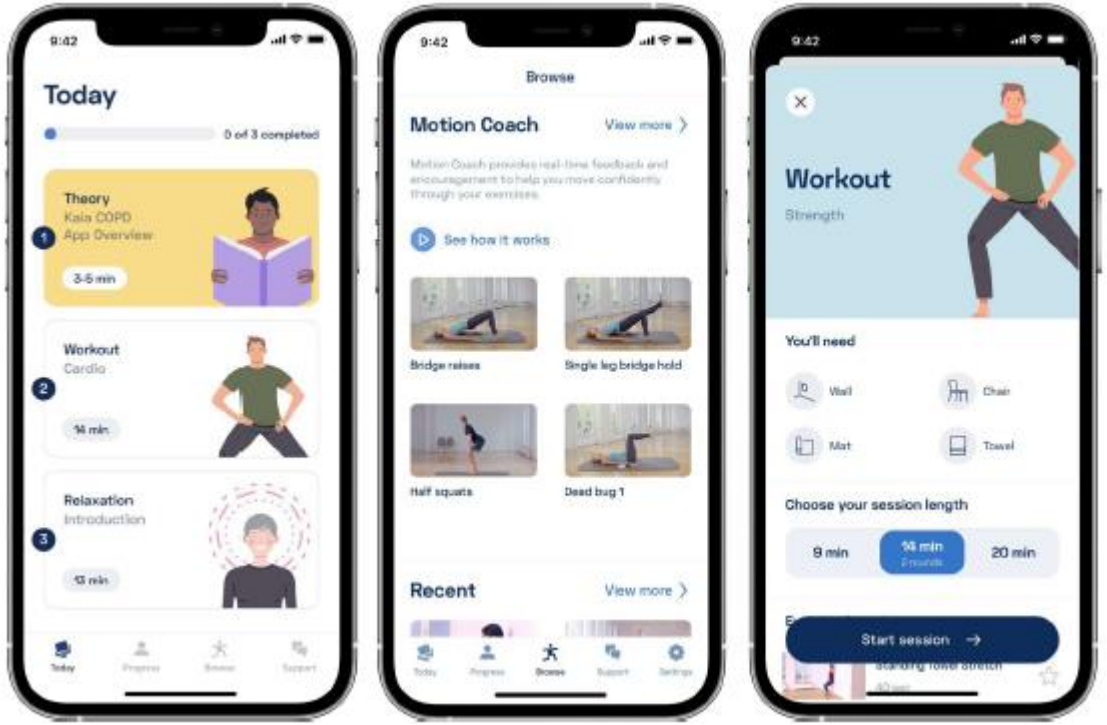
Figure 5. Topographic multiplanar rendered (tMPR, VIDA Diagnostics) computed tomographic images of target airway demonstrating tenting of the airway with an increase in diameter at 6 months postimplant relative to preimplant.

Contents

- Smoking cessation
- Vaccination
- Nutrition and physical activity
- Pulmonary rehabilitation
- Long-term oxygen therapy
- Noninvasive positive pressure ventilation
- Surgical and bronchoscopic intervention
- **Telemedicine in non-pharmacologic treatment**

Smartphone application-based pulmonary rehabilitation in COPD: a multicentre randomised controlled trial

Rainer Gloeckl ,[1,2] Marc Spielmanns,[3,4] Asta Stankeviciene,[5] Anne Plidschun,[5] Daniela Kroll,[1,2] Inga Jarosch,[1,2] Tessa Schneeberger,[1,2] Bernhard Ulm,[6] Claus F Vogelmeier,[7] Andreas Rembert Koczulla[1,2,8]



- **P:** 278 patients with COPD enrolled from 18 sites in Germany and Switzerland.
- **I:** 12 weeks of a mobile application-based PR
- **C:** standard care (the 'Living Well with COPD' booklet containing disease management information, education and encouragement to exercise, and a paper-based exercise diary)
- **O:** quality of life, measured by COPD Assessment Test (CAT), and exercise capacity, assessed by 1-minute-sit-to-stand-test (1MSTST)

Gloeckl R, et al. *Thorax*. 2025;80:209–217.

Table 1 Demographic and baseline disease characteristics (intention-to-treat population)

	Control group (n=142)	Intervention group (n=136)	P value
Age, years	64 (59–70)	66 (60–72)	0.166
Sex			0.628
Female	72 (50.7)	65 (47.8)	
Male	70 (49.3)	71 (52.2)	
BMI, kg/m²	26.4 (22.9–31.2)	25.5 (22.6–29.4)	0.083
COPD GOLD			0.999
I	5 (4.2)	4 (3.4)	
II	51 (42.9)	50 (42.7)	
III	63 (52.9)	63 (53.8)	
Smoking status			0.030
Current smoker	53 (37.3)	34 (25.2)	
Former smoker	89 (62.7)	102 (74.8)	
Mean smoking pack years	45 (35–54)	39 (25–49)	0.282
Age at COPD diagnosis	55 (49–61)	55 (50–62)	0.353
Comorbidities			
Cardiovascular	87 (61.3)	89 (66.4)	0.374
Orthopaedic	56 (39.4)	61 (45.2)	0.333
Metabolic	49 (34.5)	46 (34.3)	0.975
Psychological	33 (23.2)	32 (23.9)	0.900
Cerebrovascular	14 (10.0)	14 (10.4)	0.903
Treatment			
LABA	125 (88.0)	126 (92.6)	0.194
LAMA	127 (89.4)	124 (91.2)	0.624
ICS	86 (60.6)	86 (63.2)	0.647
LTOT	27 (19)	27 (20)	0.836
FEV_1, L	1.38 (1.03–1.77)	1.23 (1.04–1.66)	0.327
FEV_1, % predicted	48 (40–61)	48 (36–57)	0.222
FEV_1/FVC	0.52 (0.45–0.58)	0.50 (0.44–0.57)	0.135
COPD Assessment Test total score	23 (21–26)	23 (21–26)	0.617
1-minute sit-to-stand test repetitions	18 (14–22)	17 (13–22)	0.196
Patients with at least one acute COPD exacerbation during the previous 12 months, n (%)	45 (31.6)	50 (36.8)	0.371

Table 2 The COPD Assessment Test total score and 1-minute sit-to-stand test at baseline, and change from baseline at 12 (co-primary outcomes) and 24 weeks (follow-up)

	Intention-to-treat population (including all patients)			Per-protocol population (including only adherent application users in the IVG)		
	Control group (n=142)	Intervention group (n=136)	Intervention group vs control group differences	Control group (n=122)	Intervention group (n=46)	Intervention group vs control group differences
COPD Assessment Test total score						
Baseline	23 (21 to 26)	23 (21 to 26)		23 (21 to 25)	22 (20 to 25)	
Week 12, change from baseline	−3 (−8 to 0)	−4 (−8 to −1)	0 (−1 to 2) p=0.697	−3 (−8 to 0)	−4 (−8 to −2)	1 (−1 to 3) p=0.409
Week 24, change from baseline	−3.5 (−8 to 1)	−4 (−9 to −1)	2 (−0 to 3) p=0.074	−3 (−8 to 1)	−4 (−9 to −2)	2 (−0 to 4) p=0.075
1-minute sit-to-stand test, repetitions						
Baseline	18 (14 to 22)	17 (13 to 22)		18 (24 to 23)	18 (13 to 22)	
Week 12, change from baseline	2 (0 to 6)	1 (−1 to 4)	1 (0 to 2) p=0.120	2 (0 to 6)	3 (0 to 4)	0 (−2 to 2) p=0.901
Week 24, change from baseline	4 (0 to 7)	3 (0 to 6)	0 (−1 to 2) p=0.485	4 (0 to 7)	3 (1 to 6.5)	0 (−2 to 1) p=0.709

COPD, chronic obstructive pulmonary disease; IVG, intervention group.

▶ No difference in improvement of CAT score and 1MSTST between two groups

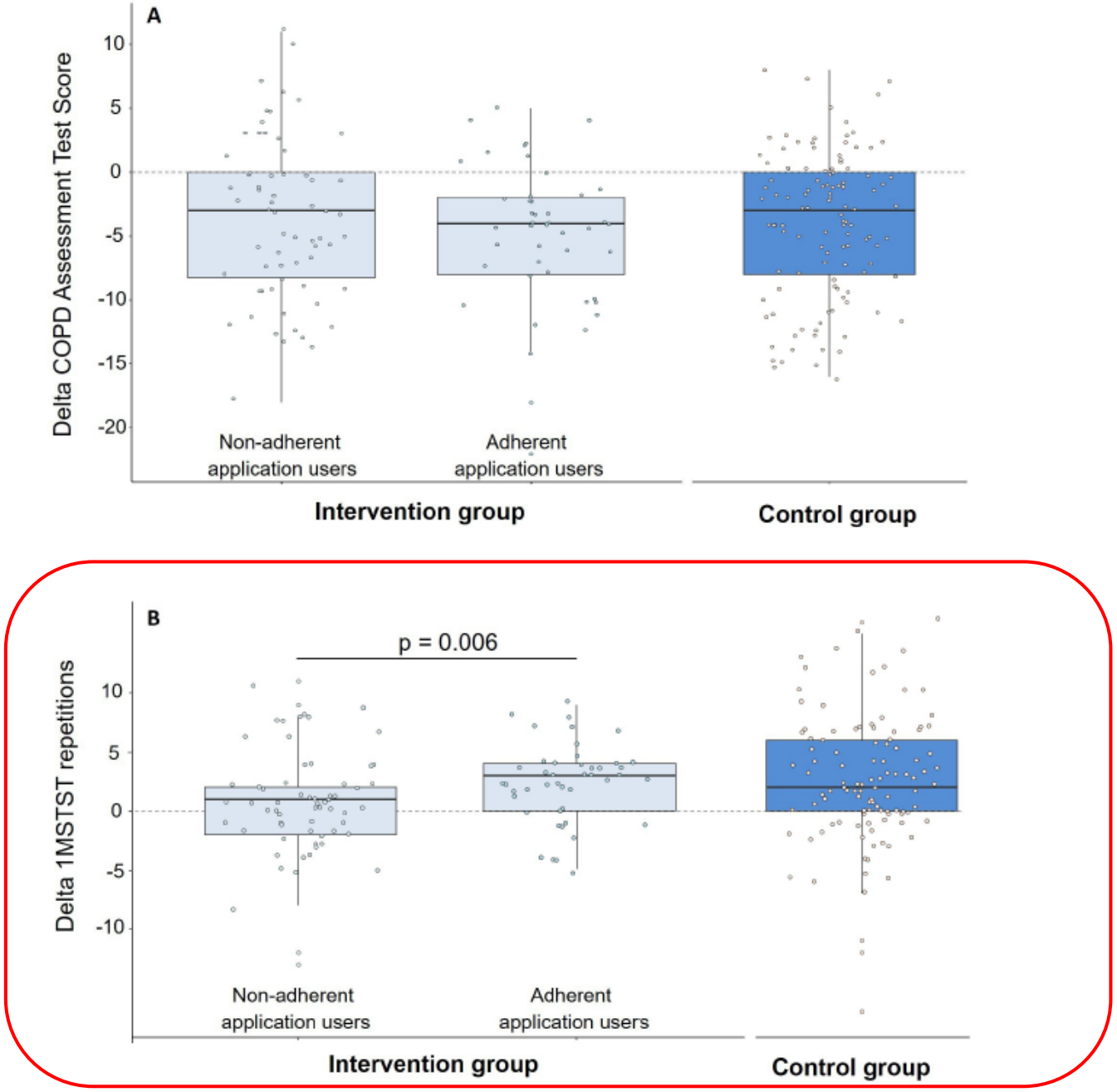


Figure 3 Changes in COPD Assessment Test score (A) and changes in 1-minute sit-to-stand test (1MSTST) repetitions (B) from baseline to week 12 between adherent application users (≥75% adherent training weeks, n=46) and non-adherent application users (<75% adherent training weeks, n=68) in the intervention group and the control group (n=122). COPD, chronic obstructive pulmonary disease.

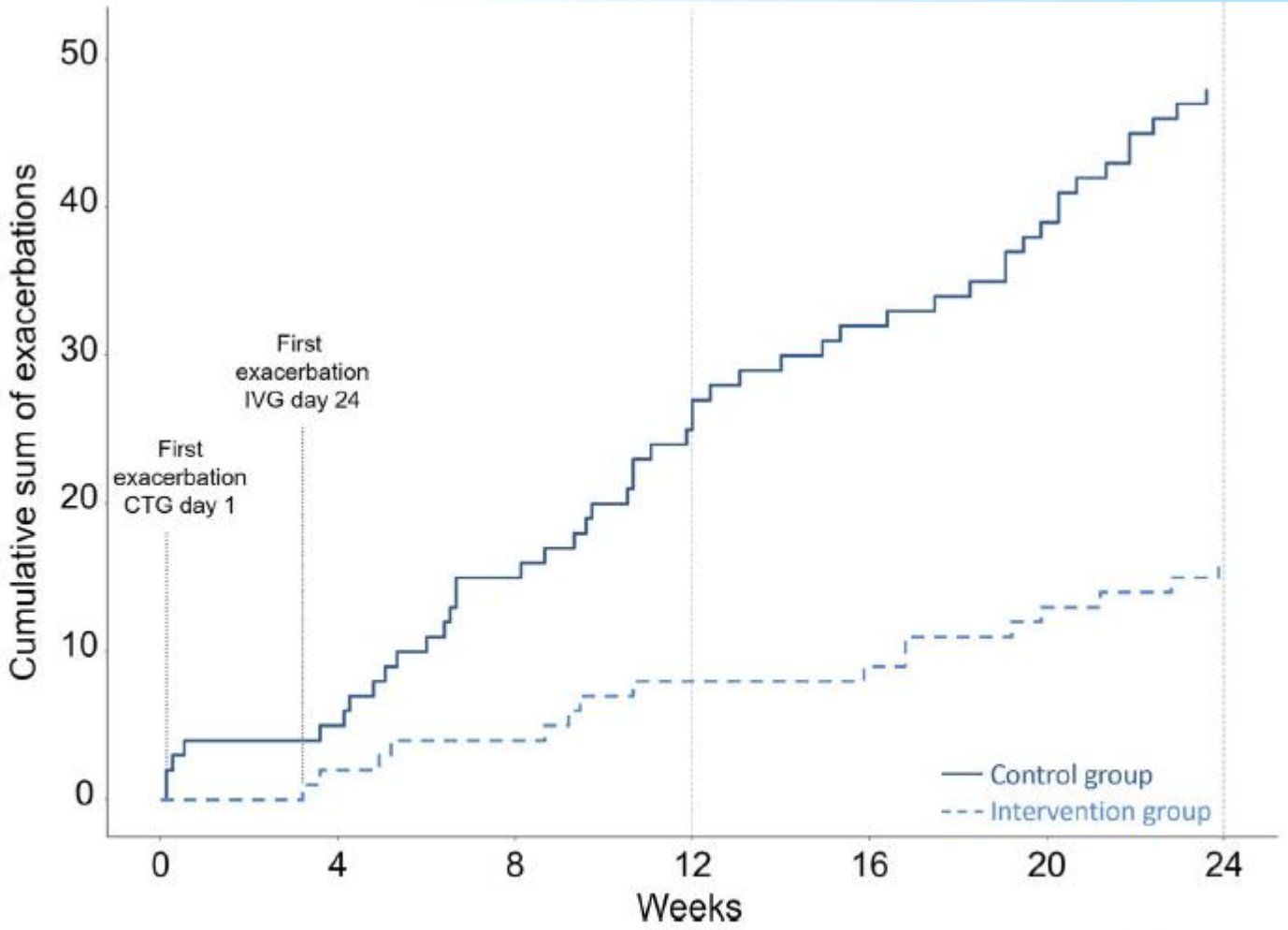


Figure 4 This Kaplan-Meier plot shows the cumulative sum of exacerbations in the per-protocol population over 24 weeks (control group: 48 acute exacerbations and 16 acute exacerbations in the intervention group). The difference was not statistically significant. The first exacerbation occurred on day 1 in the control group (CTG) and on day 24 in the intervention group (IVG); HR (95% CI) IVG 0.83 (0.41, 1.69) (post-hoc analysis).

▶ Fewer patients in IVG experienced exacerbation than the controls

Comparison of Clinically Meaningful Improvements After Center-Based and Home-Based Telerehabilitation in People With COPD

Narelle S. Cox, PhD; Christine McDonald, PhD; Angela T. Burge, PhD; Catherine J. Hill, PhD; Janet Bondarenko, MSc; and Anne E. Holland, PhD

- **P:** 266 patients with COPD from 2 separate RCTs, which compared home-based tele-rehabilitation with center-based rehabilitation.
- **I:** tele-rehabilitation delivered with telephone or videoconference.
- **C:** center-based rehab, 2 in-person sessions per week
- **O:** the number of responders for functional exercise capacity, quality of life, and symptoms for each model of delivery (home-based telerehabilitation vs center-based pulmonary rehabilitation) at 12mo f/u.

Chest. 2025;167(4):1003-1011.

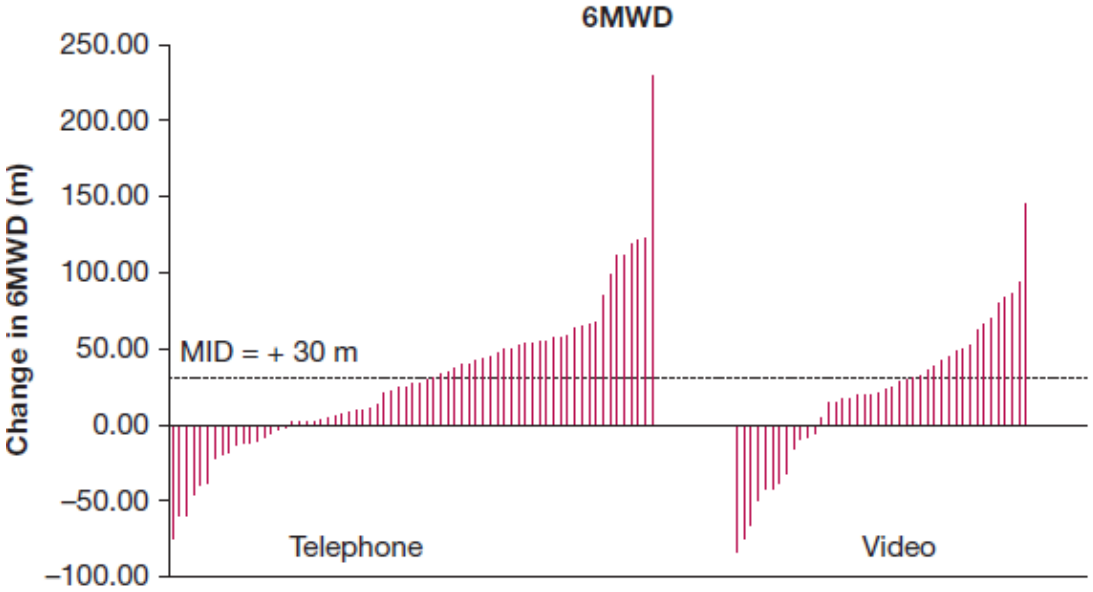
TABLE 1] Characteristics of Participants

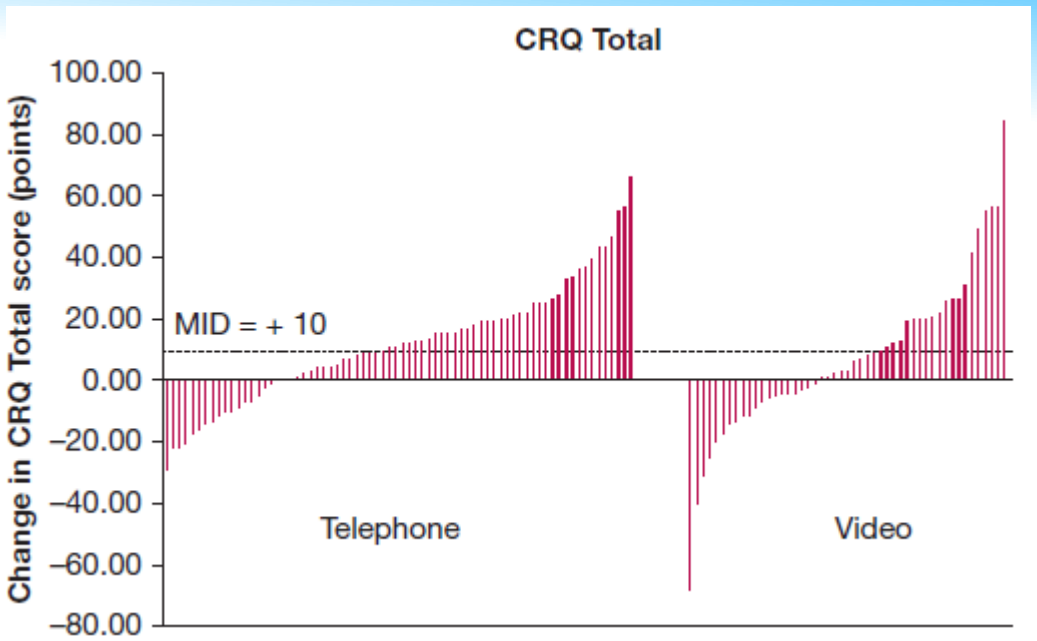
Characteristic	Center-Based PR (n = 136)	Telerehabilitation (n = 130)
Age, y	68 (10)	69 (9)
Male/female sex, No.	63/73	57/73
Smoking status		
Current	25 (18%)	21 (16%)
Former	109 (80%)	108 (83%)
Unknown	2 (1%)	1 (1%)
FEV_1		
L	1.3 (0.6)	1.3 (0.5)
% Predicted	51 (21)	51 (20)
FVC		
L	2.8 (0.9)	2.8 (0.8)
% Predicted	82 (23)	80 (20)
FEV_1 to FVC ratio, %	47 (16)	47 (16)
BMI, kg/m^2	27 (6)	28 (7)
LTOT	9 (7%)	10 (8%)
No. of comorbidities	4 (2-5)	4 (2-5)
6MWD, m	413 (99)	394 (119)
CRQ score		
Dyspnea scale	15 (6)	14 (5)
Fatigue scale	15 (5)	14 (6)
Emotion scale	32 (9)	32 (10)
Mastery scale	19 (5)	19 (6)
Total	81 (20)	80 (21)
mMRC score	2 (1-2)	2 (1-3)
PRAISE	47 (8)	48 (7)

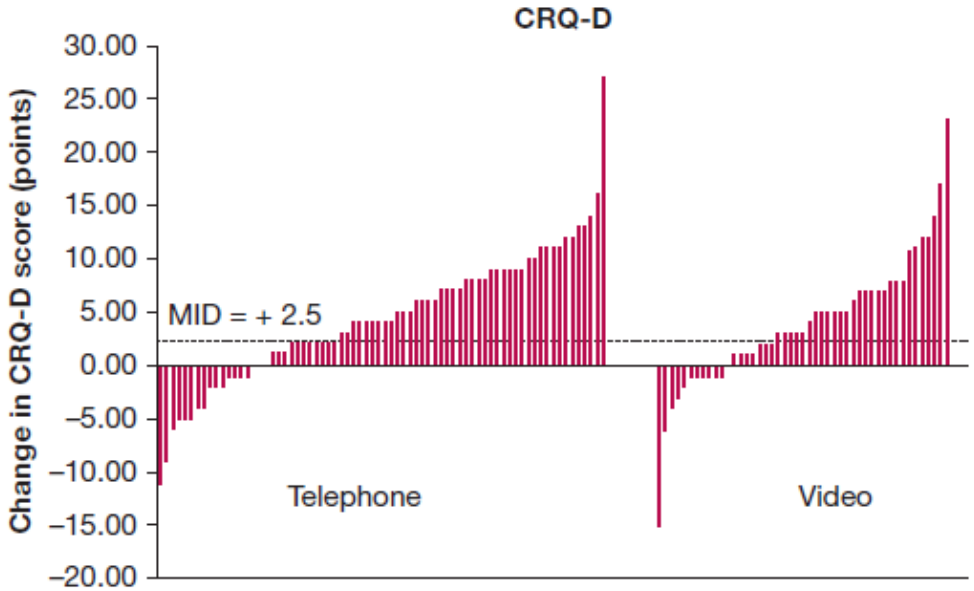
TABLE 3] Group Change Data and Responder Status at End of Rehabilitation and 12 Months

Outcome	End of Rehabilitation					12 Months				
	Center-Based PR		Telerehabilitation		*P* Value (Between-Group Responder Status)	Center-Based PR		Telerehabilitation		*P* Value (Between-Group Responder Status)
	Group Change From Baseline	Responders	Group Change From Baseline	Responders		Group Change From Baseline	Responders	Group Change From Baseline	Responders	
6MWD	18 (8-28)	44 (40)	26 (16-35)	50 (46)	.460	2 (−16 to 19)	32 (36)	4 (−12 to 20)	29 (36)	1.000
CRQ-D score	3.4 (2.3-4.6)	72 (57)	4.3 (3.1-5.4)	72 (61)	.633	1.7 (0.3 to 3.1)	48 (47)	1.1 (−0.3 to 2.4)	39 (40)	.372
CRQ-F score	1.4 (0.5-2.3)	69 (55)	2.1 (1.1-3.1)	62 (51)	.669	1.5 (0.5-2.6)	57 (56)	1.3 (−0.02 to 2.5)	43 (44)	.120
CRQ-E score	2.9 (1.3-4.5)	57 (45)	2.4 (0.7-4.1)	50 (41)	.622	2.8 (1.1-4.5)	49 (48)	2.8 (0.9-4.7)	42 (42)	.511
CRQ-M score	2.1 (1.3-2.9)	66 (52)	1.6 (0.5-2.8)	59 (49)	.659	1.3 (0.2-2.3)	52 (51)	1.1 (−0.2 to 2.3)	43 (43)	.352
CRQ total score	9.8 (6.4-13.3)	60 (48)	10.0 (6.0-14.1)	59 (49)	.958	7.3 (3.3-11.3)	45 (44)	6.3 (1.5-11.0)	40 (41)	.742
mMRC scale score	−0.2 (−0.3 to −0.003)	44 (35)	−0.3 (−0.4 to −0.1)	45 (38)	.773	0.3 (0.02-0.5)	22 (22)	0.1 (−0.2 to 0.3)	32 (32)	.151

The proportion of responders for functional exercise capacity, health-related quality of life, and symptoms was **not different** between center-based pulmonary rehabilitation and home-based telerehabilitation at either end rehabilitation or the 12-month follow-up.







The proportion of responders was not different when method of telerehabilitation (telephone vs videoconferencing)

Real-world telemonitoring and remote support for home non-invasive ventilation to improve therapy effectiveness: the exploratory, multicentre randomised eVENT study

Arnaud Prigent ,[1] Joëlle B Texereau ,[2,3] Claude Schmitz,[4] Cécile Ropars,[1] Jean-Marc Degreef,[5] Marion Teulier,[6] Christian Darne,[7] Franck Lavergne,[8] Hélène Pasche,[3] Capucine Morelot-Panzini[6,9]

- **P:** 56 patients (Pts with COPD, n=23) recently started on home NIV, eligible in the ETAPES programme, a French national telemonitoring program.
- **I:** telemonitoring (n=27, COPD n=12), a CE-marked algorithm generated alerts based on tele-transmitted ventilator data.
- **C:** usual follow-up (n=26, COPD n=11)
- **O:** mean nocturnal transcutaneous carbon dioxide level (PtCO2) on NIV after 6 months.
  +ABGs on room air and the absence of nocturnal or diurnal hypercapnia

Prigent A, et al. *Thorax.* 2025;80:720–729.

Table 1 Demographic and clinical characteristics at baseline, overall and by study group

Characteristic	TM group (n=27)	UF group (n=26)	Overall (n=53)
Age, years	64.6±9.7	67.5±16.5	66.0±13.4
Female sex, n (%)	14 (51.9)	15 (57.7)	29 (54.7)
Primary respiratory disease, n (%)			
COPD	12 (44.4)	11 (42.3)	23 (43.4)
OHS	12 (44.4)	12 (46.2)	24 (45.3)
Other*	3 (11.1)	3 (11.5)	6 (11.3)
BMI, kg/m^2†	38.1 (26.5; 44.8)	33.0 (26.7; 37.5)	34.9 (26.8; 39.9)
Patients with OSA, n (%)	21 (77.8)	9 (34.6)	30 (56.6)
Common non-respiratory comorbidities‡, n (%)			
Hypertension	13 (48.1)	18 (69.2)	31 (58.5)
Cardiac or cerebrovascular disease	10 (37.0)	12 (46.2)	22 (41.5)
Diabetes	8 (29.6)	7 (26.9)	15 (28.3)
Smoking status			
Previous smoker, n (%)	11 (40.7)	7 (26.9)	18 (34.0)
Current smoker, n (%)	8 (29.6)	5 (19.2)	13 (24.5)
Pack-years	32.3±18.1	38.6±20.7	34.7±19.1
Presence of caregiver at home§, n (%)	11 (50.0)	5 (45.5)	16 (48.5)
Hospitalised with CRF in the previous year, n (%)	8 (29.6)	11 (42.3)	19 (35.8)
COPD patients hospitalised for an acute respiratory episode in the previous 2 months, n (%)	4 (14.8)	4 (15.4)	8 (15.1)
Pulmonary function tests			
FEV_1/FVC, %	69.2±14.8	66.1±17.7	67.6±16.2
FEV_1, % predicted	64.6±24.6	56.5±23.5	60.5±24.1
PaO_2 in room air before NIV, mm Hg	64.7±11.4	67.0±8.9	65.8±10.2
$PaCO_2$ in room air before NIV, mm Hg	51.0±7.6	52.6±5.1	51.8±6.45
Characteristics of NIV			
Use of an oronasal mask, n (%)	15 (55.6)	16 (61.5)	31 (58.5)
IPAP, cmH_2O	15.6±2.4	16.2±3.6	15.9±3.0
EPAP, cmH_2O	6.9±1.8	6.9±2.0	6.9±1.9
Concomitant oxygen therapy, n (%)	4 (14.8)	2 (7.7)	6 (11.3)

Table 2 Non-invasive ventilation effectiveness and quality at 6-month follow-up

Outcomes	TM group (n=27)	UF group (n=26)	p-value
NIV effectiveness			
Nocturnal capnography on NIV			
n	23	23	
Mean $PtCO_2$, mm Hg	42.1±6.1	43.9±6.4	0.352*
Patients with mean $PtCO_2$≤50 mm Hg, n (%)	21 (91.3)	19 (82.6)	0.665†
Time with $PtCO_2$>50 mm Hg, % recording time	10.7±26.0	15.5±29.5	0.281‡
Time with SpO_2<90%, % recording time	14.4±24.4	13.3±20.8	0.733‡
Arterial blood gases in room air			
n	23§	19¶	
PaO_2, mm Hg	77.2±13.1	76.1±17.6	0.463‡
$PaCO_2$, mm Hg	41.7±6.8	46.2±3.5	0.003‡
Patients with $PaCO_2$<45 mm Hg, n (%)	18 (78.3)	6 (31.6)	0.002**
Absence of diurnal or nocturnal hypercapnia			
N	23	22	
Achieved††, n (%)	19 (82.6)	6 (27.3)	<0.001**
NIV quality			
NIV use			
n	22	21	
NIV use, hour/day	6.2±3.3	4.1±3.3	0.0504‡
Number of days of≥4 hours/day of NIV use	22.0±11.2	16.3±12.6	0.305‡
Patients with mean NIV use ≥4 hours/day, n (%)	17 (77.3)	10 (47.6)	0.044**
Non-intentional leaks			
n	20	14	
Median, L/min	2.6±2.8	9.7±9.7	0.007‡
95th percentile, L/min	16.7±12.7	30.6±21.5	0.018‡
Patients with mean median leaks ≤24 L/min, n (%)	14 (70.0)	8 (57.1)	0.487†
AHI			
n	20	14	
Mean, events/hour	2.1±2.4	3.6±5.4	0.517‡
Patients with mean AHI <10 events/hour, n (%)	20 (100.0)	13 (92.9)	0.412†
Successful NIV quality			
N	22	21	
Achieved‡‡, n (%)	12 (54.5)	6 (28.6)	0.084**

-No difference in PtCO2, however better PaCO2 in TM group.
-Better NIV effectiveness & quality in TM group.

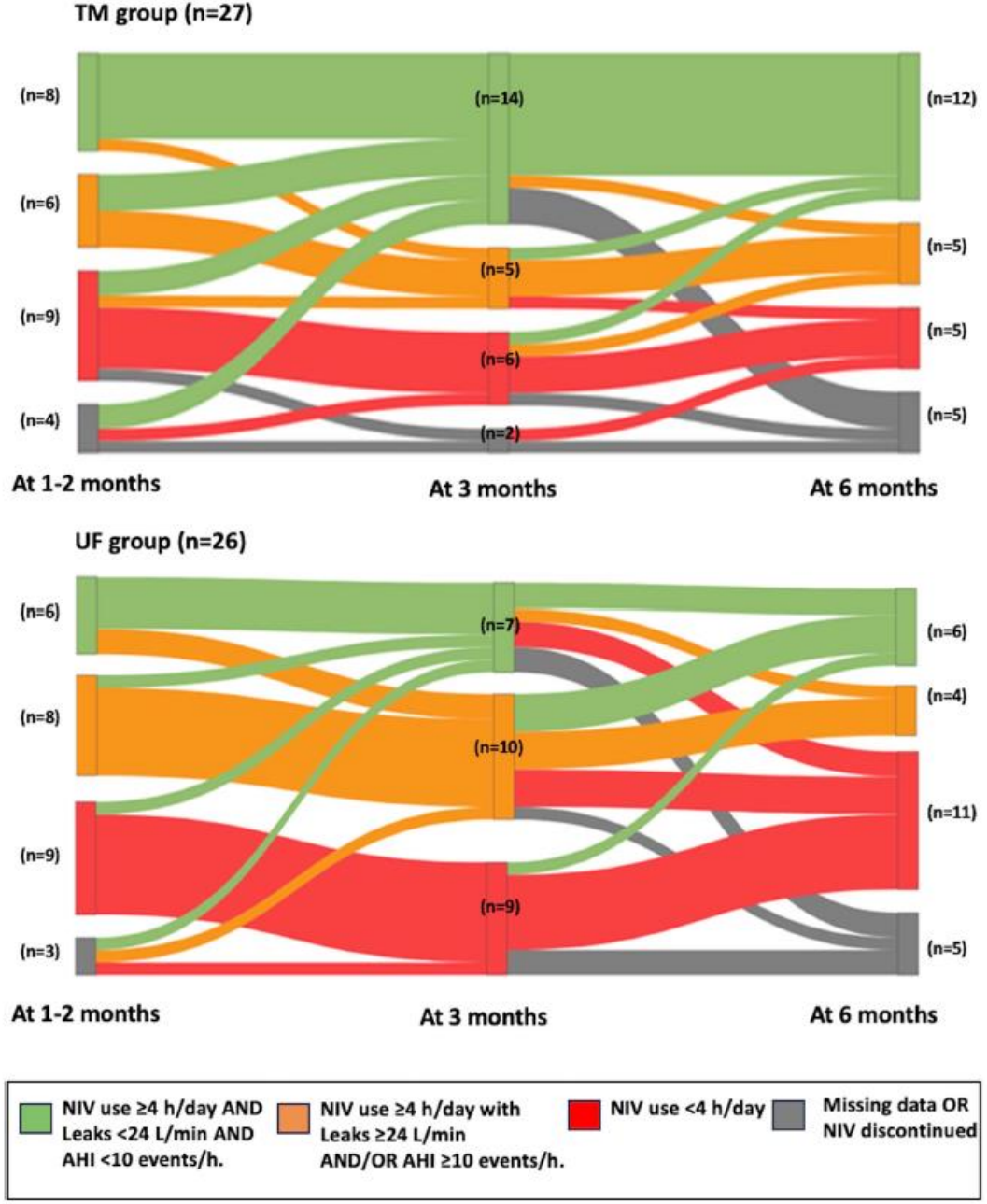


Figure 3 Sankey plots showing changes in the quality of non-invasive ventilation (NIV) therapy over time in the telemonitoring (TM) and usual follow-up (UF) groups. The colour of the lines indicates the quality of NIV therapy as defined below the Sankey plots, and the thickness of the lines represents the number of patients. Values in parentheses indicate the numbers of patients in each NIV quality category at each time point. AHI, apnoea–hypopnoea index.

Summary

- Non-pharmacologic interventions remain essential components of comprehensive COPD management, addressing symptoms, exacerbations, functional status, and quality of life beyond pharmacologic therapy.

- Smoking cessation, vaccination, optimized nutrition, and physical activity are consistently associated with reduced exacerbation risk and improved long-term outcomes.
- Pulmonary rehabilitation, including home-based and digitally delivered models, demonstrates comparable effectiveness to center-based programs and expands accessibility.
- Long-term oxygen therapy and noninvasive ventilation provide meaningful benefits when appropriately targeted and monitored, with adherence being critical to clinical outcomes.

- Emerging interventional, and telemedicine-based strategies offer promising, patient-tailored approaches, emphasizing the future role of **personalized non-pharmacologic care** in COPD.