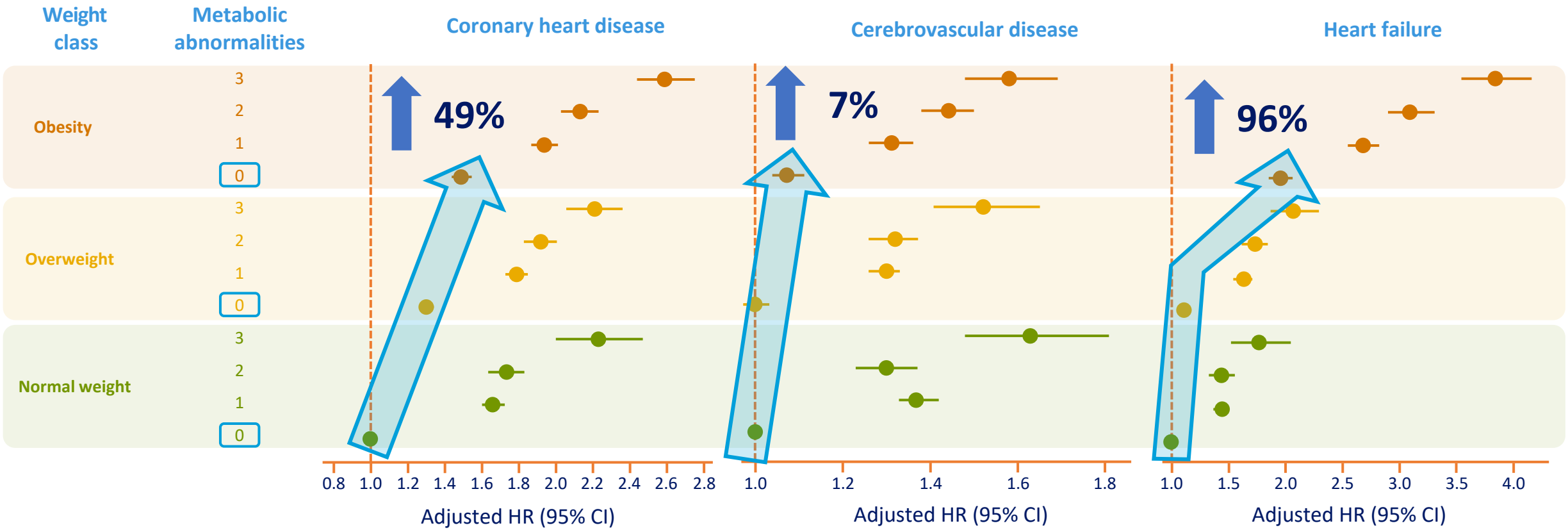
Il rischio di scompenso cardiaco nel prediabete e nell'obesità, quali strategie di intervento?

Riccardo Candido
Professore Associato di Endocrinologia
Università di Trieste
Presidente Nazionale AMD

JACC
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY

Metabolically Healthy Obese and Incident Cardiovascular Disease Events Among 3.5 Million Men and Women

Overweight and obesity increase the risk of CVD even in the absence of metabolic abnormalities

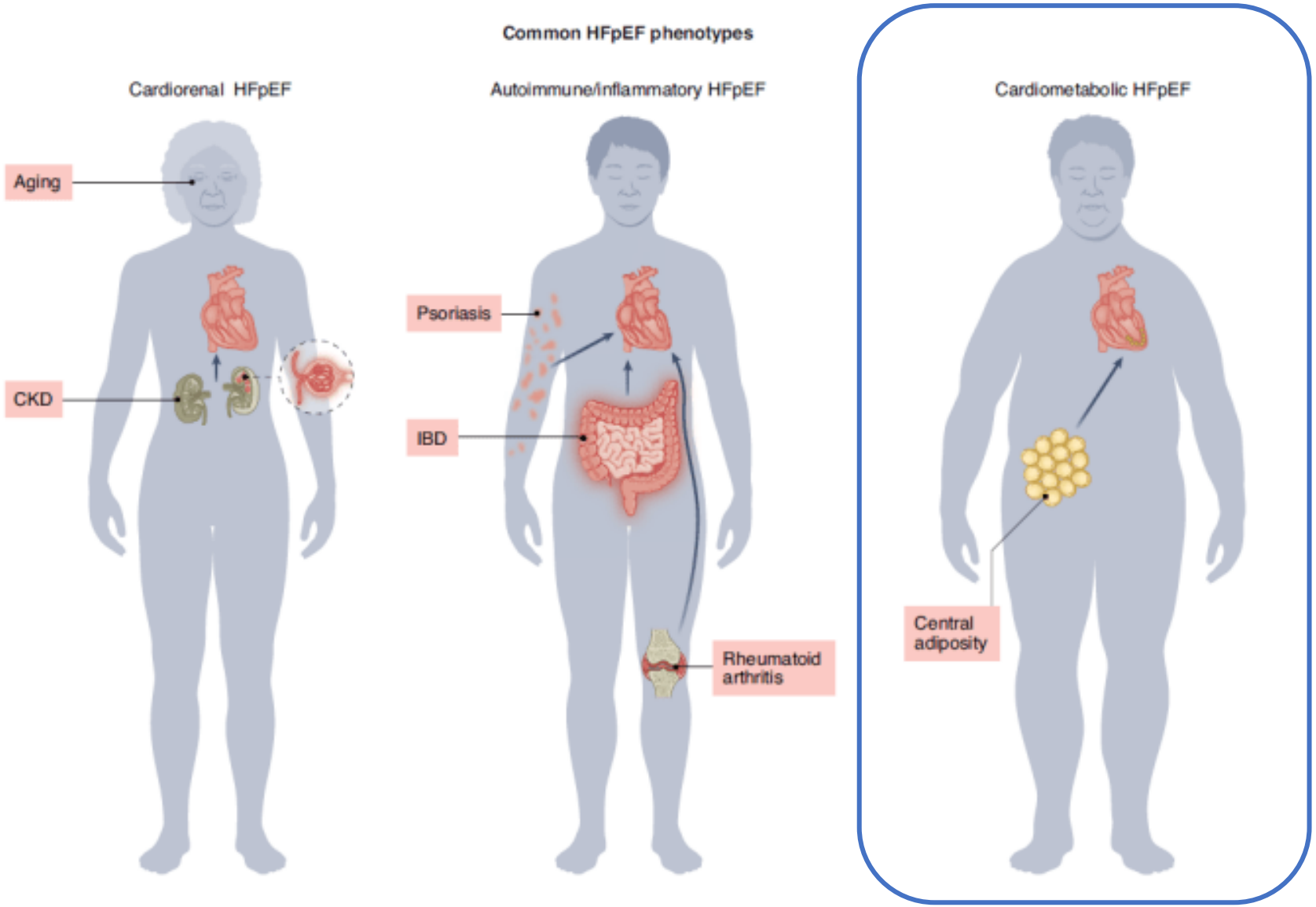


The three metabolic abnormalities (diabetes, hypertension and hyperlipidaemia) were summed to create ametabolic abnormalities score (0, 1, 2, and 3). †Analyses adjusted for age, sex, smoking status, and social deprivation. The reference category is normal weight, no metabolic abnormalities. CI, confidence interval; CHD, coronary heart disease; CVD, cardiovascular disease; HR, hazard ratio; PVD, peripheral vascular disease;

Caleyachetty R et al. J Am Coll Cardiol 2017;70:1429–37.

Common phenotypes of HFpEF

nature cardiovascular research



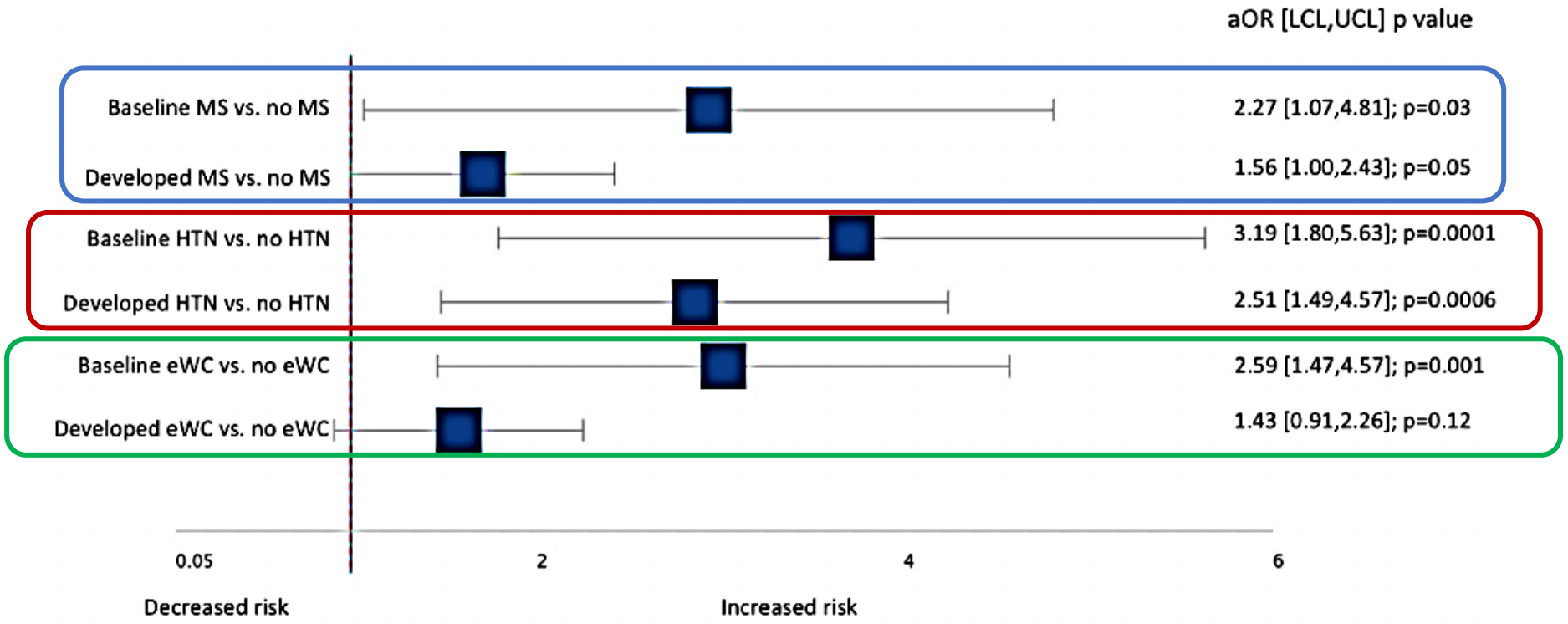
Schiattarella, G.G, et al.. Nat Cardiovasc Res 2022;1:211–222.

Metabolic syndrome and the risk of preclinical HF

Insights after 17 years of follow-up from the STANISLAS Cohort

Presence of preclinical HF after 17 years (p = 0.016):

- No MS: **46%**
- Developed MS: **58%**
- Baseline MS: **68%**



MS, metabolic syndrome; HTN, hypertension; eWC: elevated waist circumference; aOR, adjusted odds ratio; LCL, lower confidence limit; UCL, upper confidence limit

Sharma A, et al. Cardiology 2022;147(3):281-287.

Metabolic syndrome and the risk of preclinical HF

Insights after 17 years of follow-up from the STANISLAS Cohort

The study demonstrated that after **17 years** of follow-up:

- Patients with **baseline MS**, especially those with **obese** and **hypertensive phenotypes**, are at **increased risk** of developing **preclinical HF**.
- As a result, the **primary prevention** of **preclinical HF** should be an important public health concern given the **high risk of mortality** when patients with metabolic aberrations are diagnosed with **clinically confirmed HF**.

1. **Dietary strategies** to **reduce weight**, especially among individuals who are **obese** and **hypertensive**, may represent **a strategy for HF prevention**.
2. Furthermore, evaluation of **medical intervention** among patients **free of cardiovascular disease** with an **obese-hypertensive phenotype** to **prevent future HF** development is warranted.

Sharma A, et al. Cardiology 2022;147(3):281-287.

Diabete e funzione diastolica

Fontes-Carvalho *et al. Cardiovascular Diabetology* (2015) 14:4
DOI 10.1186/s12933-014-0168-x

CARDIO VASCULAR DIABETOLOGY

ORIGINAL INVESTIGATION **Open Access**

Diastolic dysfunction in the diabetic *continuum*: association with insulin resistance, metabolic

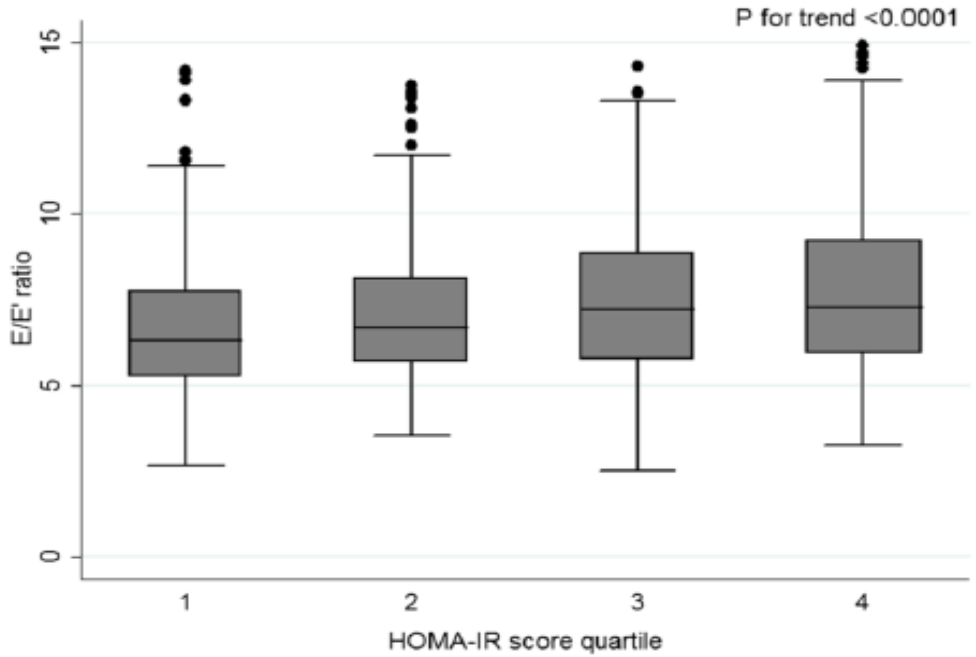


Figure 2 E/E' ratio according to insulin resistance quartiles.

Evaluation and management of heart failure with preserved ejection fraction

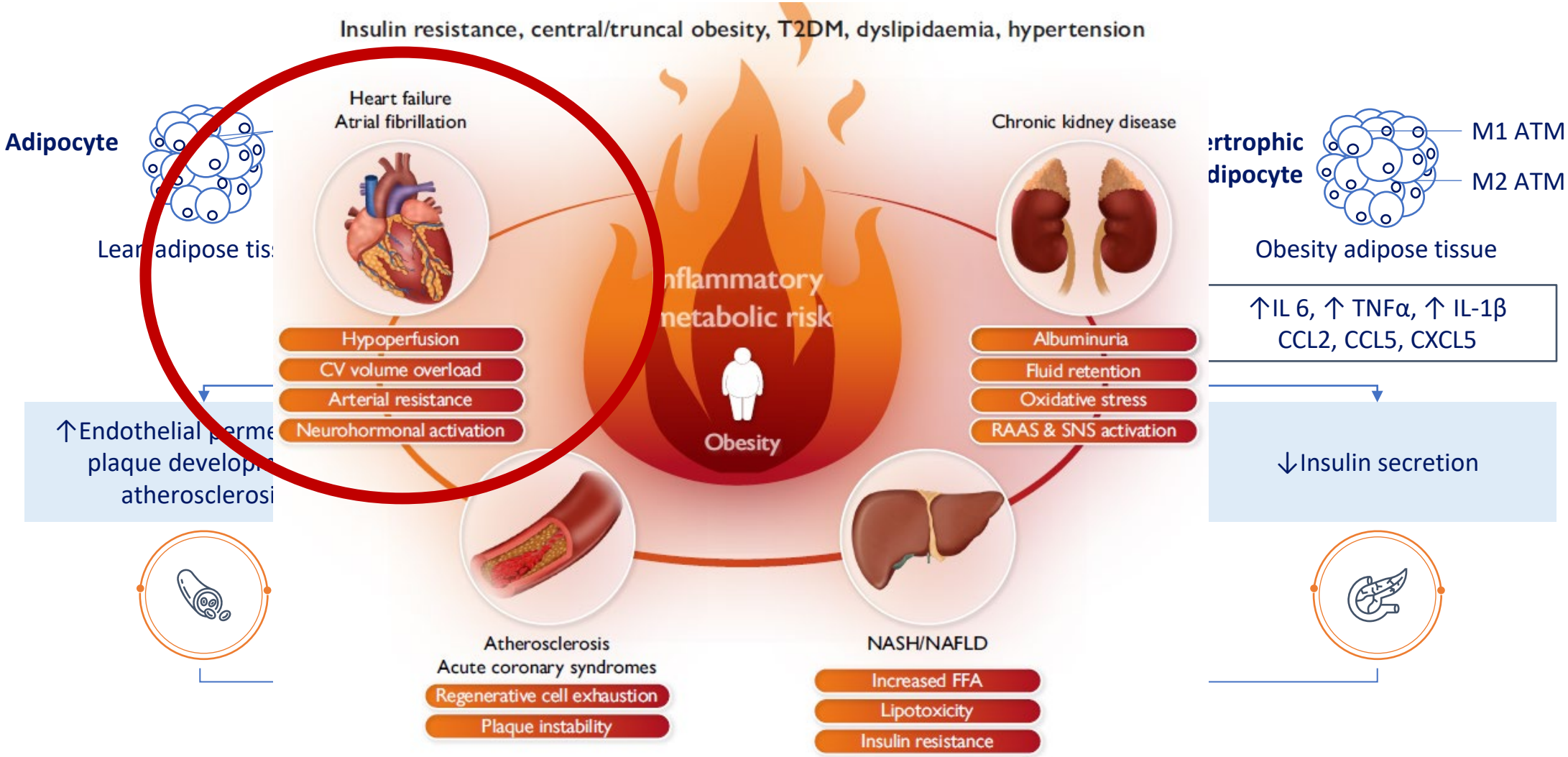
Predictors of HFpEF

Parameters	Odds ratio	C-statistic	Sensitivity (%)	Specificity (%)	*P* value
Clinical					
Age >60 years	6.20	0.704	80	60	<0.0001
Obesity	3.46	0.651	65	65	<0.0001
Grade II obesity or higher[a]	4.02	0.615	35	88	<0.0001
Chronic kidney disease stage 3 or higher	3.38	0.584	26	90	<0.0001
Hypertension	5.33	0.664	86	47	<0.0001
Atrial fibrillation	12.35	0.652	35	96	<0.0001
Diabetes mellitus	2.80	0.579	28	88	0.0003
Prediabetes or diabetes	2.82	0.624	55	70	<0.0001

Borlaug BA, Nat Rev Cardiol. 2020;17(9):559-573

Pathophysiology of obesity to cardiovascular disease

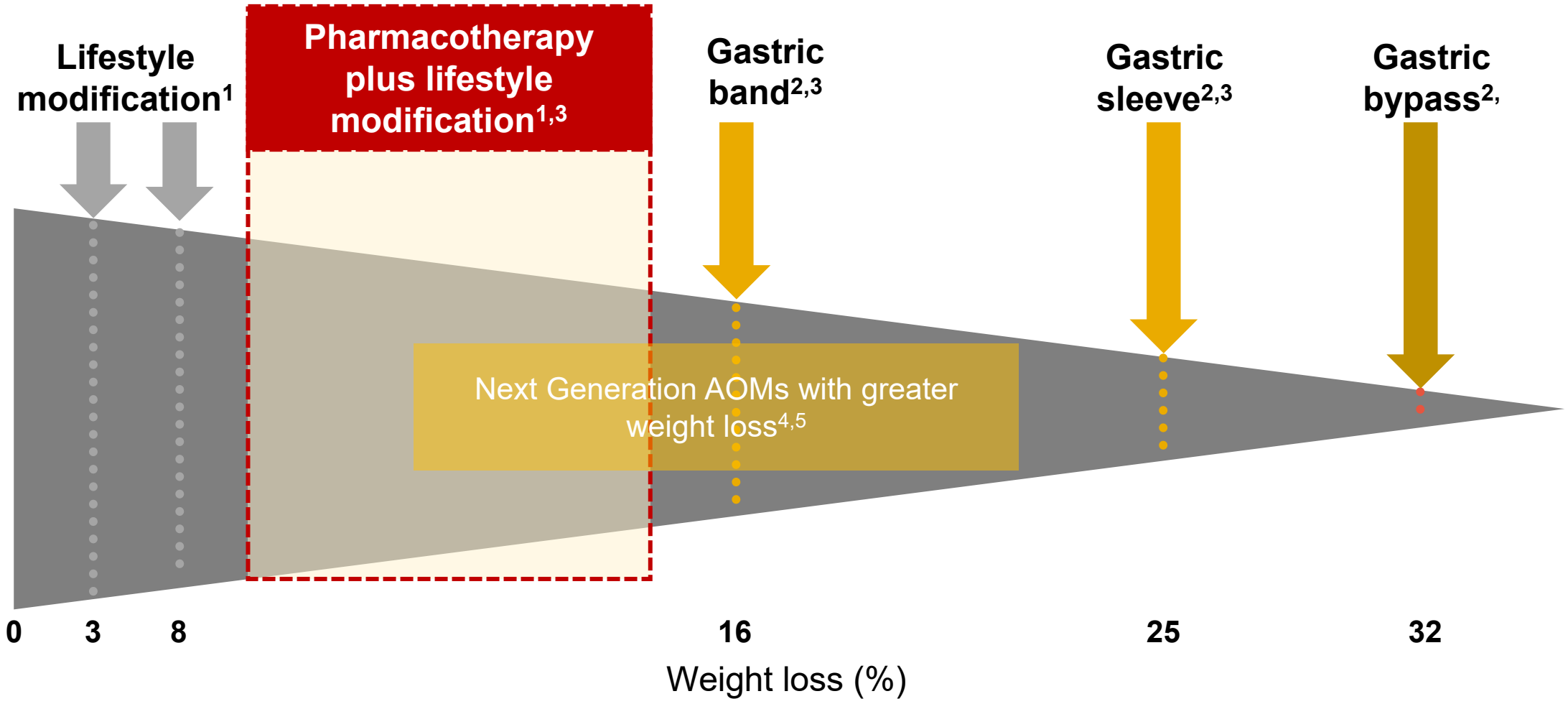
Significance of adipose tissue



CCL, chemokine (C-C motif) ligand; CXCL5, chemokine (C-X-C motif) ligand 5; IL, interleukin; PwO, patient with obesity; TNFα, tumour necrosis factor alpha; M1 ATM, classically activated adipose tissue macrophages; M2 ATM, alternatively activated adipose tissue macrophages; pWo, patients with obesity

Yao L, et al. J Immunol Res 2014;2014:181450
Cosentino F et al. Eur Heart J. 2023 Oct 14;44(39):4141-4156

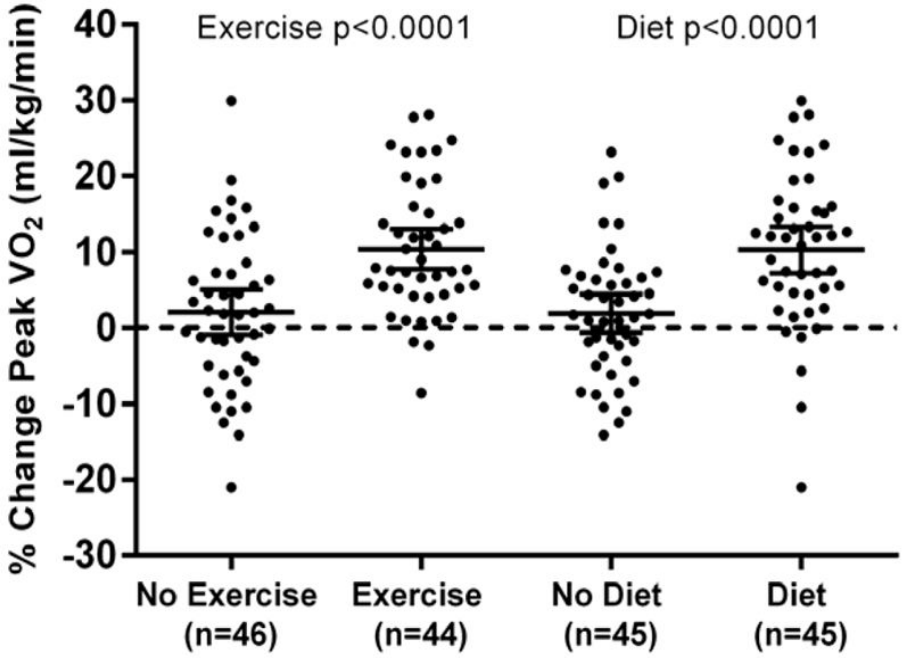
Continuum of Weight Management in Obesity



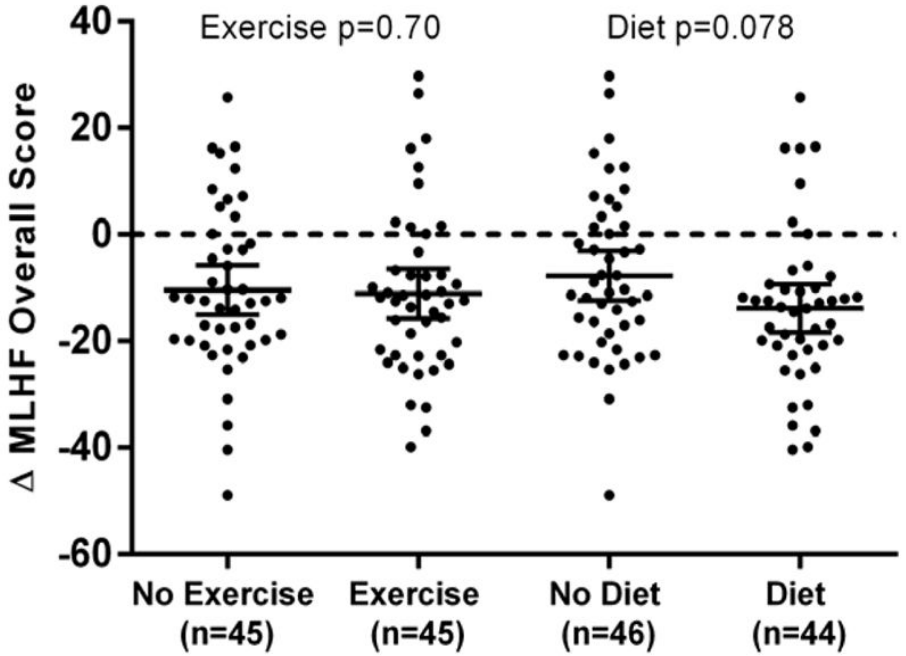
1. Jensen et al. Circulation 2014;129(25 Suppl 2):S102–38; 2. Courcoulas et al. JAMA 2013;310:2416–25; 3. Obesity Drug Outcome Measures: A Consensus Report of Considerations Regarding Pharmacologic Intervention. Available at: http://sphhs.gwu.edu/pdf/releases/obesitydrugmeasures.pdf. 4. WEGOVY ® Prescribing information Jun 2021; 5. Pilisti, E et al. Metab. Clin. Exp. 2019.; 92: 170-192

Effect of Caloric Restriction or Aerobic Exercise Training on Peak Oxygen Consumption and Quality of Life in Obese Older Patients with Heart Failure and Preserved Ejection Fraction A Randomized, Controlled Trial

Dalane W. Kitzman[1], **Peter Brubaker, PhD**[2], **Timothy Morgan**[3], **Mark Haykowsky**[4], **Gregory Hundley**[1], **William E. Kraus**[5], **Joel Eggebeen**[6], and **Barbara J. Nicklas, PhD**[7]



Caloric restriction diet or aerobic exercise training increased peak oxygen consumption

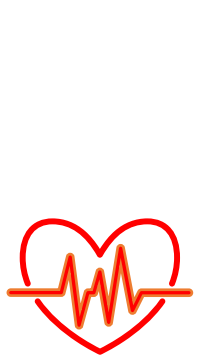


Neither intervention had a significant effect on quality of life as measured by the Minnesota Living with Heart Failure Questionnaire,

Weight Loss >10% Associated With Composite CV Endpoint Risk Reduction

Post hoc secondary analysis of Look AHEAD to assess whether CV incidence varied due to weight or fitness change. Analysis included the full cohort of control and intervention group participants combined

Reductions in body weight by >10%



21%

Risk reduction in primary outcome, which is a composite of

- CVD death
- MI
- Stroke
- Hospitalization for angina

24%

Risk reduction in secondary outcome, which included primary outcome indices plus

- CABG
- Carotid endarterectomy
- PCI
- **Hospitalization for CHF**
- PVD
- Total mortality

CABG=coronary artery bypass graft; CV=cardiovascular; CVD=cardiovascular disease; CHF=coronary heart failure; MI=myocardial infarction; PCI=percutaneous coronary intervention; PVD=peripheral vascular disease.

Look AHEAD Research Group. Lancet Diabetes Endocrinol. 2016;4(11): 913–921.

The Effects of Bariatric Surgery on Cardiovascular Outcomes and Cardiovascular Mortality: A Systematic Review and Meta-Analysis

Cureus 2023 Feb 7;15(2):e34723

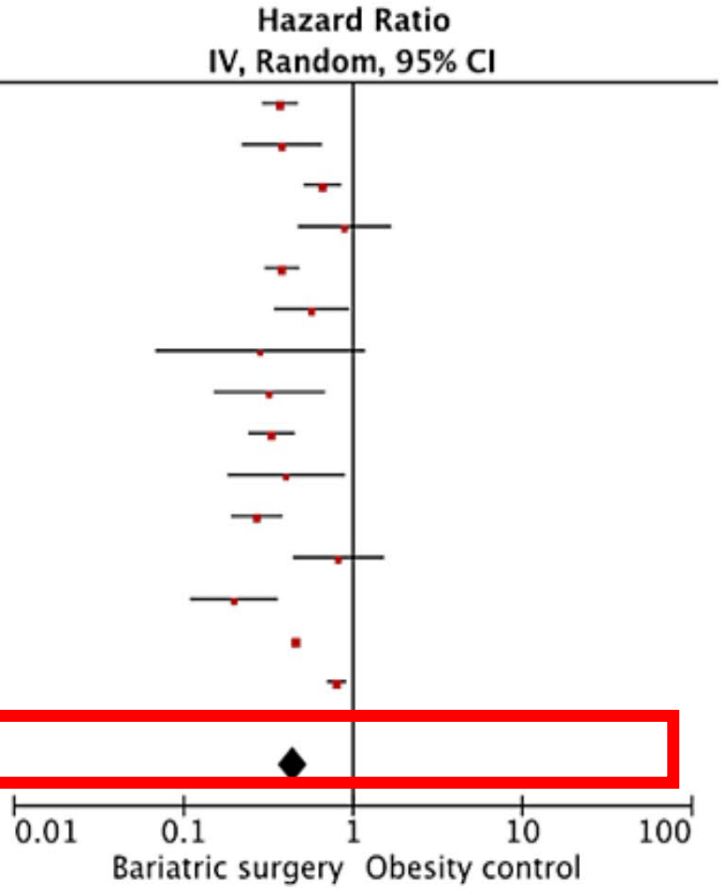
Harshith Chandrakumar [1], Nazima Khatun [1], Tanuj Gupta [1], Suzette Graham-Hill [2], Angelina Zhyvotovska [3], Samy I. McFarlane [1]

Effect on Heart Failure

Study or Subgroup	log[Hazard Ratio]	SE	Weight	Hazard Ratio IV, Random, 95% CI	Year
Persson et al 2017	-0.9943	0.1243	9.0%	0.37 [0.29, 0.47]	2017
Benotti et al 2017	-0.9676	0.2789	5.8%	0.38 [0.22, 0.66]	2017
Jamaly et al 2019	-0.4155	0.1315	8.8%	0.66 [0.51, 0.85]	2019
Alkharaiji et al 2019	-0.1165	0.3258	5.0%	0.89 [0.47, 1.69]	2019
Aminian et al 2019	-0.9676	0.1206	9.0%	0.38 [0.30, 0.48]	2019
Singh et al 2020	-0.5621	0.2636	6.1%	0.57 [0.34, 0.96]	2020
Wong et al 2020	-1.2623	0.7275	1.6%	0.28 [0.07, 1.18]	2020
Hoskuldsdottir et al 2020	-1.1394	0.3866	4.1%	0.32 [0.15, 0.68]	2020
Liakopoulos et al 2020	-1.1087	0.1625	8.2%	0.33 [0.24, 0.45]	2020
Moussa et al 2020	-0.9088	0.4084	3.8%	0.40 [0.18, 0.90]	2020
Hoskuldsdottir et al 2021	-1.3093	0.1793	7.8%	0.27 [0.19, 0.38]	2021
Rassen et al 2021	-0.1985	0.3176	5.1%	0.82 [0.44, 1.53]	2021
Dash et al 2021	-1.6195	0.3046	5.3%	0.20 [0.11, 0.36]	2021
Mentias et al 2022	-0.7765	0.0227	10.3%	0.46 [0.44, 0.48]	2022
Bouchard et al 2022	-0.2231	0.0681	9.9%	0.80 [0.70, 0.91]	2022
Total (95% CI)			**100.0%**	**0.45 [0.37, 0.55]**	

Heterogeneity: $Tau^2 = 0.10$; $Chi^2 = 107.02$, df = 14 ($P < 0.00001$); $I^2 = 87\%$

Test for overall effect: $Z = 7.97$ ($P < 0.00001$)

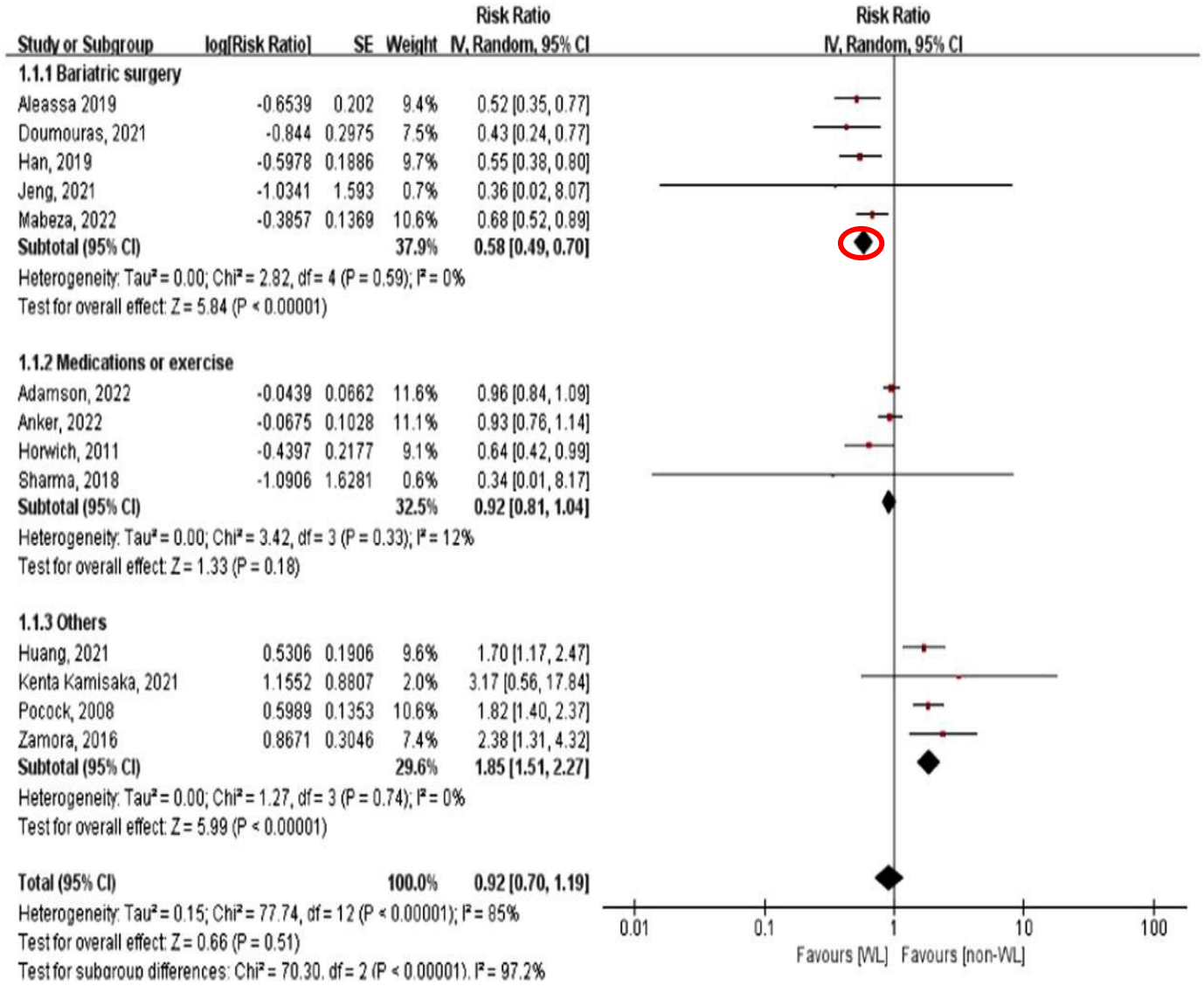


ESC European Society of Cardiology
European Journal of Preventive Cardiology (2023) **30**, 1906–1921
https://doi.org/10.1093/eurjpc/zwad284
FULL RESEARCH PAPER
Heart failure and cardiomyopathies

Effects of weight loss in heart failure patients with overweight and obesity: a systematic review and meta-analysis

Meixuan Chi[1,2†], Yangfan Nie[1,2†], Yue Su[2], Naijuan Wang[2], Anan Li[2], Tianyu Ma[2], and Yunying Hou [1,2*]

The effect of weight loss on mortality



Review > Obes Surg. 2023 Dec;33(12):4125-4136. doi: 10.1007/s11695-023-06898-4.
Epub 2023 Oct 28.

The Effect of Bariatric Surgery on Patients with Heart Failure: a Systematic Review and Meta- analysis

Ali Esparham [1], Ali Mehri [2], Hooman Hadian [3], Maryam Taheri [4], Hengameh Anari Moghadam [1], Armin Kalantari [5], Michael J Fogli [4 6], Zhamak Khorgami [7 8]

RESULTS:

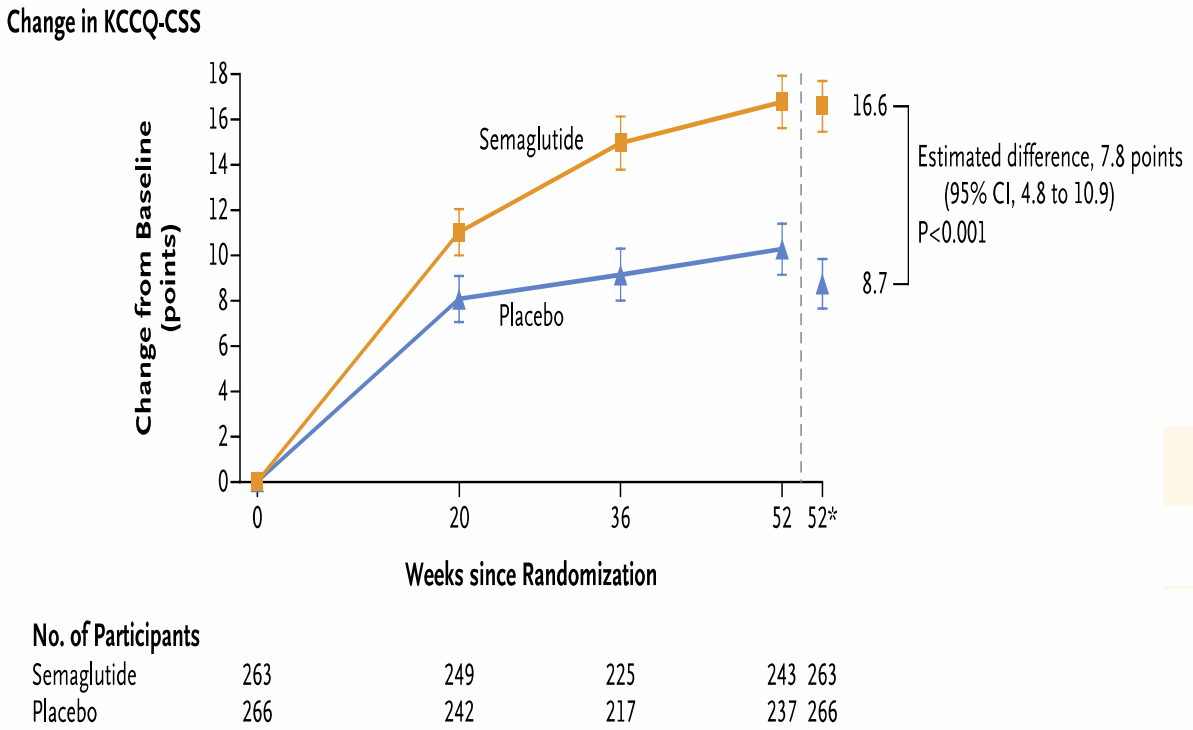
- LVEF significantly improved after BMS in patients with HF with a mean difference of 7.78% (CI 95%: 3.72, 11.84, $I^2 = 83.75$, p-value < 0.001).
- Also, the NYHA class significantly decreased after BMS with a mean difference of - 0.40 (CI 95%: - 0.62, - 0.19, I^2: 47.03, p-value < 0.001).
- A total of 27 patients with obesity and HF were listed for cardiac transplantation after BMS. Of those, 20 patients successfully underwent heart transplantation after BMS.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 21, 2023 VOL. 389 NO. 12

Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

529 patients who had heart failure with preserved ejection fraction and a body-mass index of 30 or higher to receive once-weekly semaglutide (2.4 mg) or placebo for 52 weeks.



Characteristic	Semaglutide (N=263)	Placebo (N=266)	Total (N=529)
Median KCCQ-CSS (IQR) — points§	59.4 (42.7–72.9)	58.3 (40.5–72.9)	58.9 (41.7–72.9)
Increase in KCCQ-CSS at week 52 — % of participants			
≥5-point increase	75.3	63.7	1.9 (1.3 to 2.8) —
≥10-point increase	63.4	48.5	2.1 (1.4 to 3.1) —

Kansas City Cardiomyopathy Questionnaire clinical summary score. Scores range from 0 to 100, with higher scores indicating fewer symptoms and physical limitations.

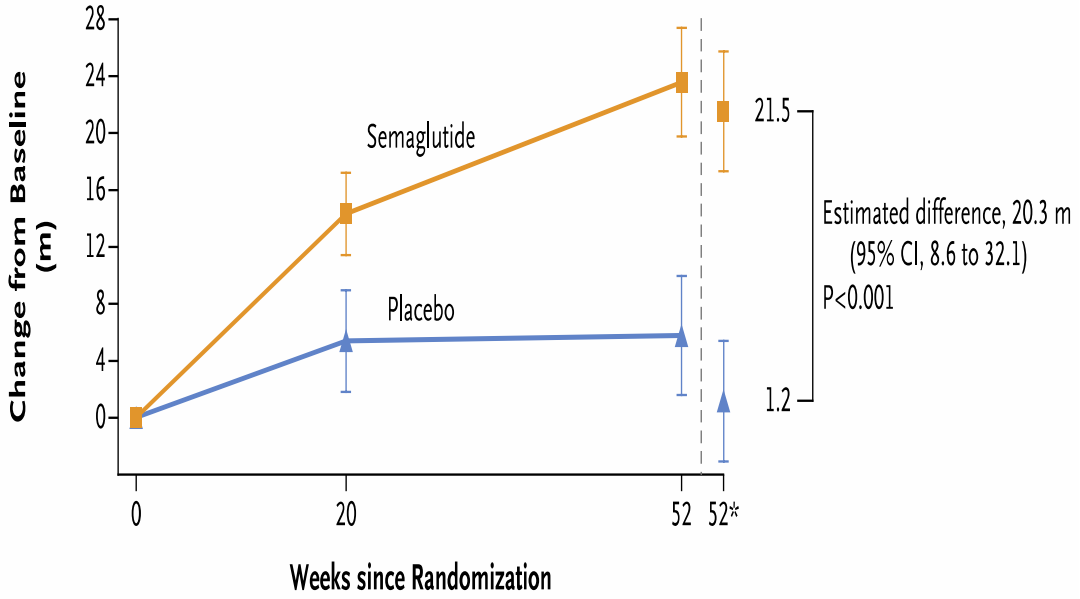
Kosiborod MN et al. N Engl J Med 2023;389:1069-84

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 21, 2023 VOL. 389 NO. 12

Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

Change in 6-Minute Walk Distance



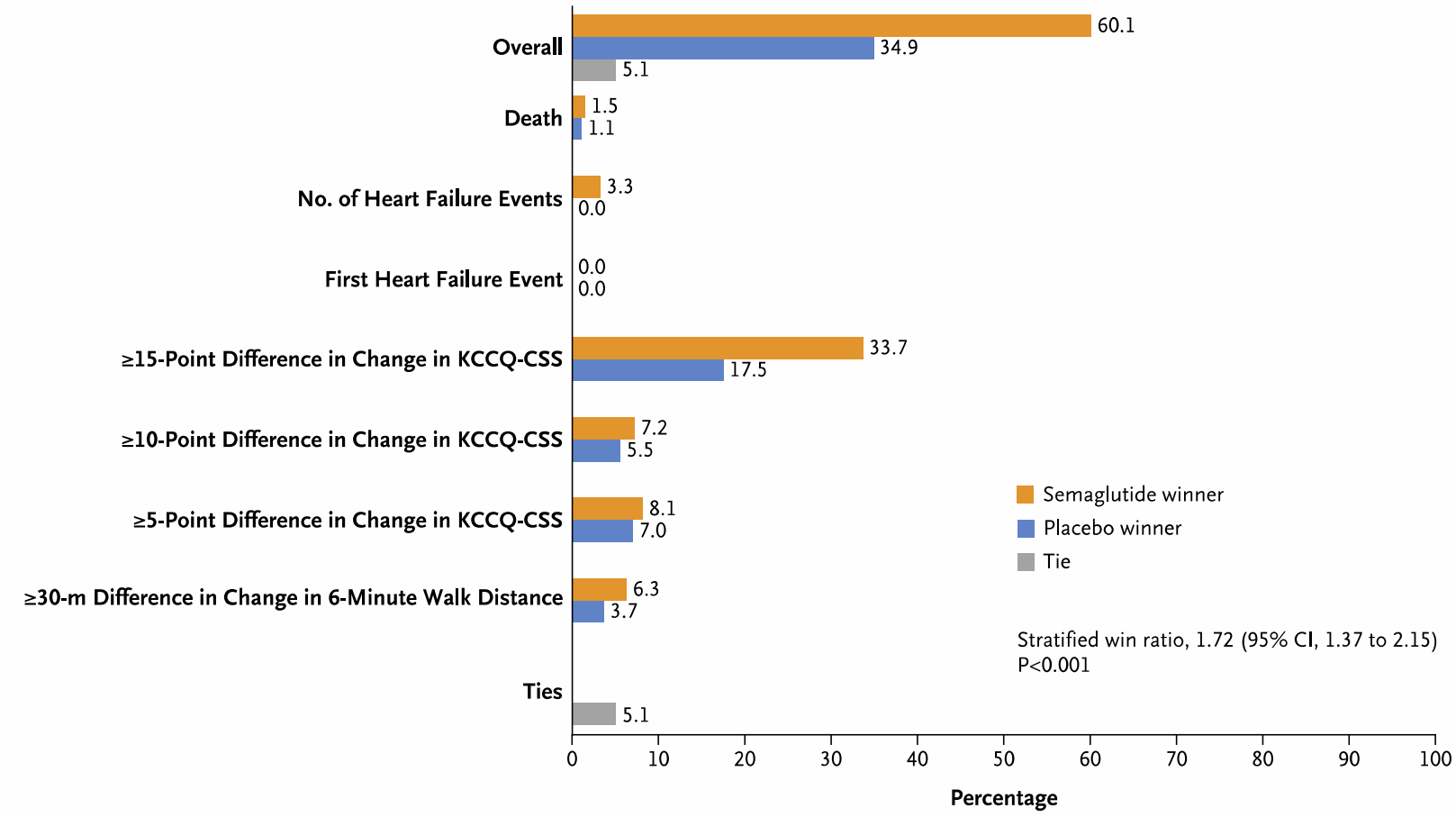
No. of Participants				
Semaglutide	263	245	240	263
Placebo	266	232	225	266

Kosiborod MN et al. N Engl J Med 2023;389:1069-84

Kosiborod MN et al. N Engl J Med 2023;389:1069-84
The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 SEPTEMBER 21, 2023 VOL. 389 NO. 12

Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

B Stratified Win Ratio for Hierarchical Composite End Point

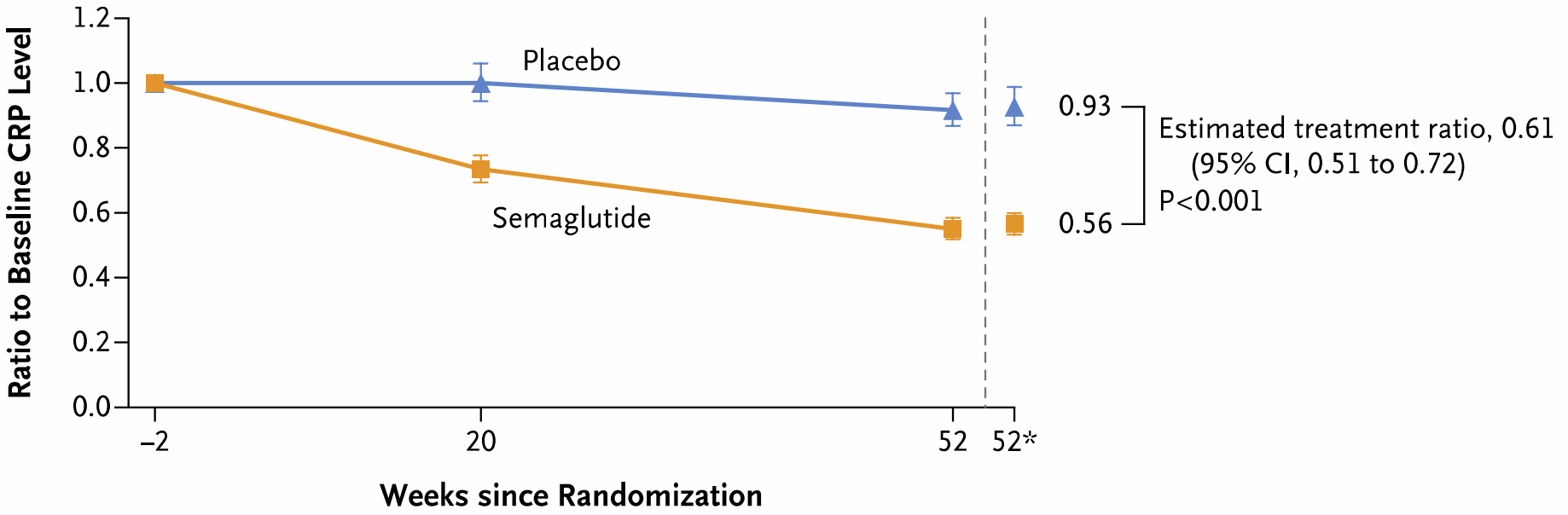


The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 21, 2023 VOL. 389 NO. 12

Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

Change in C-Reactive Protein Level



No. of Participants

Semaglutide	263	245	240	263
Placebo	266	232	225	266

Kosiborod MN et al. N Engl J Med 2023;389:1069-84

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 21, 2023 VOL. 389 NO. 12

Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

CONCLUSIONS

In patients with heart failure with preserved ejection fraction and obesity, treatment with semaglutide (2.4 mg) led to larger reductions in symptoms and physical limitations, greater improvements in exercise function, and greater weight loss than placebo.

Kosiborod MN et al. N Engl J Med 2023;389:1069-84

nature medicine

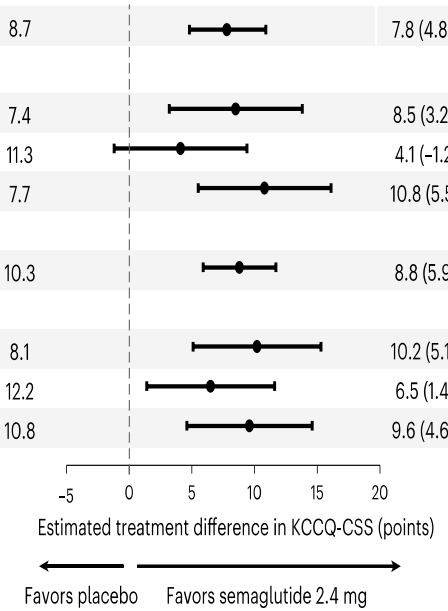
Article

https://doi.org/10.1038/s41591-023-02526-x

Semaglutide in HFpEF across obesity class and by body weight reduction: a prespecified analysis of the STEP-HFpEF trial

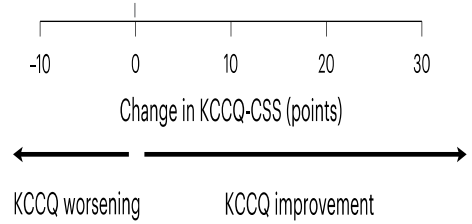
Effects of semaglutide on symptoms & physical limitations by obesity class

Subgroup	Semaglutide 2.4 mg *n*	Semaglutide 2.4 mg Change from baseline to week 52	Placebo *n*	Placebo Change from baseline to week 52	ETD (95% CI)	*P* value	Interaction *P* value
Intention-to-treat							
All patients	243	16.6	237	8.7	7.8 (4.8, 10.9)	<0.0001	
BMI, kg m^{-2}							
<35	80	15.9	83	7.4	8.5 (3.2, 13.8)	0.0018	0.2122
≥35–<40	81	15.4	78	11.3	4.1 (−1.2, 9.4)	0.1331	
≥40	82	18.5	76	7.7	10.8 (5.5, 16.1)	<0.0001	
On-treatment							
All patients	202	19.1	206	10.3	8.8 (5.9, 11.7)	0.0001	
BMI, kg m^{-2}							
<35	61	18.3	71	8.1	10.2 (5.1, 15.3)	0.0001	0.5505
≥35–<40	67	18.7	68	12.2	6.5 (1.4, 11.6)	0.0125	
≥40	74	20.3	67	10.8	9.6 (4.6, 14.6)	0.0002	



Relationship between weight loss and change in KCCQ-CSS

Subgroup	Semaglutide 2.4 mg *n*	Change from baseline to week 52 (95% CI)	*P* value for trend
Intention-to-treat			
Body weight decrease			
<5%	33	5.4 (−0.1, 10.8)	<0.0001
≥5–<10%	51	16.1 (11.7, 20.4)	
≥10–<15%	54	18.2 (14.0, 22.5)	
≥15–<20%	50	20.3 (16.0, 24.6)	
≥20%	58	21.6 (17.6, 25.6)	



Borlaug BA et al. Nat Med 2023;29(9):2358-2365

nature medicine

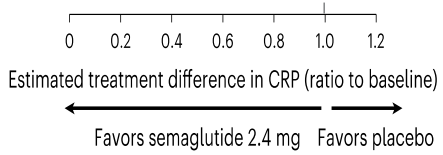
Article

https://doi.org/10.1038/s41591-023-02526-x

Semaglutide in HFpEF across obesity class and by body weight reduction: a prespecified analysis of the STEP-HFpEF trial

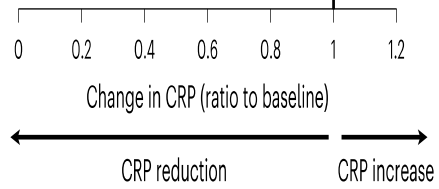
Effects of semaglutide on systemic inflammation by obesity class

Subgroup	Semaglutide 2.4 mg		Placebo		ETD (95% CI)	*P* value	Interaction *P* value
	n	Ratio to baseline at week 52	*n*	Ratio to baseline at week 52			
Intention-to-treat							
All patients	241	0.56	243	0.93	0.61 (0.51, 0.72)	<0.0001	
BMI, kg m^{-2}							
<35	79	0.54	84	0.87	0.61 (0.46, 0.83)	0.0013	
≥35–<40	83	0.46	78	0.90	0.51 (0.38, 0.68)	<0.0001	0.2321
≥40	79	0.73	81	1.01	0.73 (0.54, 0.98)	0.0362	
On-treatment							
All patients	199	0.51	211	0.91	0.56 (0.48, 0.66)	<0.0001	
BMI, kg m^{-2}							
<35	60	0.47	73	0.76	0.62 (0.47, 0.82)	0.0009	
≥35–<40	68	0.41	69	0.94	0.44 (0.33, 0.57)	<0.0001	0.0938
≥40	71	0.69	69	1.07	0.64 (0.49, 0.84)	0.0015	



Relationship between weight loss and change in inflammation

Subgroup	Semaglutide 2.4 mg *n*	Change from baseline to week 52 (95% CI)	*P* value for trend
Intention-to-treat			
Body weight decrease			
<5%	33	0.9 (0.6, 1.1)	
≥5–<10%	51	0.6 (0.5, 0.8)	
≥10–<15%	54	0.5 (0.4, 0.7)	<0.0001
≥15–<20%	50	0.6 (0.5, 0.7)	
≥20%	58	0.4 (0.3, 0.5)	

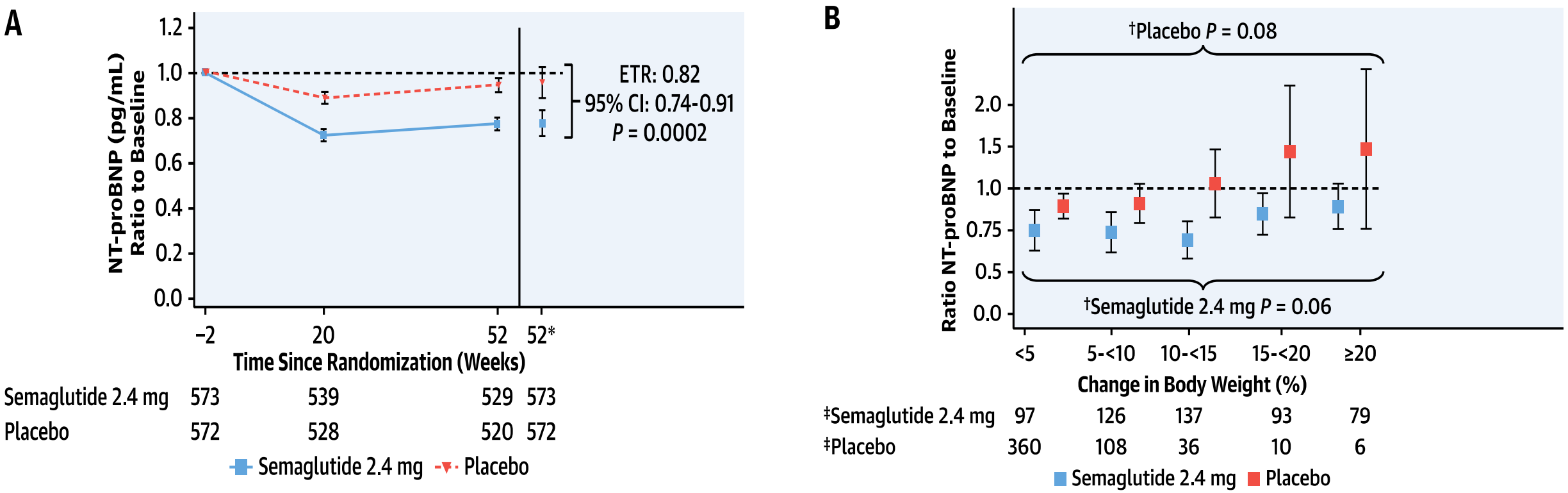


Semaglutide and NT-proBNP in Obesity-Related HFpEF

Insights From the STEP-HFpEF Program

Petrie MC et al. J Am Coll Cardiol 2024 May 13:S0735-1097(24)07020-7

Effect on NT-proBNP for the Combined STEP-HFpEF and STEP-HFpEF DM Population (A) and the Relationship Between Change in NT-proBNP and Change in Body Weight (B) at 52 Weeks

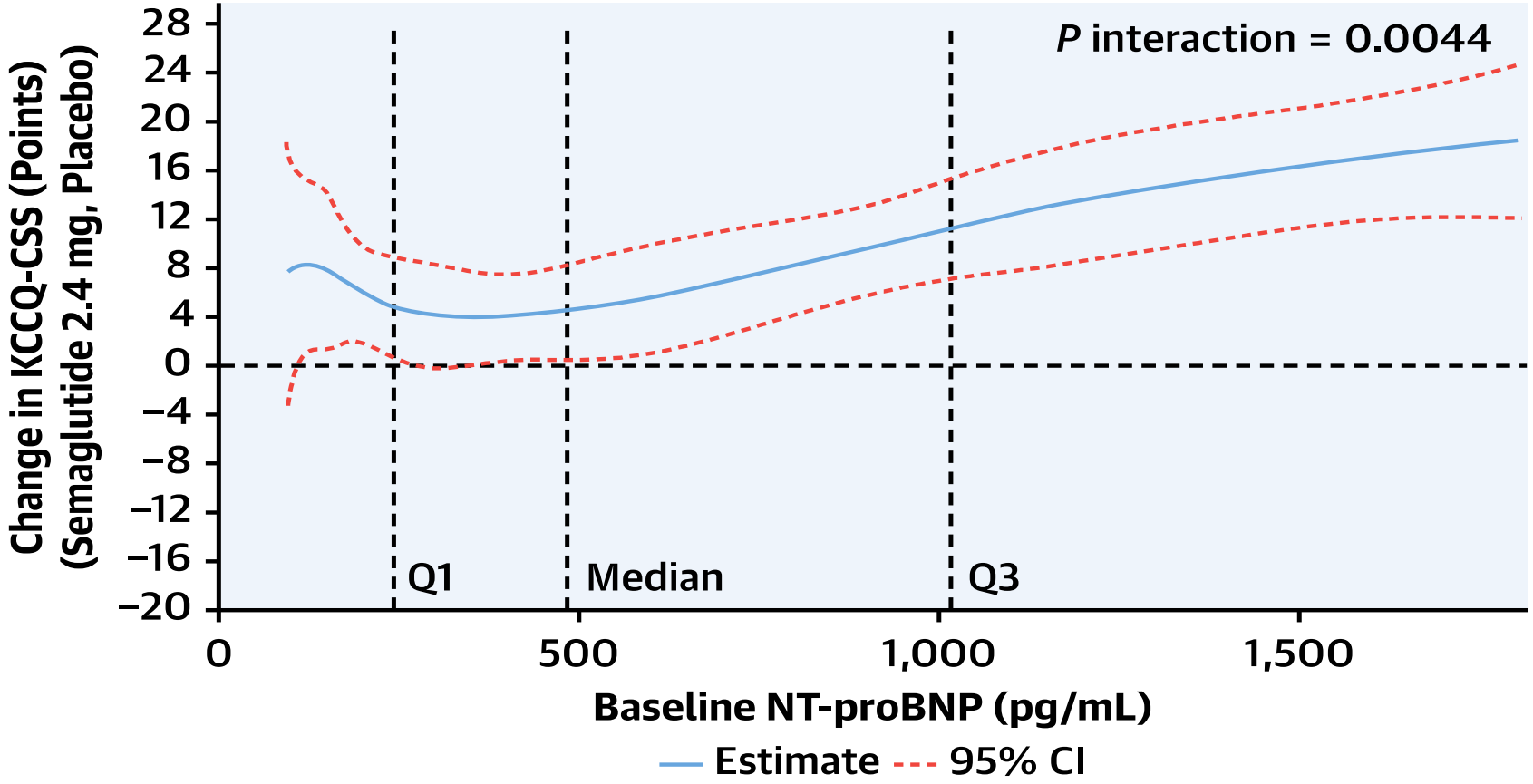


Semaglutide and NT-proBNP in Obesity-Related HFpEF

Insights From the STEP-HFpEF Program

Petrie MC et al. J Am Coll Cardiol 2024 May 13:S0735-1097(24)07020-7

Semaglutide improved health status in all patients, with a more pronounced impact in those with higher vs lower baseline NT-proBNP



> Eur Heart J. 2024 May 13:ehae322. doi: 10.1093/eurheartj/ehae322. Online ahead of print

Semaglutide and Diuretic Use in Obesity- Related Heart Failure with Preserved Ejection Fraction: A Pooled Analysis of the STEP- HFpEF and STEP- HFpEF- DM trials

Semaglutide was effective and safe regardless of baseline diuretic use, but KCCQ-CSS improvements were magnified at ↑loop diuretic doses

Total daily dose of loop diuretics increased in the placebo arm and decreased in the semaglutide arm during follow-up

Semaglutide reduced new initiation of loop diuretics by 71% and resulted in a 2.7-fold ↑likelihood of loop diuretic discontinuations (P=0.02)

Primary outcome: KCCQ-CSS

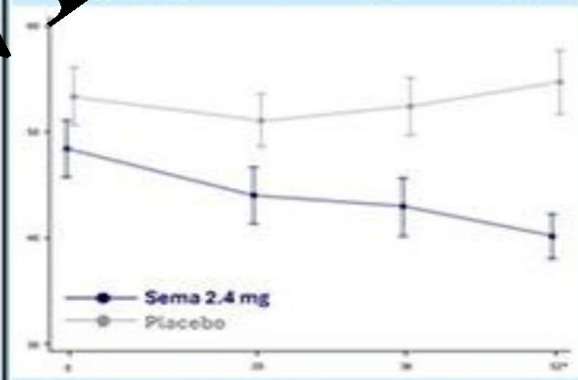
52-week treatment difference (semaglutide – placebo)

Baseline loop diuretic dose (mg/day furosemide equivalents)

P-interaction = 0.011

Loop diuretic initiation

Loop diuretic dose (mg/day furosemide equivalents)

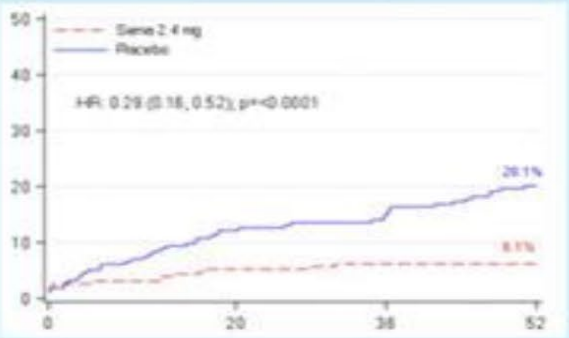


Time since randomization (weeks)

Estimated treatment difference over 52 weeks: -11.8 mg/day (95% CI -16.8, -6.8); P<0.0001

New loop diuretic initiation

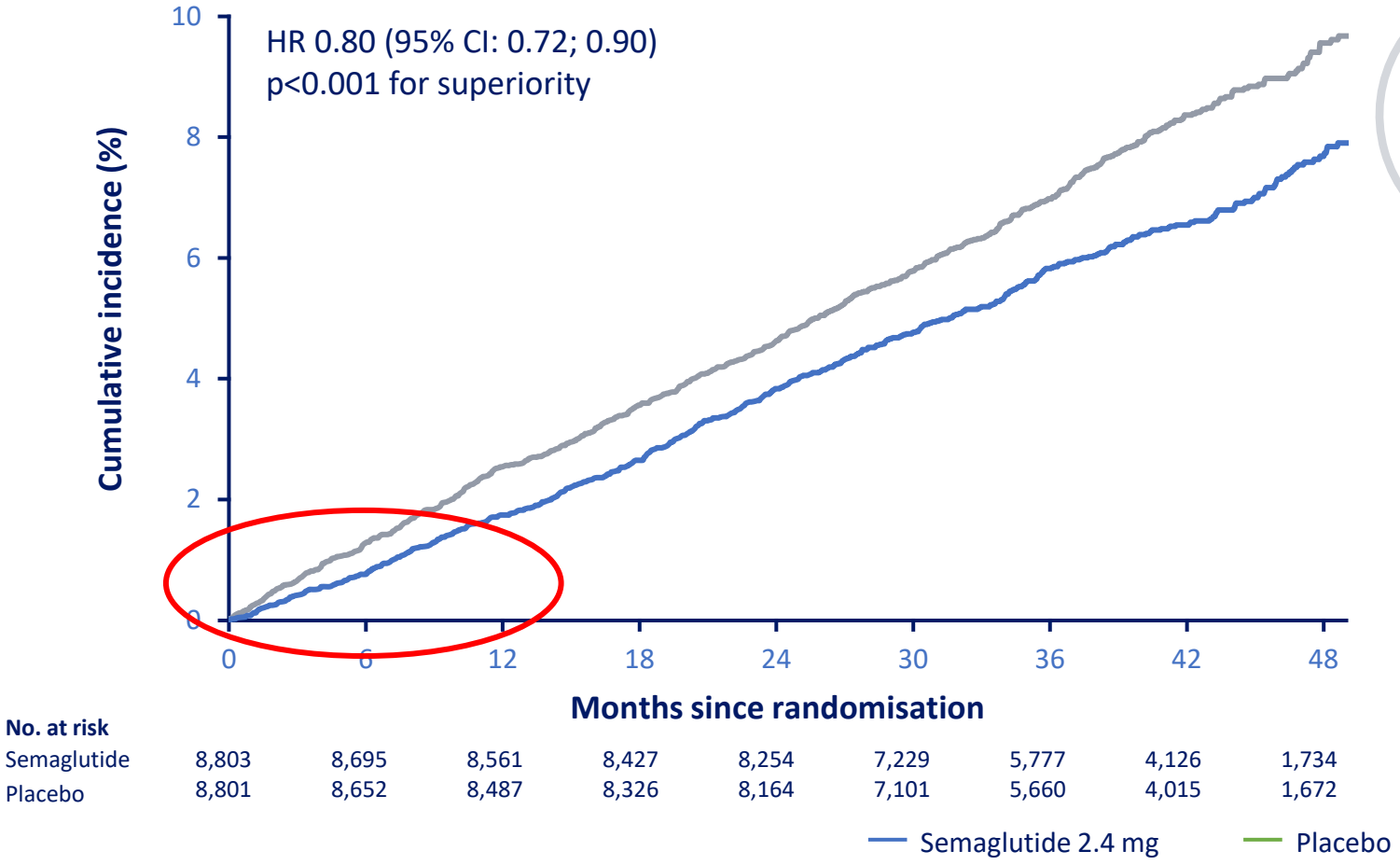
Cumulative incidence of new loop diuretic initiations



Time (weeks)

HR 0.29 (95% CI 0.16, 0.52); P<0.0001

Cumulative incidence of MACE
SELECT: Primary cardiovascular composite endpoint



20%
reduction in risk of MACE*

Semaglutide 2.4 mg significantly reduced the risk of MACE by 20%
compared with placebo in people with obesity and established CVD, without T2D[1,2]

All three components (death from CV causes, non-fatal MI and non-fatal stroke) contributed to MACE risk reduction

Mean follow-up time was 39.8 months

Lincoff AM et al. N Engl J Med 2023;389(24):2221-2232

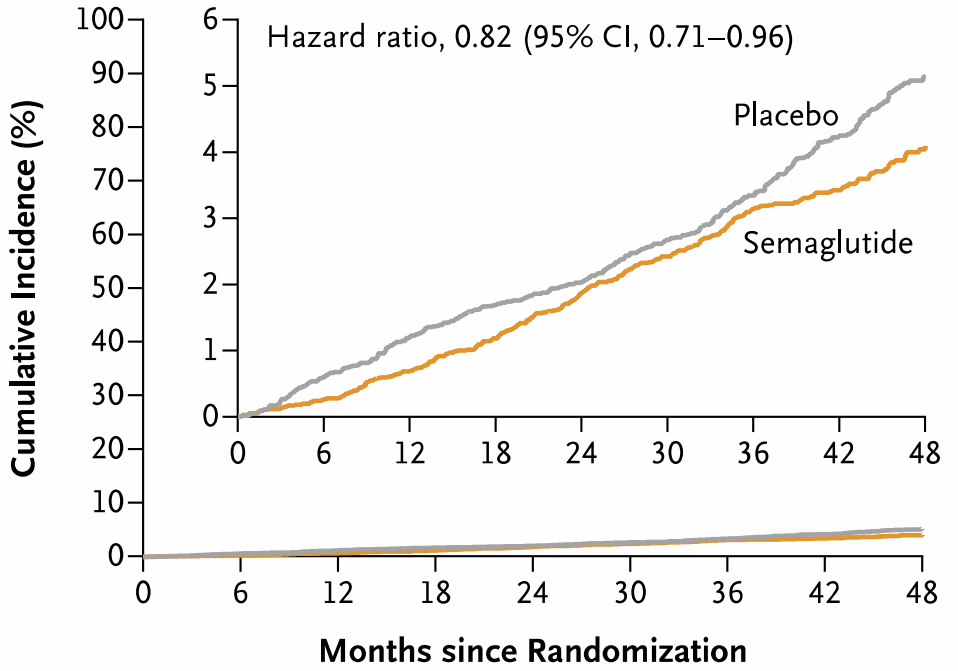
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 14, 2023 VOL. 389 NO. 24

Semaglutide and Cardiovascular Outcomes in Obesity without Diabetes

A. Michael Lincoff, M.D., Kirstine Brown-Frandsen, M.D., Helen M. Colhoun, M.D., John Deanfield, M.D., Scott S. Emerson, M.D., Ph.D., Sille Esbjerg, M.Sc., Søren Hardt-Lindberg, M.D., Ph.D., G. Kees Hovingh, M.D., Ph.D., Steven E. Kahn, M.B., Ch.B., Robert F. Kushner, M.D., Ildiko Lingvay, M.D., M.P.H., Tugce K. Oral, M.D., Marie M. Michelsen, M.D., Ph.D., Jorge Plutzky, M.D., Christoffer W. Tornøe, Ph.D., and Donna H. Ryan, M.D., for the SELECT Trial Investigators*

C Heart Failure Composite End Point



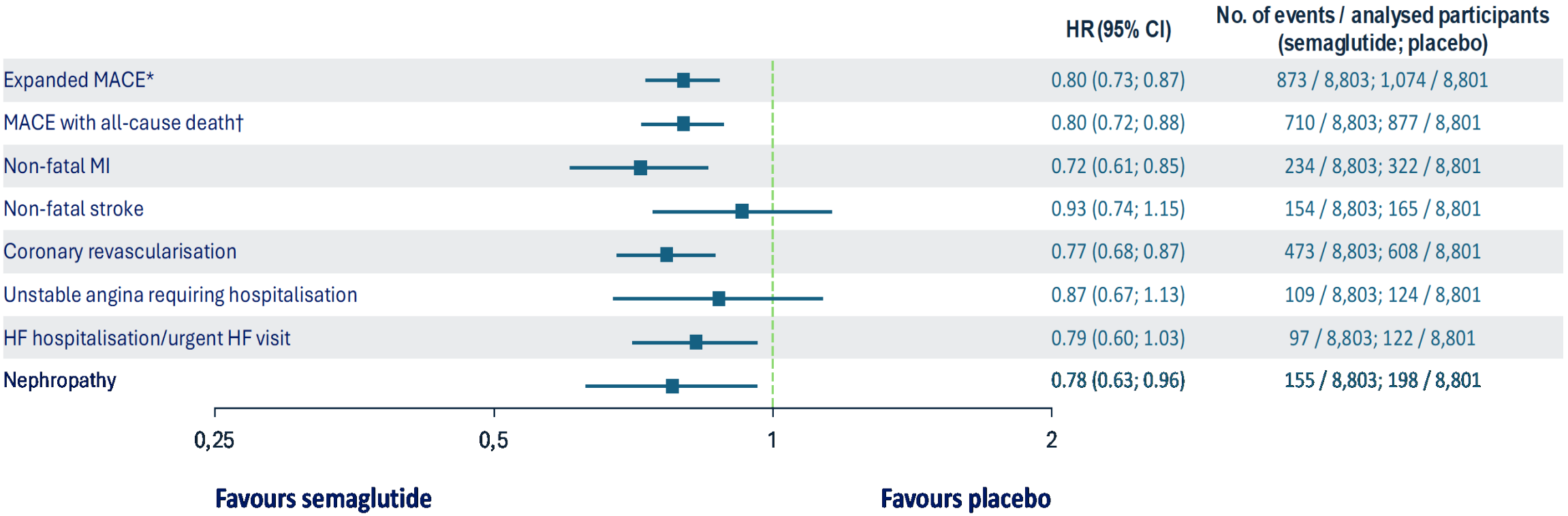
No. at Risk

Placebo	8801	8711	8601	8485	8381	7341	5885	4198	1766
Semaglutide	8803	8740	8654	8557	8425	7409	5944	4277	1816

Lincoff AM et al. N Engl J Med 2023;389(24):2221-2232

Secondary CV endpoints
SELECT

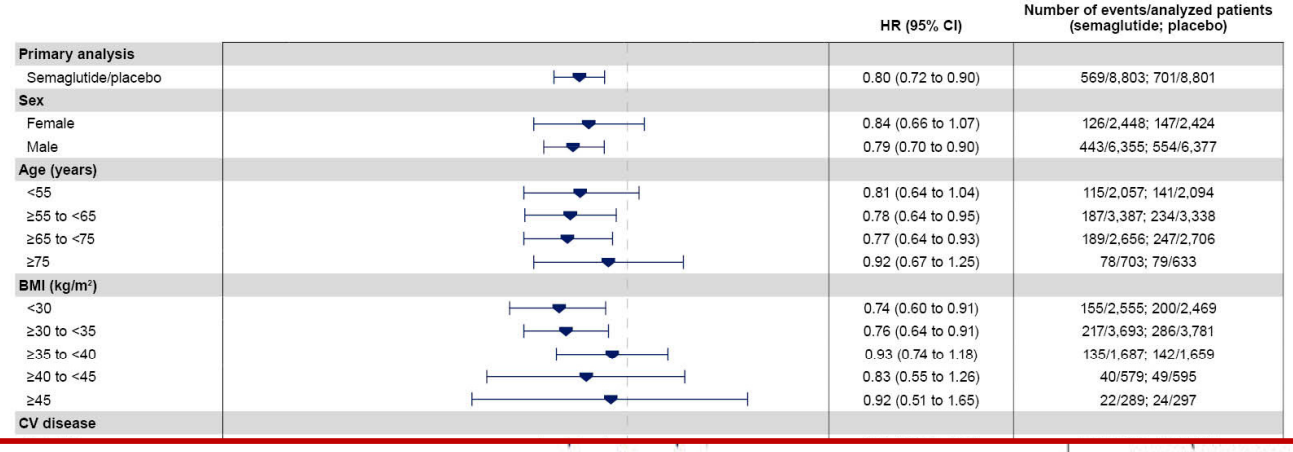
Semaglutide 2.4 mg had **consistent beneficial effects** across measured CV endpoints



Lincoff AM et al. N Engl J Med 2023;389(24):2221-2232

Prespecified Subgroup Analyses for the Primary Cardiovascular Efficacy End Point - SELECT

Figure S5. Forest Plot of Prespecified Subgroup Analyses for the Primary Cardiovascular Efficacy End Point.



	HR (95% CI)	Number of events/analyzed patients (semaglutide; placebo)
Primary analysis		
Semaglutide/placebo	0.80 (0.72 to 0.90)	569/8,803; 701/8,801
Sex		
Female	0.84 (0.66 to 1.07)	126/2,448; 147/2,424
Male	0.79 (0.70 to 0.90)	443/6,355; 554/6,377
Age (years)		
<55	0.81 (0.64 to 1.04)	115/2,057; 141/2,094
≥55 to <65	0.78 (0.64 to 0.95)	187/3,387; 234/3,338
≥65 to <75	0.77 (0.64 to 0.93)	189/2,656; 247/2,706
≥75	0.92 (0.67 to 1.25)	78/703; 79/633
BMI (kg/m²)		
<30	0.74 (0.60 to 0.91)	155/2,555; 200/2,469
≥30 to <35	0.76 (0.64 to 0.91)	217/3,693; 286/3,781
≥35 to <40	0.93 (0.74 to 1.18)	135/1,687; 142/1,659
≥40 to <45	0.83 (0.55 to 1.26)	40/579; 49/595
≥45	0.92 (0.51 to 1.65)	22/289; 24/297
CV disease		
	0.82 (0.68 to 1	
	0.79 (0.69 to 0.90)	
Region		
North America	0.92 (0.75 to 1.13)	176/2,200; 189/2,201
Europe	0.69 (0.56 to 0.84)	168/3,326; 244/3,366
Asia	0.71 (0.52 to 0.97)	70/1,100; 96/1,101
Other	0.88 (0.71 to 1.09)	155/2,177; 172/2,133
Race		
Asian	0.64 (0.43 to 0.95)	41/720; 63/727

International Journal of Molecular Sciences

Int. J. Mol. Sci. **2024**;*25*:4407.

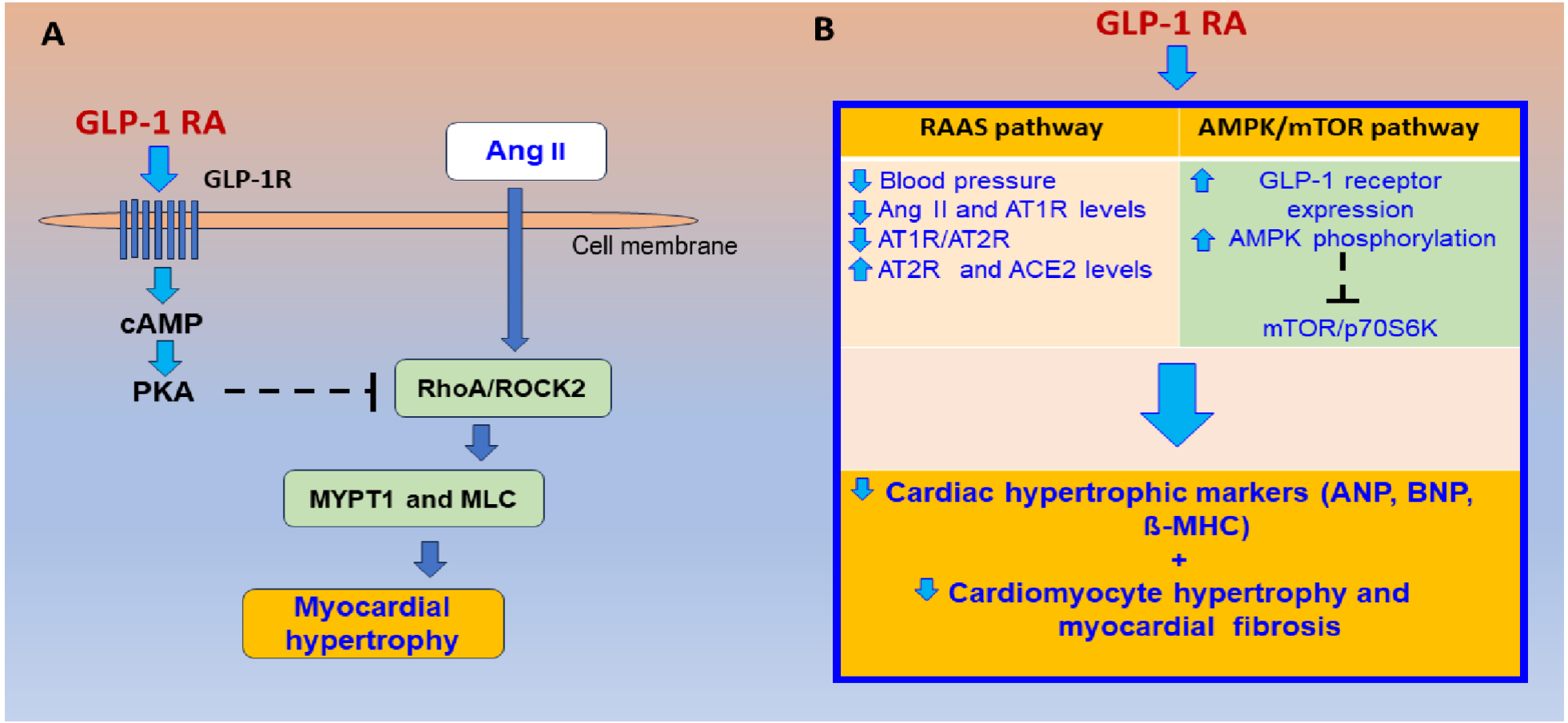
MDPI

Review

New Mechanisms to Prevent Heart Failure with Preserved Ejection Fraction Using Glucagon-like Peptide-1 Receptor Agonism (GLP-1 RA) in Metabolic Syndrome and in Type 2 Diabetes: A Review

Jorge E. Jalil [1,*,†], Luigi Gabrielli [1,†], María Paz Ocaranza [1,*], Paul MacNab [1], Rodrigo Fernández [1], Bruno Grassi [2], Paulina Jofré [2], Hugo Verdejo [1], Monica Acevedo [1], Samuel Cordova [1], Luis Sanhueza [1] and Douglas Greig [1]

Mechanisms of GLP-1 RA on prevention of pathologic cardiac hypertrophy



International Journal of Molecular Sciences

Int. J. Mol. Sci. **2024**;*25*:4407.

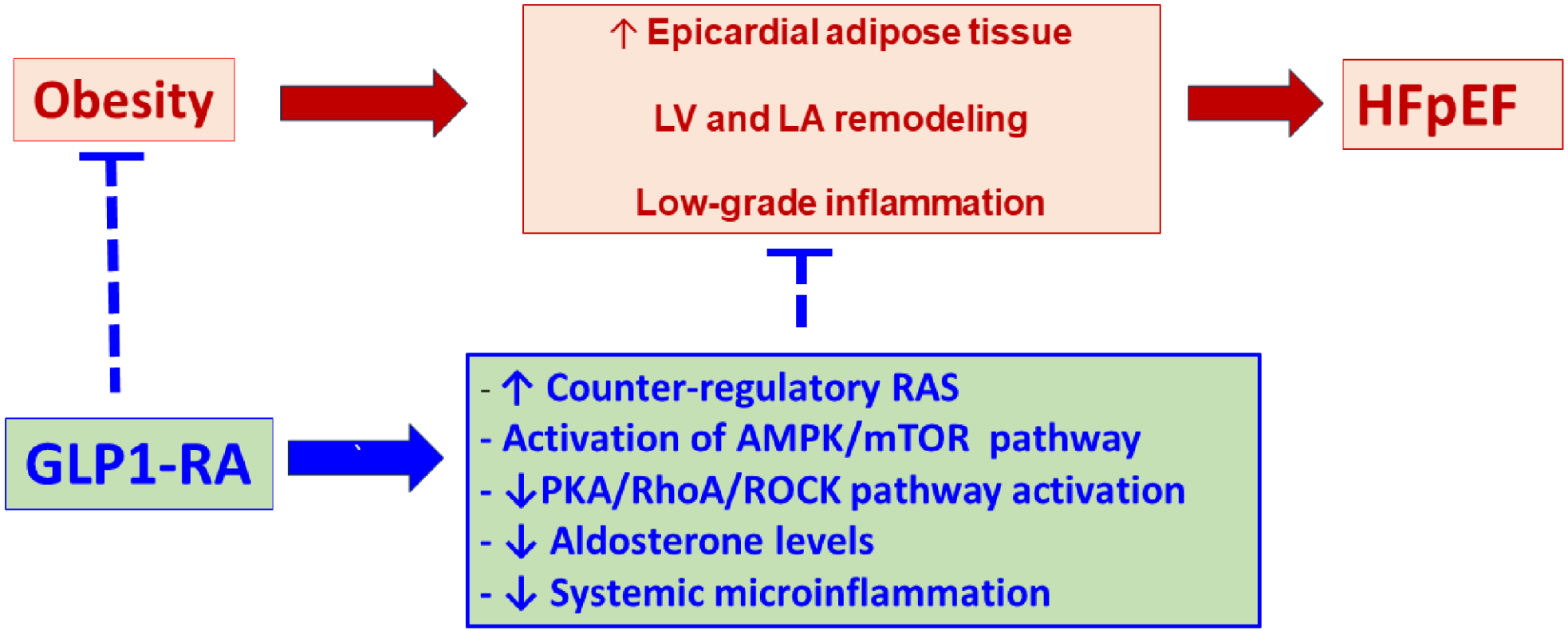
MDPI

Review

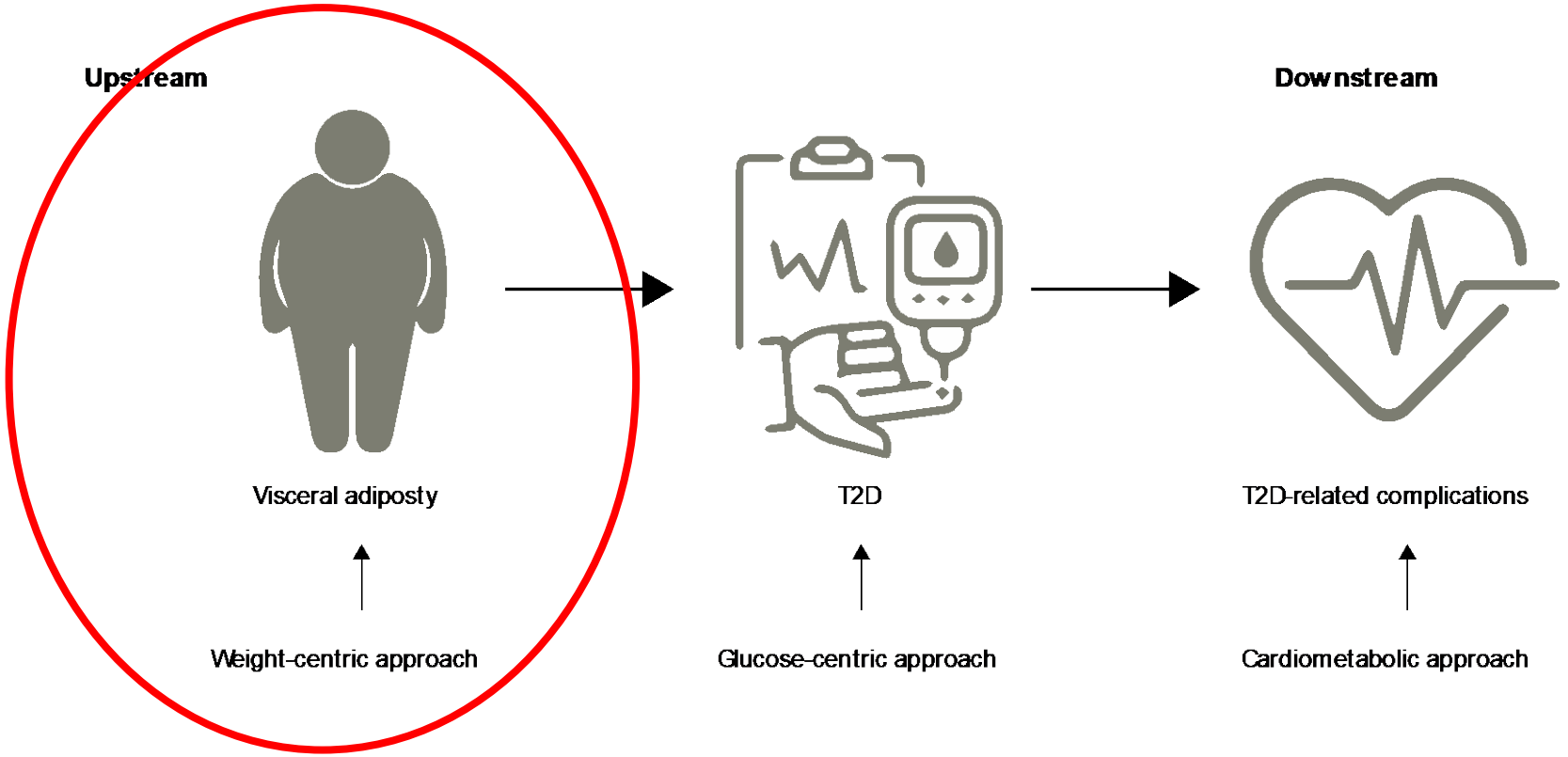
New Mechanisms to Prevent Heart Failure with Preserved Ejection Fraction Using Glucagon-like Peptide-1 Receptor Agonism (GLP-1 RA) in Metabolic Syndrome and in Type 2 Diabetes: A Review

Jorge E. Jalil [1,*,†], Luigi Gabrielli [1,†], María Paz Ocaranza [1,*], Paul MacNab [1], Rodrigo Fernández [1], Bruno Grassi [2], Paulina Jofré [2], Hugo Verdejo [1], Monica Acevedo [1], Samuel Cordova [1], Luis Sanhueza [1] and Douglas Greig [1]

Mechanisms to prevent HFpEF using a GLP-1 RA



An upstream weight-centric approach versus more downstream, glucose-centric and cardiometabolic approaches



Lancet 2022;399 (10322):394-405