Prof. dr. Petar M. Seferovic, MD, PhD, FESC, FACC

Co-editor for Eastern Europe, European Heart Journal

Vice-president, European Society of Cardiology (2020-2022)

President, Heart Failure Association of the ESC (2018-2020)

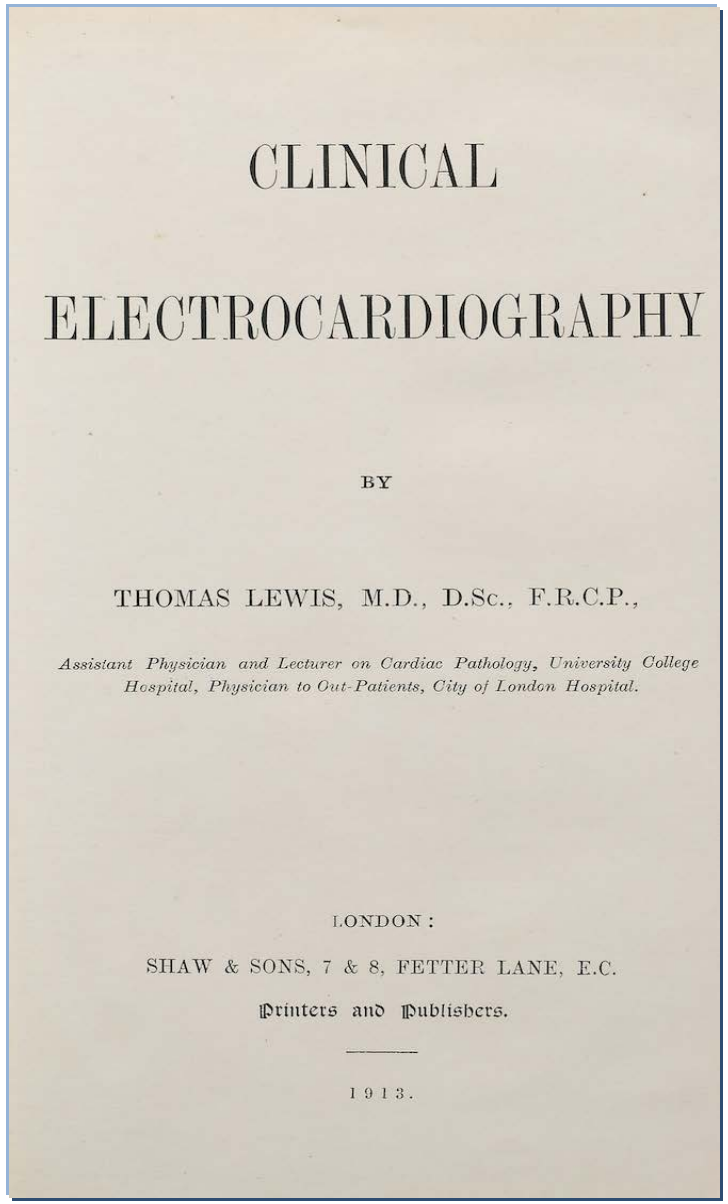
The golden four in the treatment of heart failure

Academician, Serbian Academy of Sciences and Arts

Professor of Cardiology, Belgrade University School of Medicine

President, Heart failure Society of Serbia

Heart failure: The basics of clinical cardiology



CLINICAL

ELECTROCARDIOGRAPHY

BY

THOMAS LEWIS, M.D., D.Sc., F.R.C.P.,

Assistant Physician and Lecturer on Cardiac Pathology, University College Hospital, Physician to Out-Patients, City of London Hospital.

LONDON:

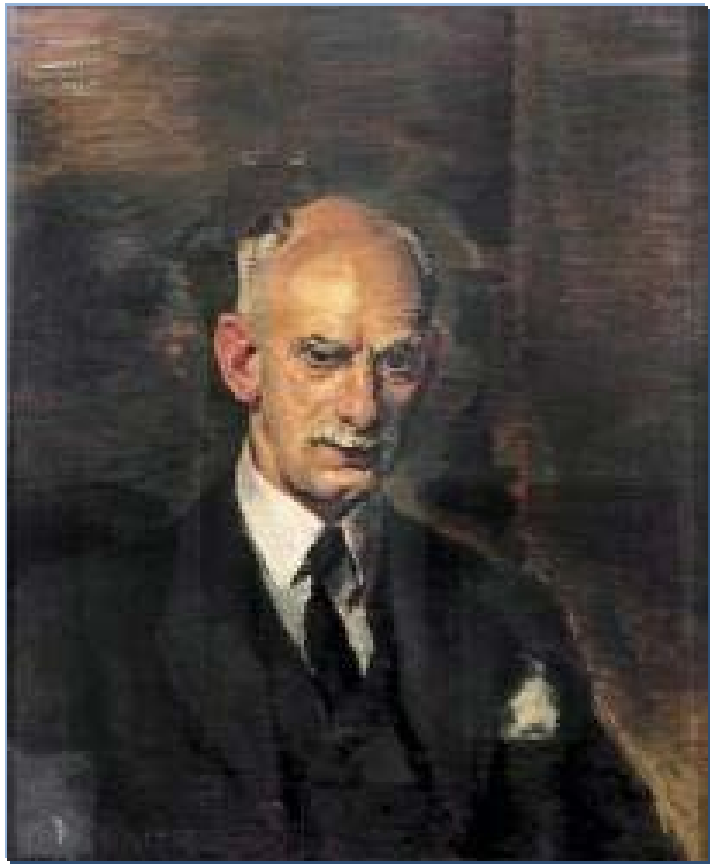
SHAW & SONS, 7 & 8, FETTER LANE, E.C.

Printers and Publishers.

1913.

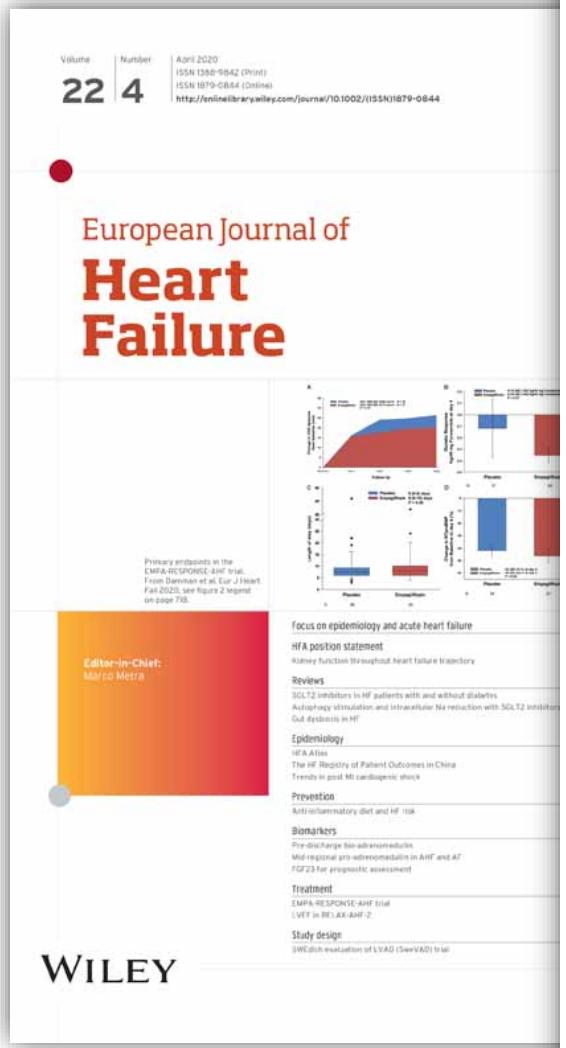
"Basic task of cardiologist is to know diagnosis and treatment of heart failure"

Sir Thomas Lewis 1913.



"Heart failure is a major health threat of the 21st century, it is frequent, deadly but preventable"

Thomas Luscher, ESC President-elect 2023.



ESC European Society of Cardiology

European Journal of Heart Failure (2021)
doi:10.1002/ejhf.2143

RESEARCH ARTICLE

The Heart Failure Association Atlas: Heart Failure Epidemiology and Management Statistics 2019

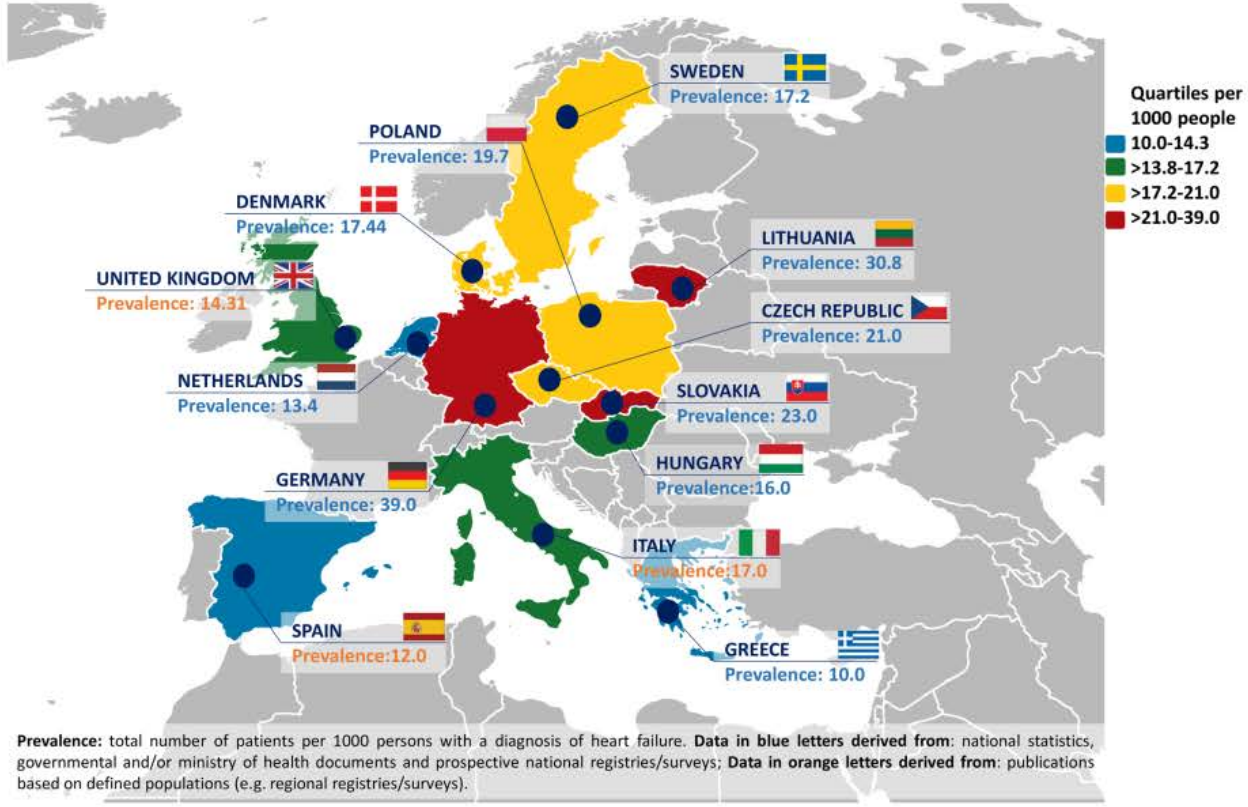
Petar M. Seferović[1,2]*, Panagiotis Vardas[3,4], Ewa A. Jankowska[5], Aldo P. Maggioni[6], Adam Timmis[7], Ivan Milinković[1,8], Marija Polovina[1,8], Chris P. Gale[9,10,11], Lars H. Lund[12], Yuri Lopatin[13], Mitja Lainscak[14,15], Gianluigi Savarese[12], Radu Huculeci[4], Dzianis Kazakiewicz[4], and Andrew J.S. Coats[16], in collaboration with the National Heart Failure Societies of the ESC member countries (see *Appendix*)

[1]Faculty of Medicine, University of Belgrade, Belgrade, Serbia; [2]Serbian Academy of Sciences and Arts, Belgrade, Serbia; [3]Hygeia Heart Sector, Hygeia Group of Hospitals, Athens, Greece; [4]European Society of Cardiology Health Policy Unit, European Heart Health Institute, European Heart Agency, Brussels, Belgium; [5]Department of Heart Diseases, Wroclaw Medical University, and Centre for Heart Diseases, University Hospital, Wroclaw, Poland; [6]ANMCO Research Center, Heart Care Foundation, Florence, Italy; [7]Queen Mary University London, London, UK; [8]Department of Cardiology, Clinical Centre of Serbia, Belgrade, Serbia; [9]Leeds Institute of Cardiovascular and Metabolic Medicine, University of Leeds, Leeds, UK; [10]Leeds Institute for Data Analytics, University of Leeds, Leeds, UK; [11]Department of Cardiology, Leeds Teaching Hospitals NHS Trust, Leeds, UK; [12]Department of Medicine, Karolinska Institute, and Heart and Vascular Theme, Karolinska University Hospital, Stockholm, Sweden; [13]Volgograd State Medical University, Regional Cardiology Centre Volgograd, Volgograd, Russia; [14]Department of Internal Medicine, and Department of Research and Education, General Hospital Murska Sobota, Murska Sobota, Slovenia; [15]Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia; and [16]Centre of Clinical and Experimental Medicine, IRCCS San Raffaele Pisana, Rome, Italy

Received 28 January 2021; revised 17 February 2021; accepted 23 February 2021

Incidence of heart failure per 1000 person-years (left), and prevalence of heart failure per 1000 persons (right)

Incidence: number of new cases of heart failure per 1000 person-years. **Data in blue letters derived from**: national statistics, governmental and/or ministry of health documents and prospective national registries/surveys; **Data in orange letters derived from**: publications based on defined populations (e.g. regional registries/surveys).



Prevalence: total number of patients per 1000 persons with a diagnosis of heart failure. **Data in blue letters derived from**: national statistics, governmental and/or ministry of health documents and prospective national registries/surveys; **Data in orange letters derived from**: publications based on defined populations (e.g. regional registries/surveys).

- **Median annual incidence of HF: 3.20 per 1000 person-years** (IQR 2.66–4.17)

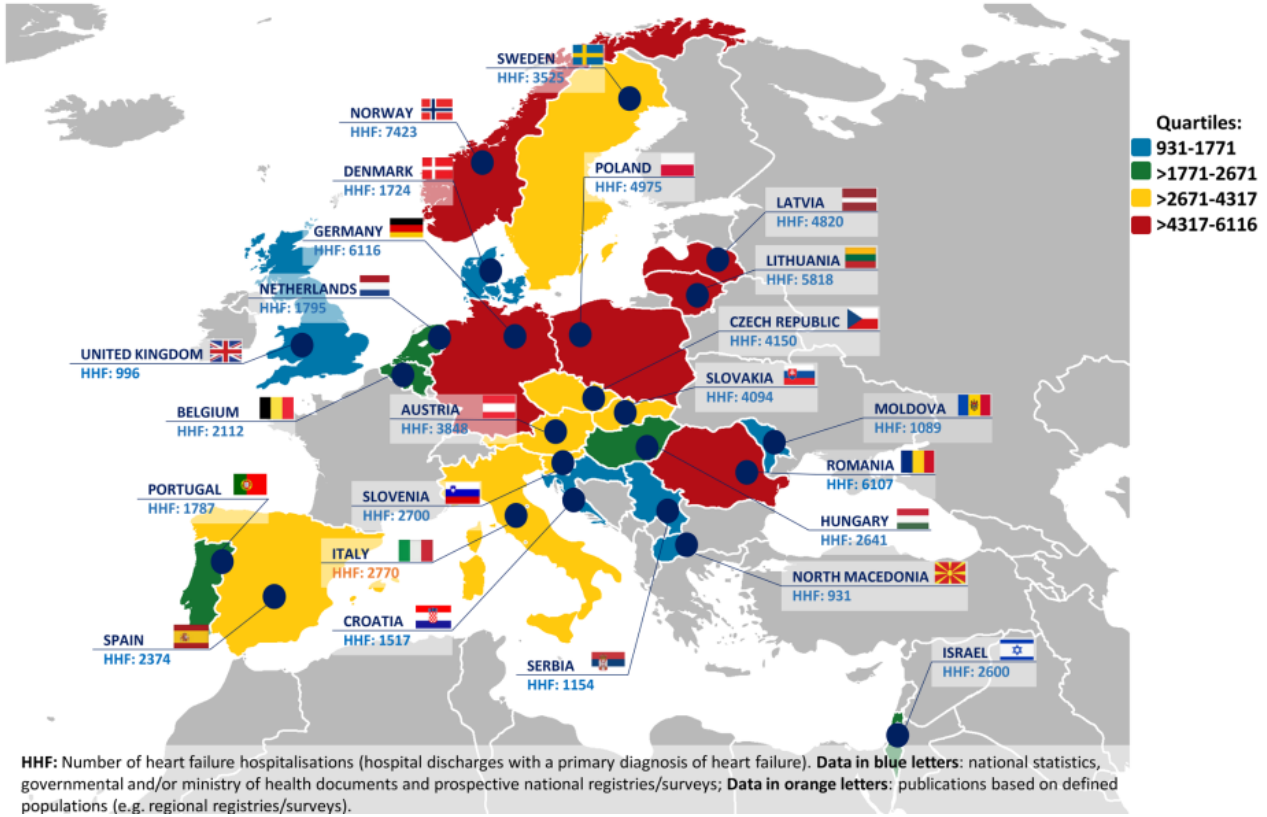
*Ranging from <2 in Italy, to ≥6 in Estonia and Germany

- **Median prevalence of HF: 17.20 per 1000 people**(IQR 14.30–21)

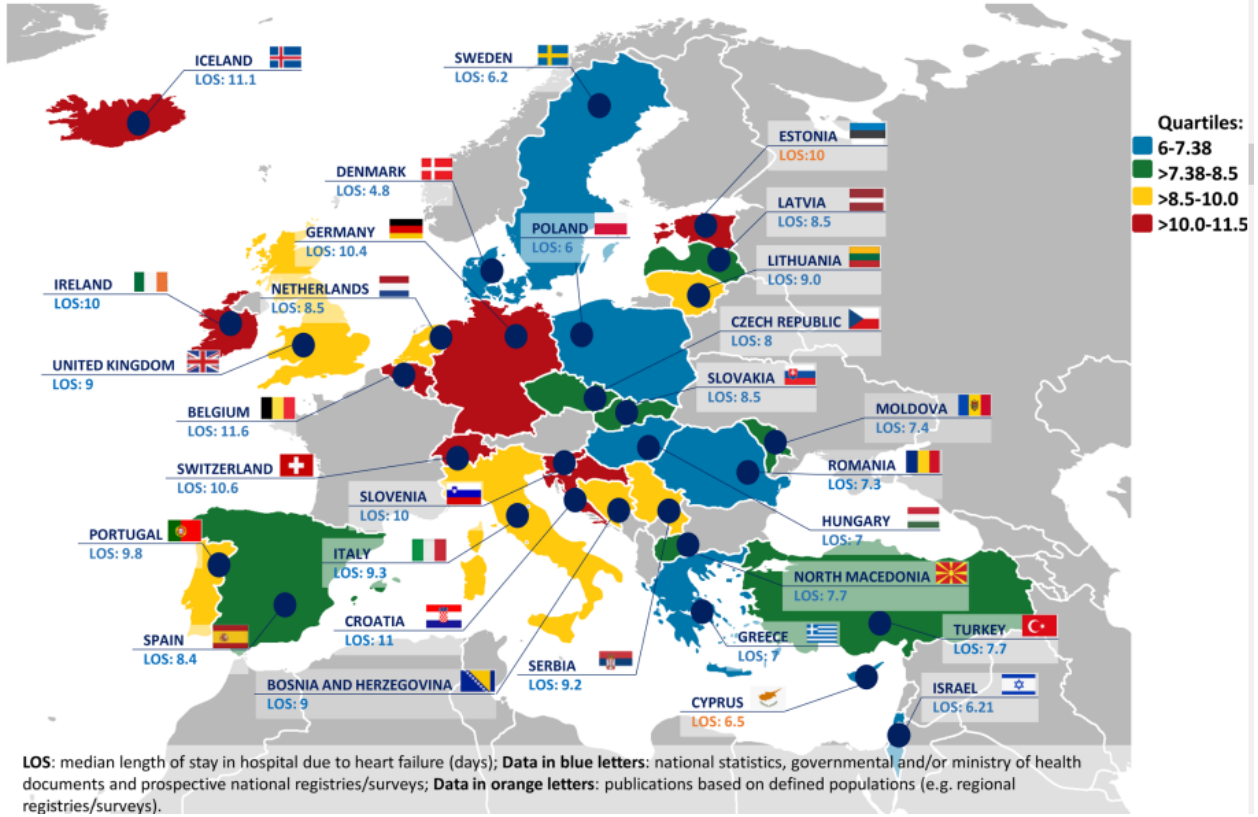
*Ranging from ≤12 in Greece and Spain to >30 in Lithuania and Germany

Seferovic P et al. European Journal of Heart Failure (2021)

Number of HF-related hospital discharges per million people (left) and average length of stay in hospital primarily due to HF (right).



HHF: Number of heart failure hospitalisations (hospital discharges with a primary diagnosis of heart failure). **Data in blue letters**: national statistics, governmental and/or ministry of health documents and prospective national registries/surveys; **Data in orange letters**: publications based on defined populations (e.g. regional registries/surveys).



LOS: median length of stay in hospital due to heart failure (days); **Data in blue letters**: national statistics, governmental and/or ministry of health documents and prospective national registries/surveys; **Data in orange letters**: publications based on defined populations (e.g. regional registries/surveys).

- Heart failure-related hospital discharge statistics available for 24 countries (57%)
- **Median number of HF discharges: 2671 per million people** (IQR 1771–4317)

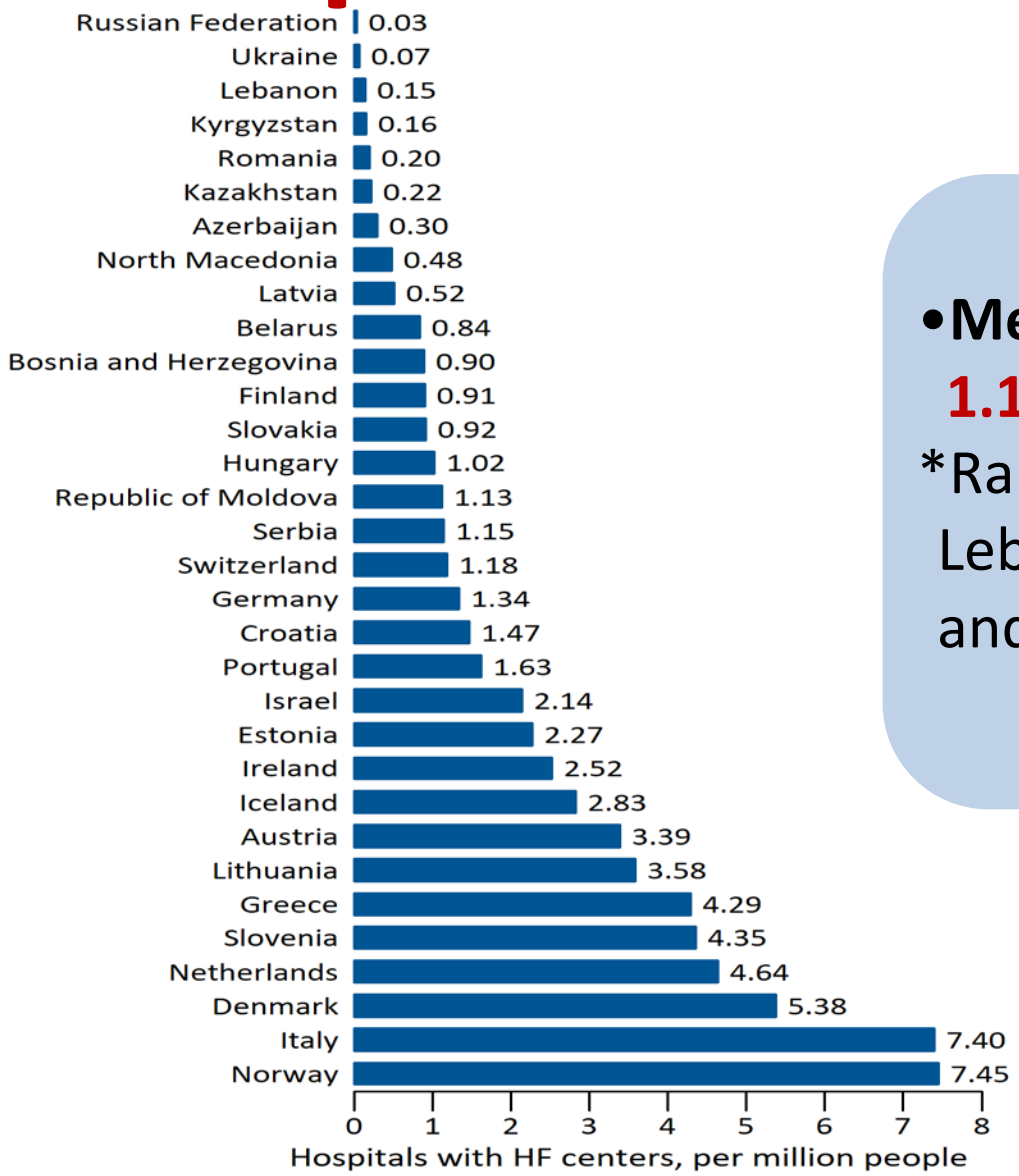
*Ranging from <1000 in North Macedonia and United Kingdom to >6000 in Romania, Norway and Germany

- Days spent in hospital available for 32 countries (76%)
- **Median length of stay for hospitalized for HF**: **8.50 days** (IQR 7.38–10)

*Ranging from ≤6 days in Denmark and Poland to ≥11 days in Croatia, Iceland and Belgium

Seferovic P et al. European Journal of Heart Failure (2021)

Hospitals with dedicated HF centers



- **Median number of HF centres**:
  1.16 per million people (IQR 0.51–2.97)

*Ranging from <0.50 in Russian Federation, Ukraine, Lebanon, Kyrgyzstan, Romania, Kazakhstan, Azerbaijan, and North Macedonia to >7 in Norway and Italy

Source: HFA Survey, 2018 or latest year
Data not available: Belgium, Bulgaria, Cyprus, Czech Republic, Poland, Republic of Georgia, Spain, Sweden, Turkey, United Kingdom.

Seferovic P et al. European Journal of Heart Failure (2021)

Trilateral Cooperation Project

Starting date: Munich, March 22 nd, 2019

Petar M. Seferovic
President of HFA

HFA
Heart Failure
Association
European Society of Cardiology

Randall Starling
President of HFSA

HFSA
HEART FAILURE SOCIETY OF AMERICA

Hiroyuki Tsutsui
President of JHFS

The Japanese
Heart Failure Society

ESC European Society of Cardiology

European Journal of Heart Failure (2021) 23, 352–380
doi:10.1002/ejhf.2115

POSITION PAPER

Universal definition and classification of heart failure: a report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure

Endorsed by the Canadian Heart Failure Society, Heart Failure Association of India, Cardiac Society of Australia and New Zealand, and Chinese Heart Failure Association

Journal of Cardiac Failure Vol. 27 No. 4 2021

Consensus Statement

Universal Definition and Classification of Heart Failure

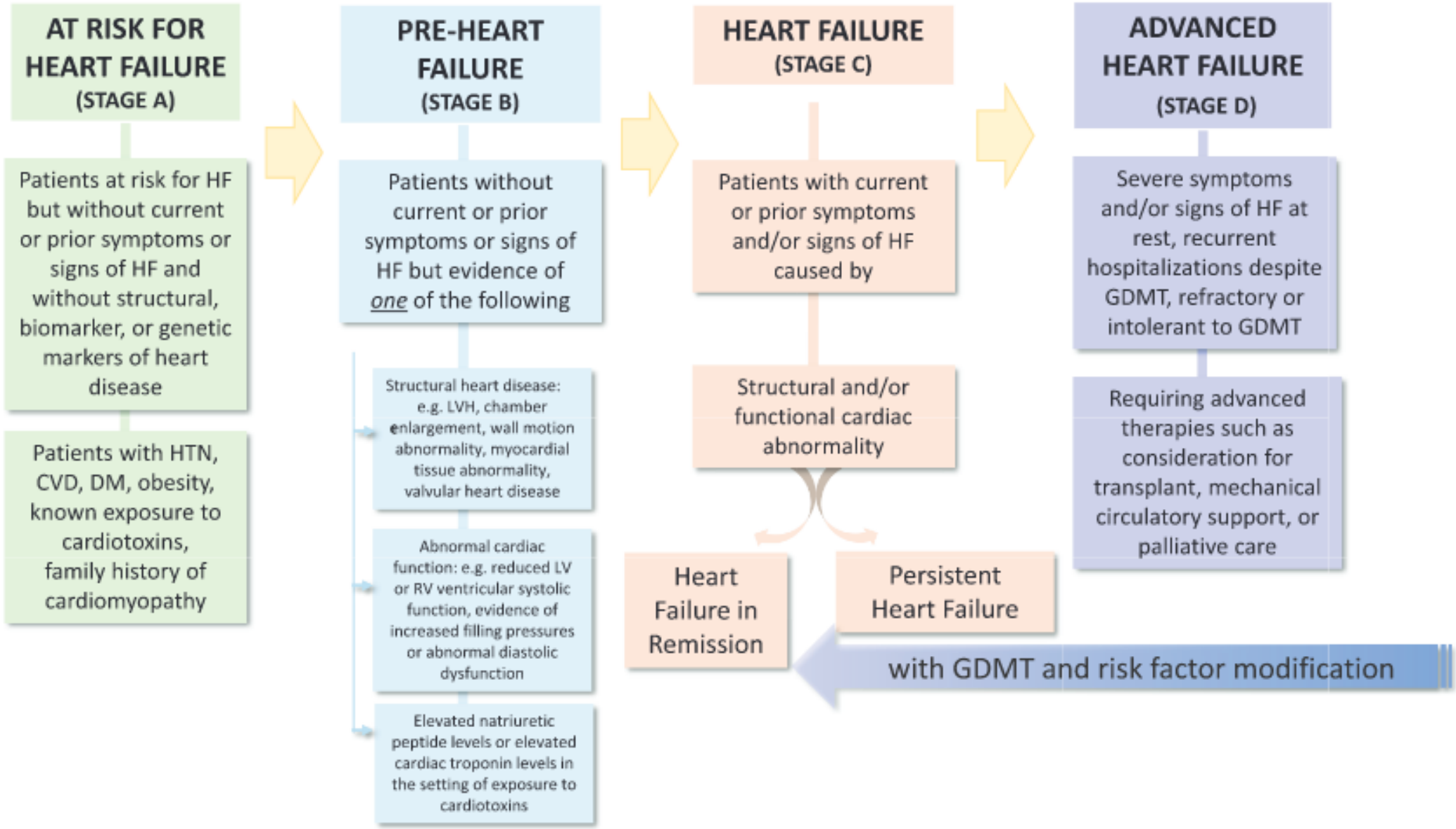
A Report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure

Endorsed by Canadian Heart Failure Society, Heart Failure Association of India, the Cardiac Society of Australia and New Zealand, and the Chinese Heart Failure Association

BIYKEM BOZKURT, MD, PhD, Chair, ANDREW JS COATS, DM, DSC, Co-Chair, HIROYUKI TSUTSUI, MD, Co-Chair, MAGDY ABDELHAMID, MD, STAMATIS ADAMOPOULOS, MD, NANCY ALBERT, PhD, CCNS, CHFN, CCRN, NE-BC, STEFAN D. ANKER, MD, PhD, JOHN ATHERTON, MBBS, PhD, MICHAEL B€OHM, MD, JAVED BUTLER, MD, MPH, MBA, MARK H. DRAZNER, MD, MSc, G. MICHAEL FELKER, MD, MHS, GERASIMOS FILIPPATOS, MD, GREGG C. FONAROW, MD, MONA FIUZAT, PharmD, JUAN□ISTEBAN GOMEZ-MESA, MD, PAUL HEIDENREICH, MD, TERUHIKO IMAMURA, MD, PhD, JAMES JANUZZI, MD, EWA A. JANKOWSKA, MD, PhD, PRATEETI KHAZANIE, MD, MPH, KOICHIRO KINUGAWA, MD, PhD, CAROLYN S.P.LAM, MBBS, FRCP, PhD, YUYA MATSUE, MD, PhD, MARCO METRA, MD, TOMOHITO OHTANI, MD, PhD, MASSIMO FRANCESCO PIEPOLI, MD, PhD, PIOTR PONIKOWSKI, MD, PhD, GIUSEPPE M.C. ROSANO, MD, PhD, YASUSHI SAKATA, MD, PhD, PETAR SEFEROVI□C, MD, PhD, RANDALL C. STARLING, MD, MPH, JOHN R. TEERLINK, MD, ORLY VARDENY, PharmD, MS, KAZUHIRO YAMAMOTO, MD, PhD, CLYDE YANCY, MD, MSc, JIAN ZHANG, MD, PhD, AND SHELLEY ZIEROTH, MD

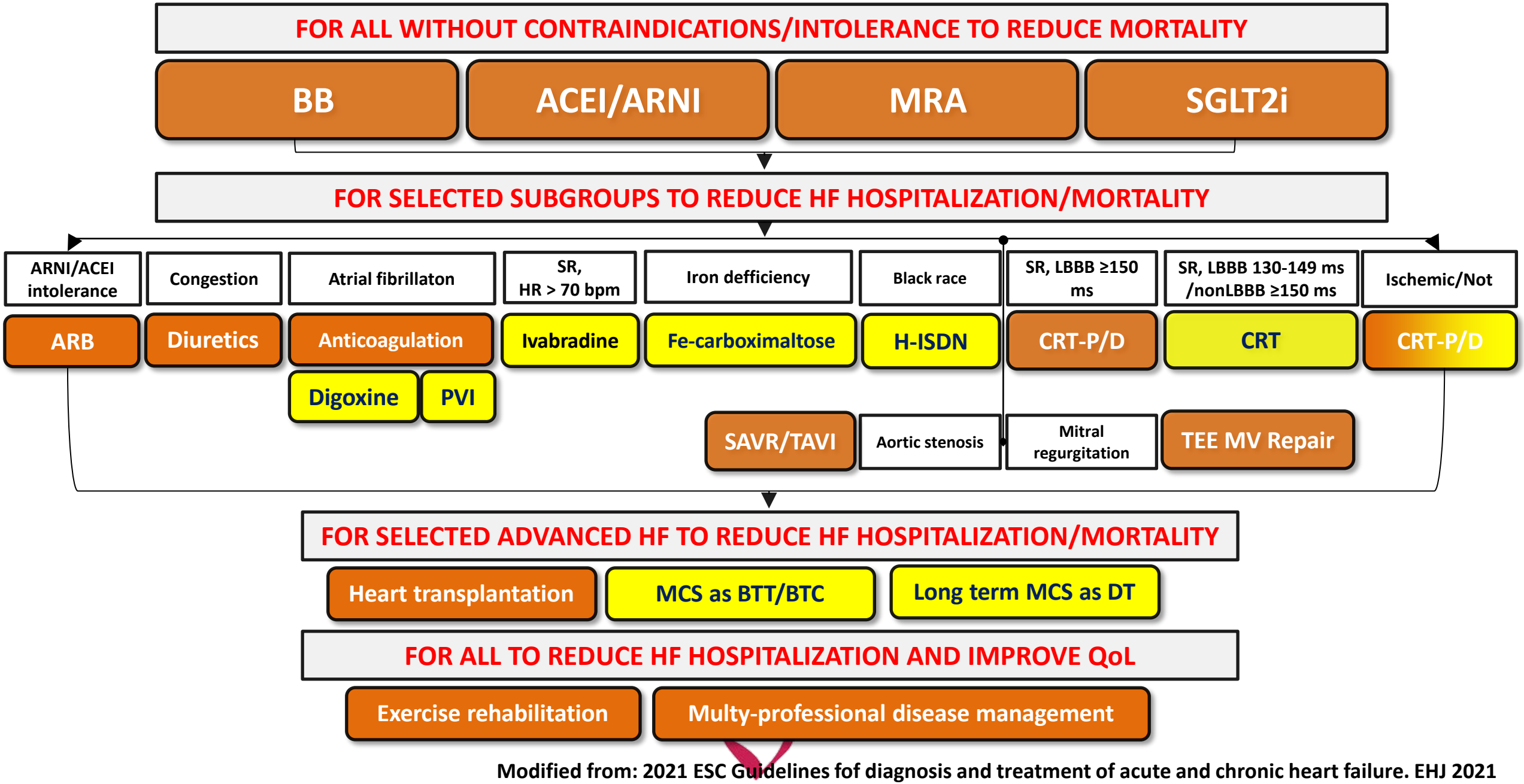
European Journal of Heart Failure (2021)23, 352–380; Journal of Cardiac Failure (2021)27(4) 387-413

Stages in the development and progression of heart failure



European Journal of Heart Failure (2021)23, 352–380; Journal of Cardiac Failure (2021)27(4) 387-413

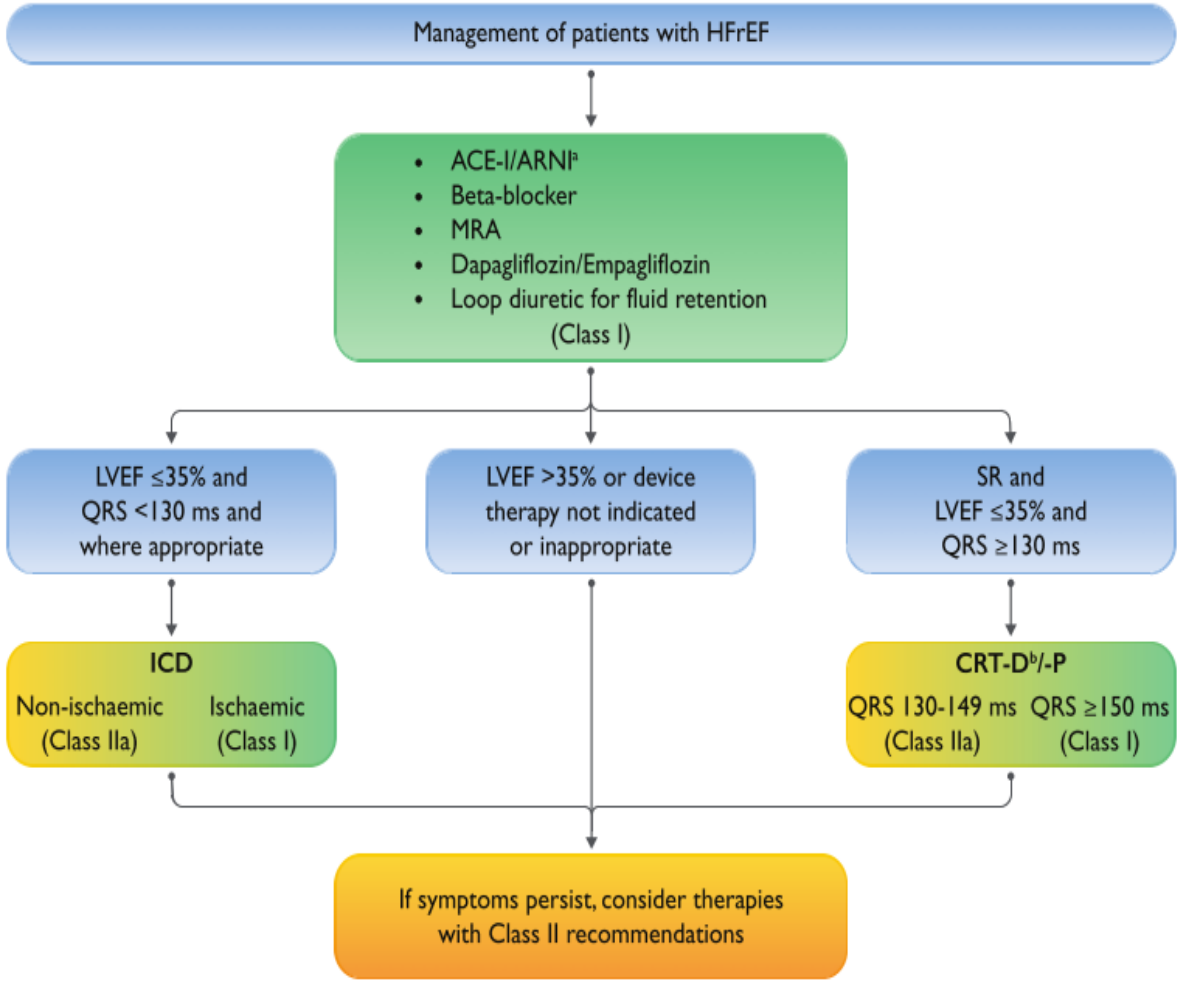
Management of HFrEF by phenotype



Modified from: 2021 ESC Guidelines fof diagnosis and treatment of acute and chronic heart failure. EHJ 2021

ESC
European Society of Cardiology

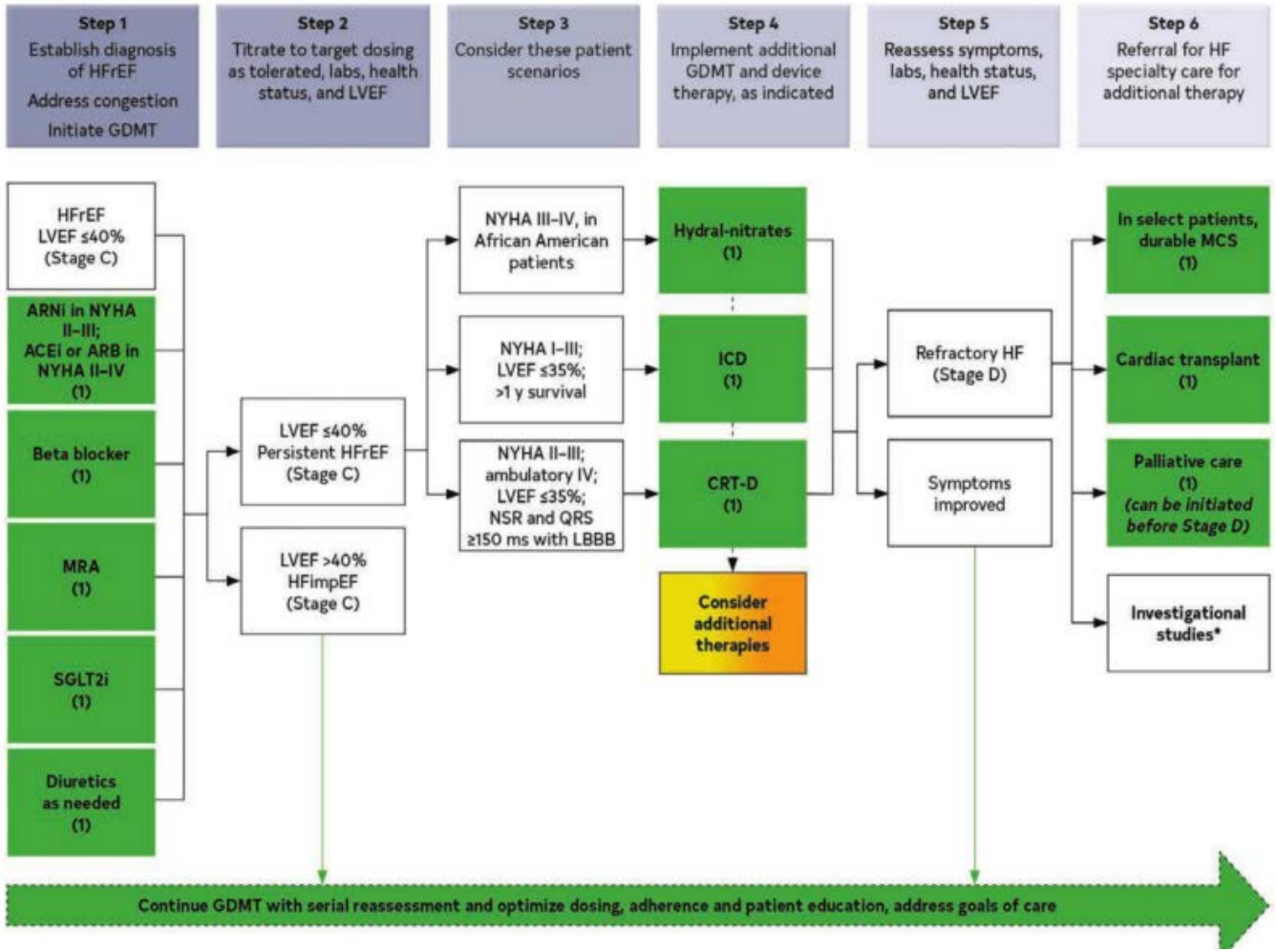
2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure



American Heart Association.
AMERICAN COLLEGE of CARDIOLOGY
HFSA HEART FAILURE SOCIETY OF AMERICA

CLINICAL PRACTICE GUIDELINE: FULL TEXT

2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure



EHJ 2021;00:1-128; Circulation. 2022;145:00–00

ESC European Society of Cardiology

European Journal of Heart Failure (2019)
doi:10.1002/ejhf.1369

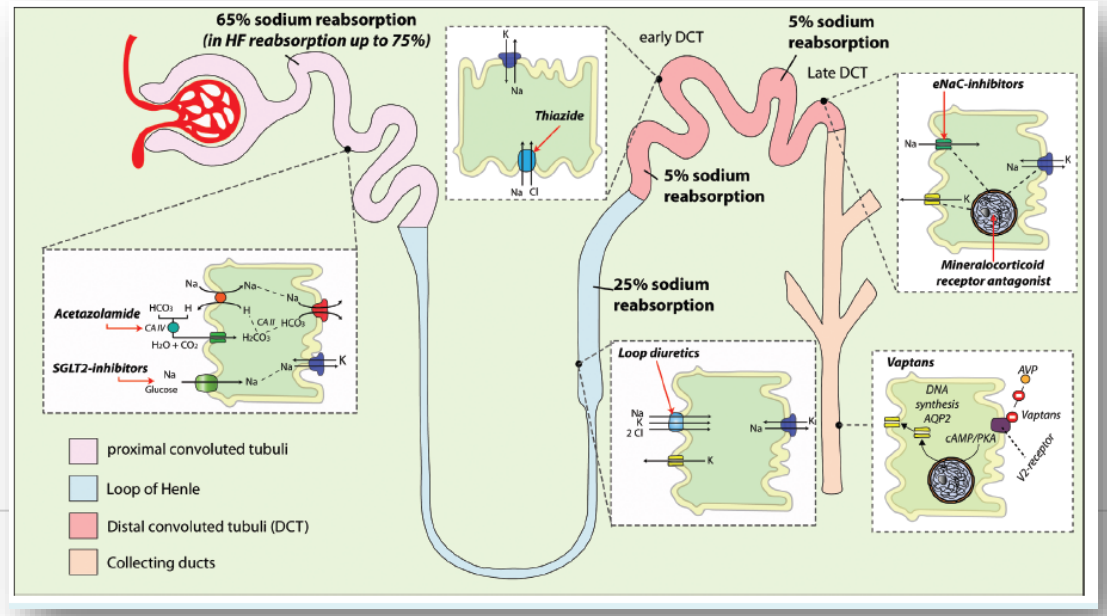
POSITION PAPE

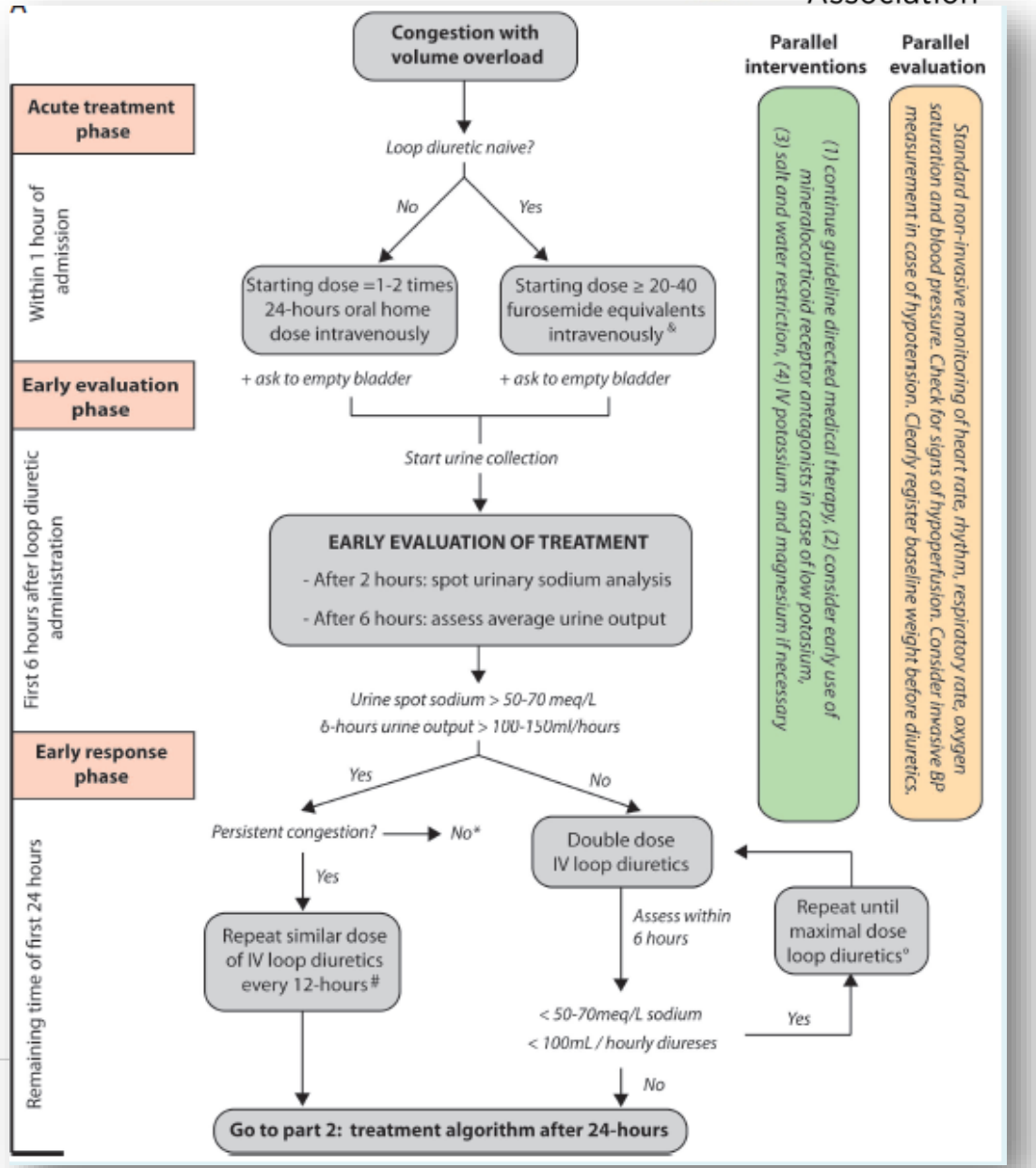
Check for updates

HFA Heart Failure Association

The use of diuretics in heart failure with congestion — a position statement from the Heart Failure Association of the European Society of Cardiology

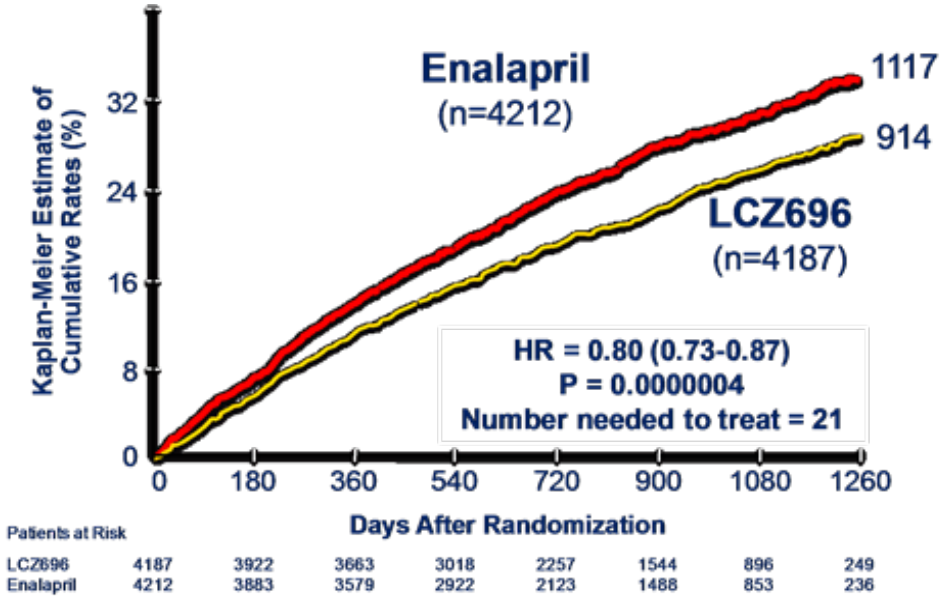
Wilfried Mullens[1,2]*, Kevin Damman[3], Veli-Pekka Harjola[4], Alexandre Mebazaa[5], Hans-Peter Brunner-La Rocca[6], Pieter Martens[1,2], Jeffrey M. Testani[7], W.H. Wilson Tang[8], Francesco Orso[9], Patrick Rossignol[10], Marco Metra[11], Gerasimos Filippatos[12,13], Petar M. Seferovic[14], Frank Ruschitzka[15], and Andrew J. Coats[16]

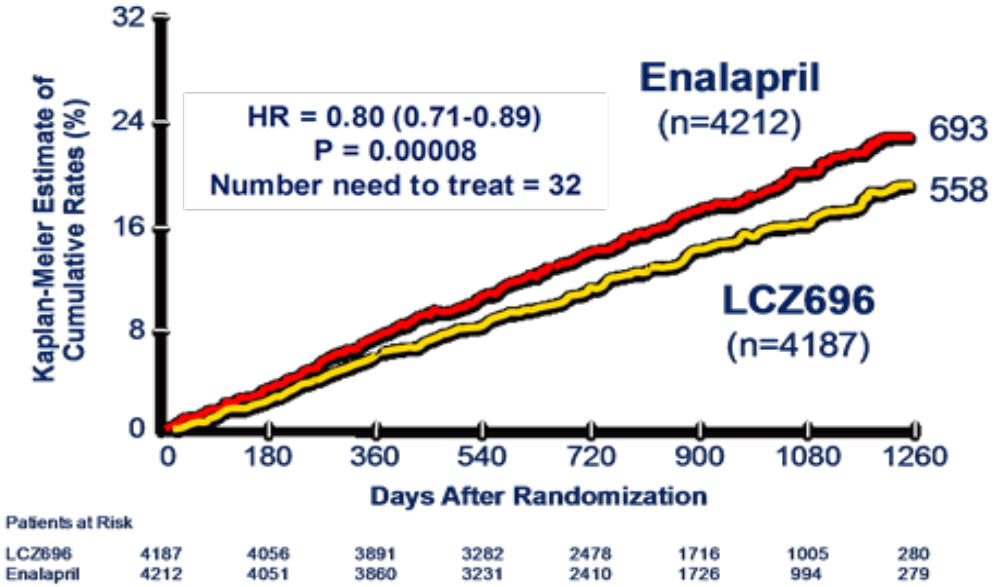


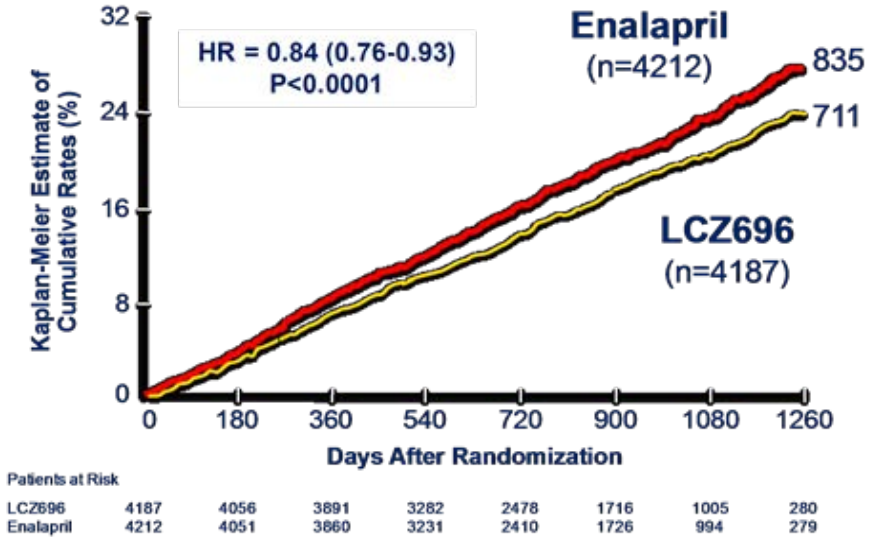


PARADIGM-HF Primary Results

Significant Reduction in Primary Endpoints (CV death or heart failure hospitalization), CV Death and All-Cause Mortality



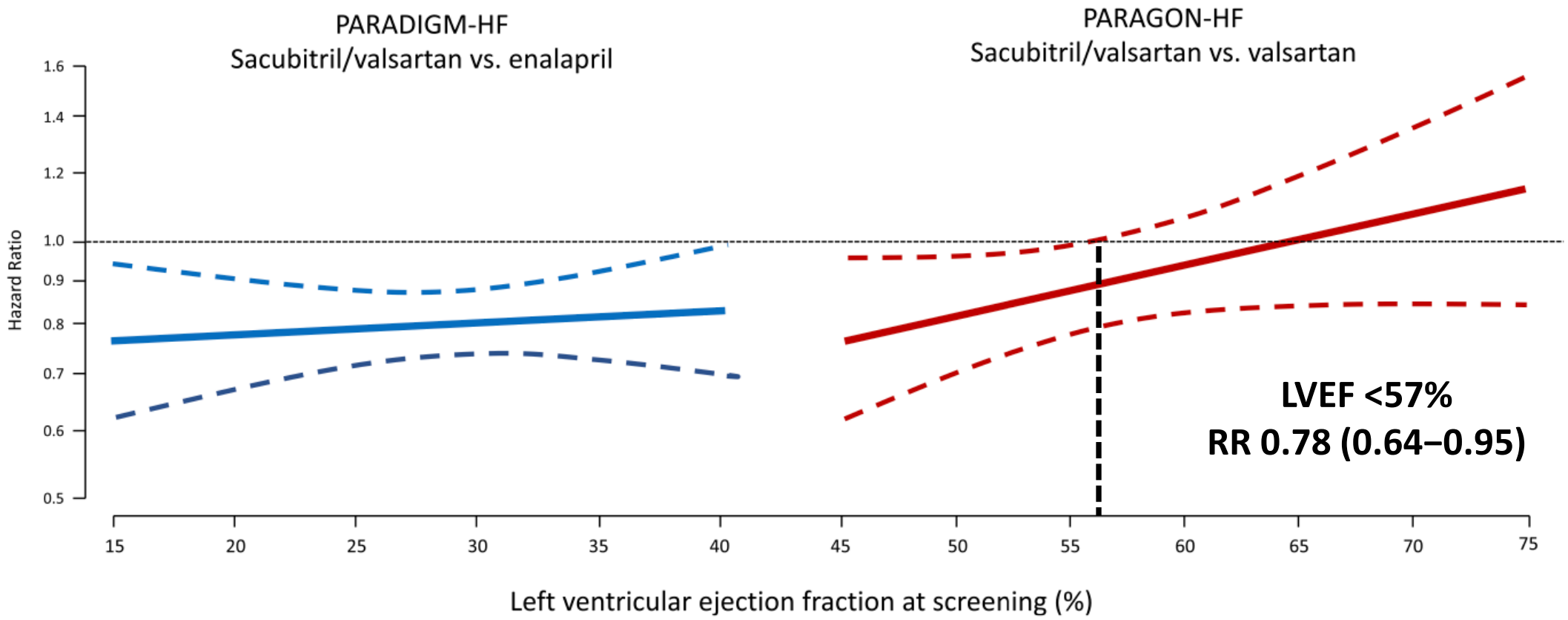




McMurray et al. N Engl J Med 2014; 371(11):993-1004.

Switching from ACEi/ARB to sacubitril/valsartan

Benefits of sacubitril/valsartan in “lower than normal” LVEF



Sacubitril/valsartan may be a preferred treatment option compared to either ACEi or ARBs in patients with LVEF <57%

Solomon S et al. N Engl J Med 2019;381:1609-20

Solon S, McMurray J. Journal of Cardiac Failure Vol. 27 No. 6 2021

Heart Failure & World Congress on Acute Heart Failure 2023

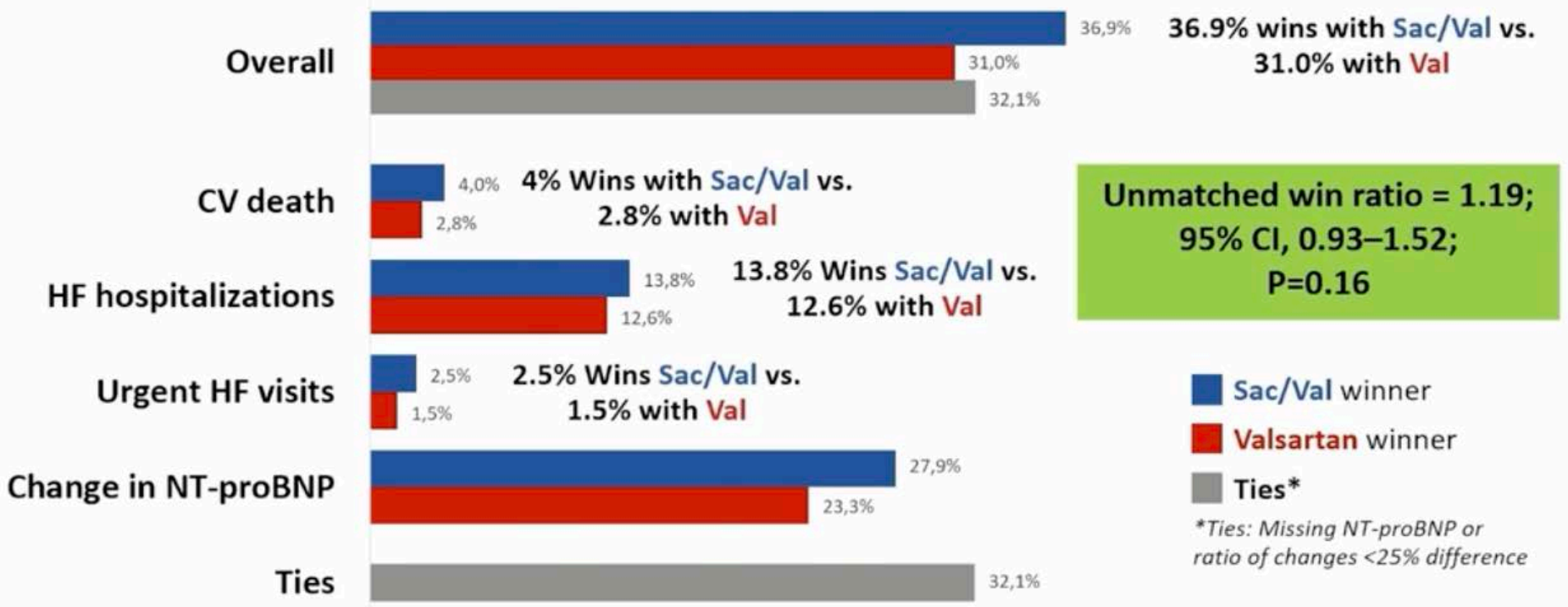
20-23 MAY
PRAGUE & ONLINE

HFmrEF/HFpEF (LVEF >40%) And recent worsening HF event N=466

Secondary Outcome

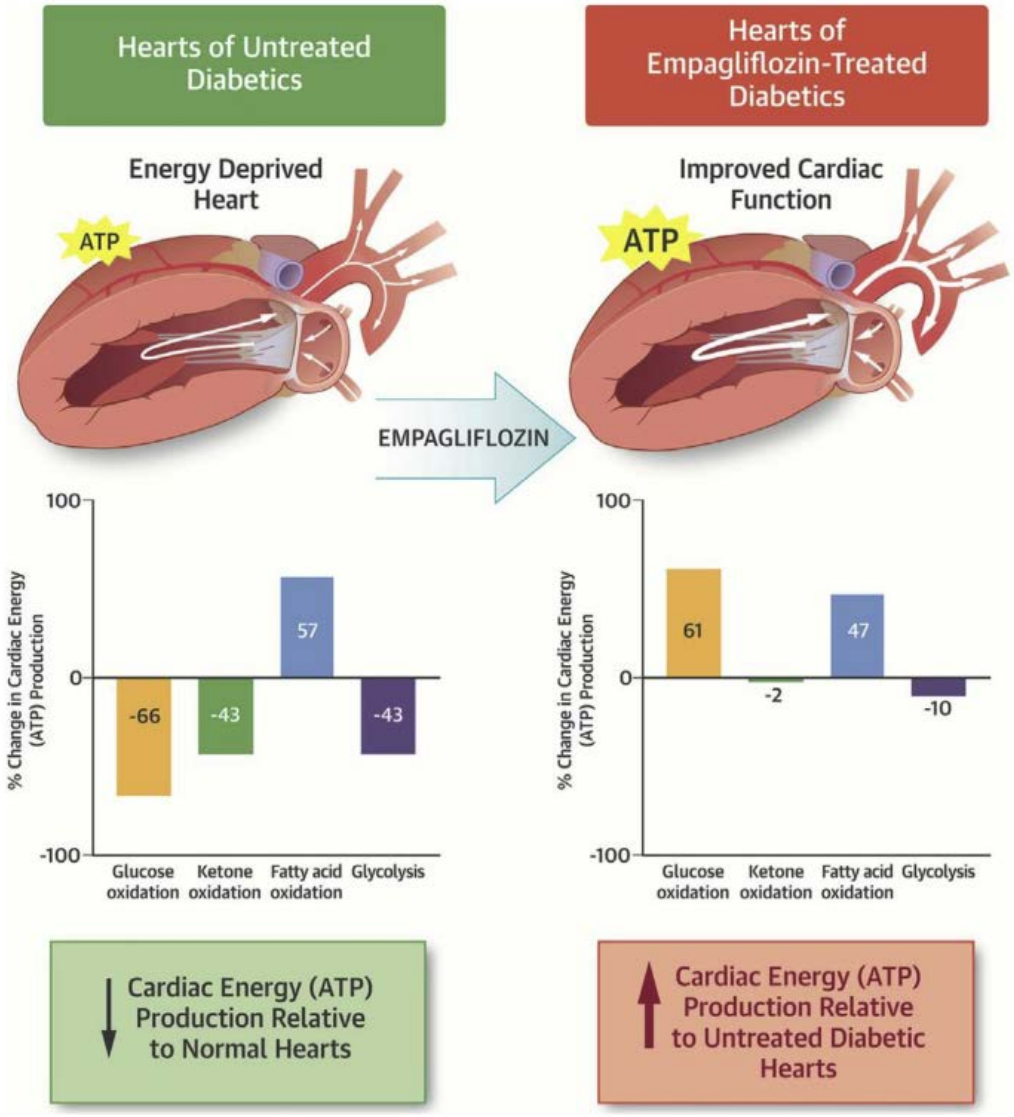
PARAGLIDEHF

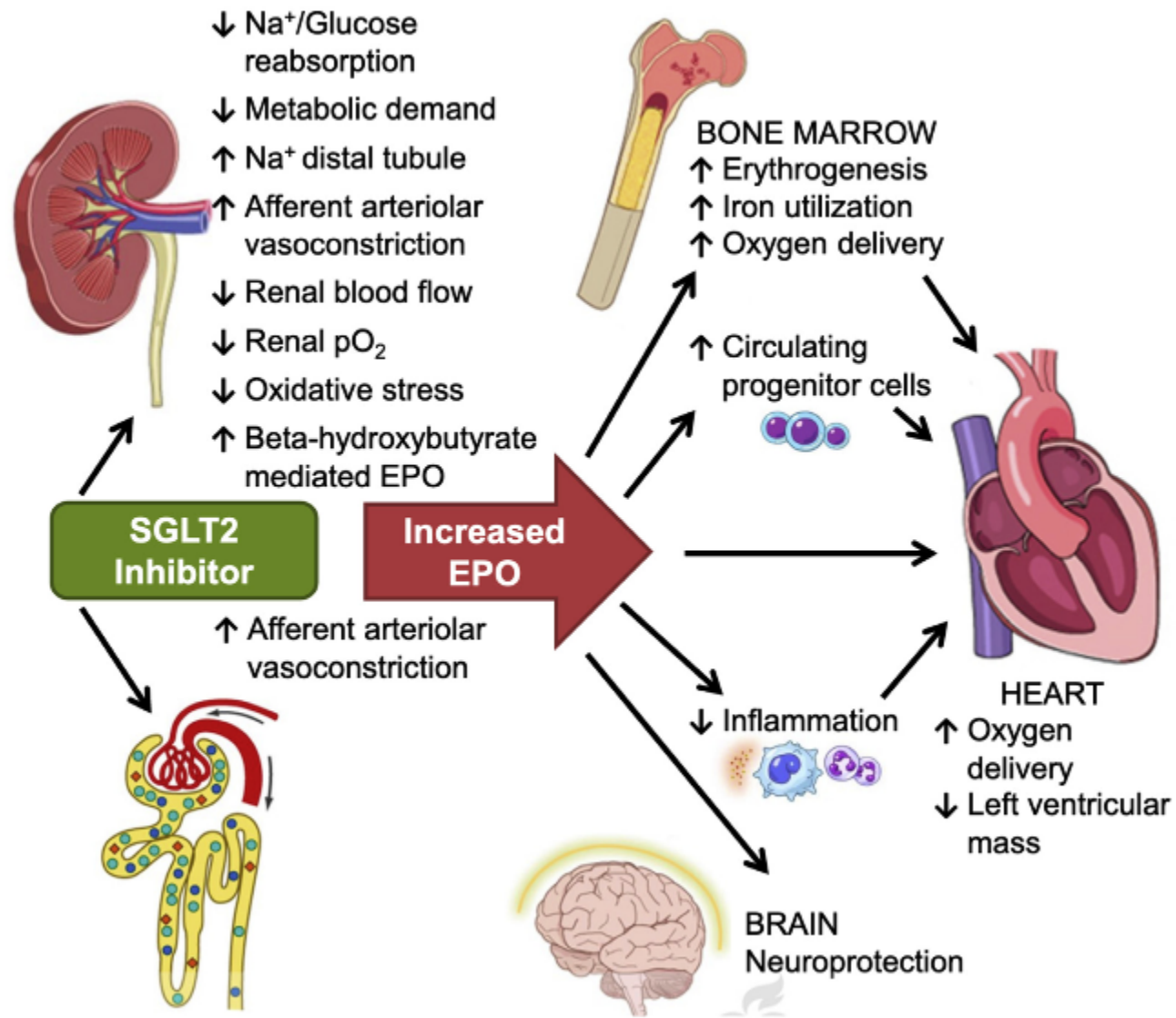
Hierarchical composite of a) time to CV death, b) HF hospitalizations, c) urgent HF visits, and d) change in NT-proBNP



Presented by Dr Robert Mentz at Late Breaking Clinical Trials Session, HF Congress 2023, Prague

SGLT2 inhibition
Mechanisms of the cardio-/nephroprotective effects

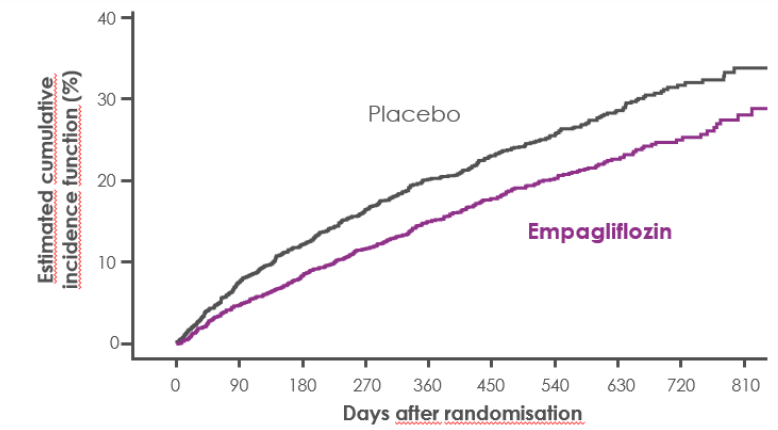




Lopaschuk, G.D. et al. J Am Coll Cardiol Basic Trans Science. 2020;5(6):632–44

EMPEROR Reduced

Primary endpoint: First adjudicated CV death or HF hospitalisation



Patients at risk

Placebo	1867	1715	1612	1345	1108	854	611	410	224	109
Empagliflozin	1863	1763	1677	1424	1172	909	645	423	231	101

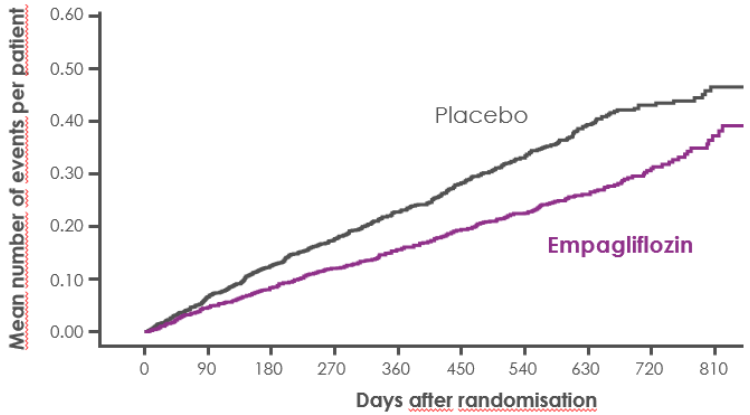
RRR 25%

ARR 5.2%

NNT = 19

HR 0.75
(95% CI 0.65, 0.86)
p<0.001

Key secondary: Adjudicated total HF hospitalisations (first and recurrent)



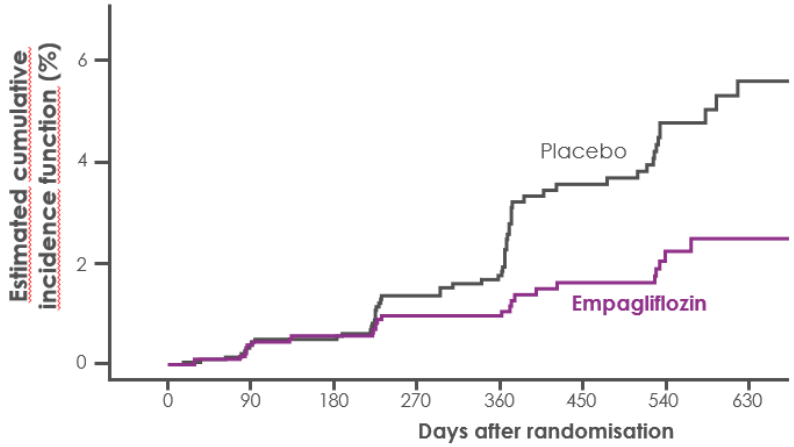
Patients at risk

Placebo	1867	1820	1762	1526	1285	1017	732	497	275	135
Empagliflozin	1863	1826	1768	1532	1283	1008	732	495	272	118

RRR 30%

HR 0.70
(95% CI 0.58, 0.85)
p<0.001

Composite renal endpoint (ESKD or sustained profound decrease in eGFR)



Patients at risk

Placebo	1867	1592	1501	1136	1058	681	357	259
Empagliflozin	1863	1599	1532	1155	1062	687	391	276

RRR 50%

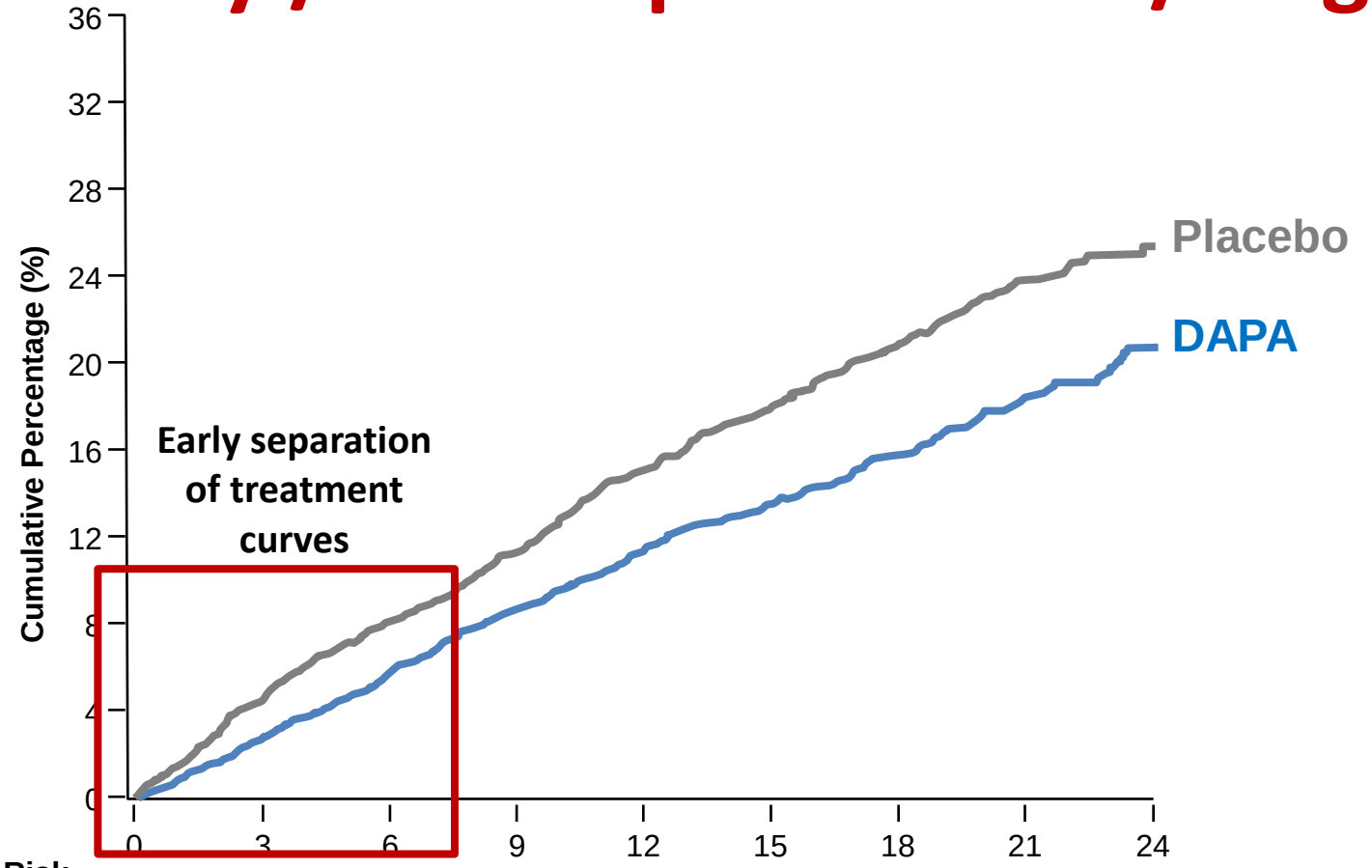
ARR 1.5%

HR 0.50
(95% CI 0.32, 0.77)

N Engl J Med 2020; 383:1413-1424

DAPA-HF: primary composite outcome

CV mortality / HF hospitalisation / Urgent HF visit



HR 0.74 (0.65, 0.85)
p=0.00001

26% RRR

NNT = 21

DAPA = dapagliflozin; HF = heart failure; hHF = hospitalization for heart failure; HR = hazard ratio; NNT = number needed to treat.

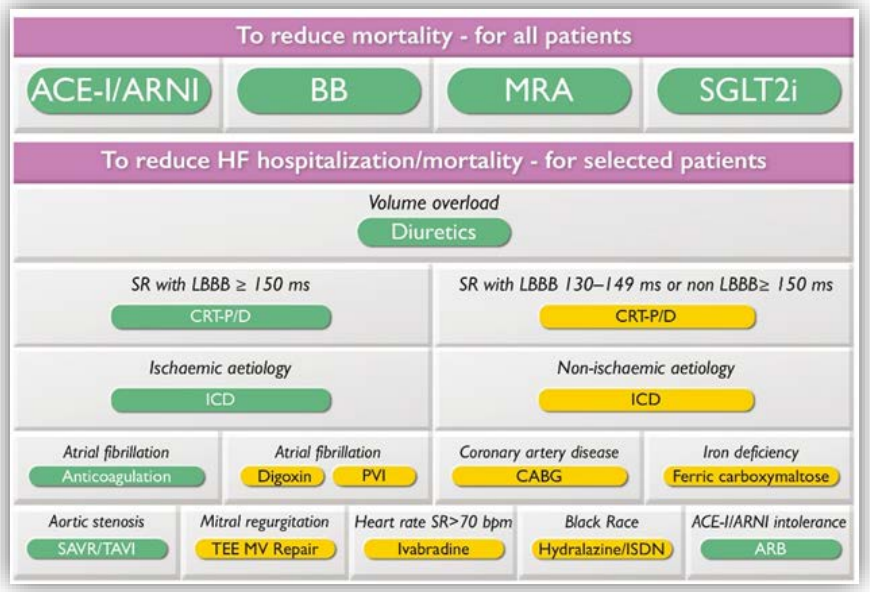
1. McMurray J. Presentation at: European Society of Cardiology Congress. September 1, 2019; Paris, France.

Manuel Jimenez Prieto: Martin Charcot visits a patient, 1897

HFA Heart Failure Association
European Society of Cardiology

2021 ESC/HFA Guidelines for heart failure

New strategies for medical treatment



- **Quarduple**, instead of triple, basic medical treatment

- **Simultaneous**, instead of sequential, introduction of the drugs

---

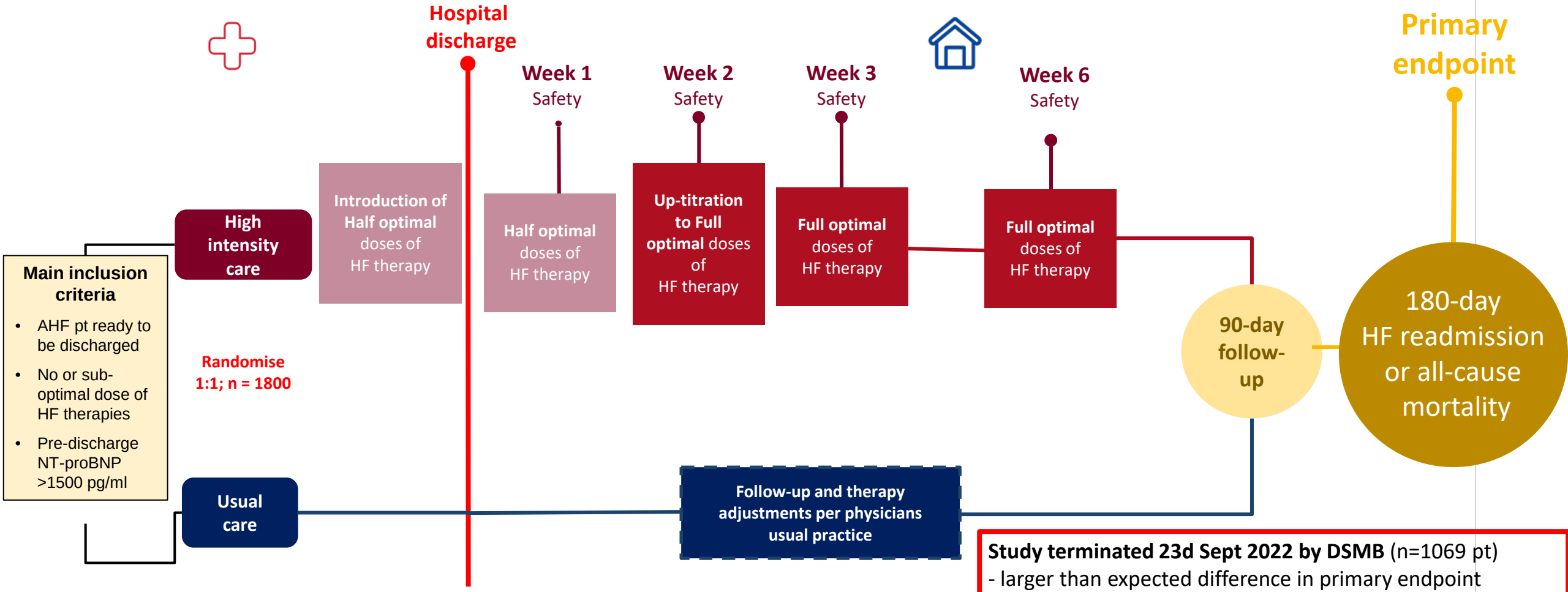
- **Patients profiling** (Strategic phenotyping)

HFA Heart Failure Association
European Society of Cardiology

Patient profling in heart failure

G. Rosano et al. European Journal of Heart Failure (2021) 23, 872–881

STRONG-HF – Study Design



HF therapy: combining ACEi/ARB/ARNi & BB & MRA
Safety = clinical exam & biology (NT-proBNP, K, Creat, hemoglobin)

Study terminated 23d Sept 2022 by DSMB (n=1069 pt)
- larger than expected difference in primary endpoint
- unethical to keep patients in usual care

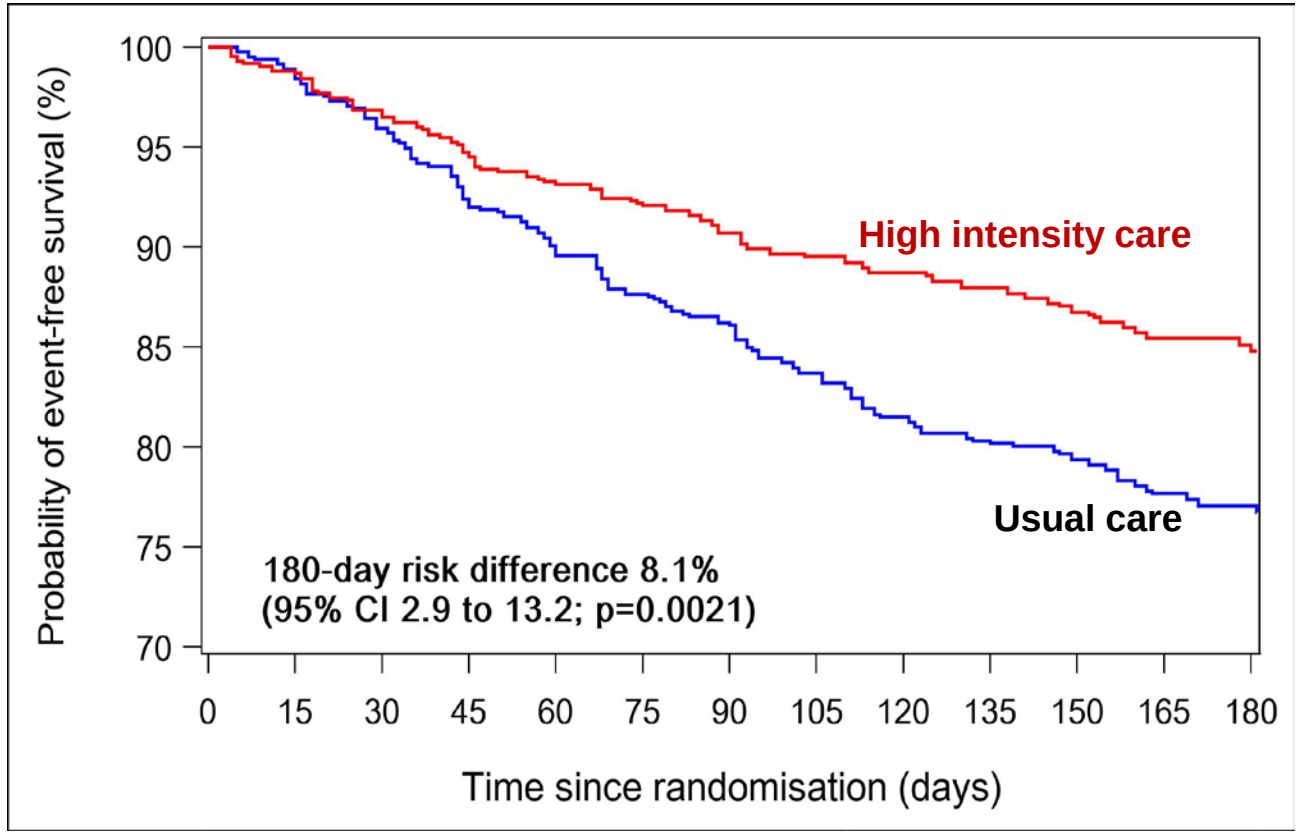
Peptide for Life

STRONG-HF
CONTEMPORARY POST-DISCHARGE MANAGEMENT IN HEART-FAILURE

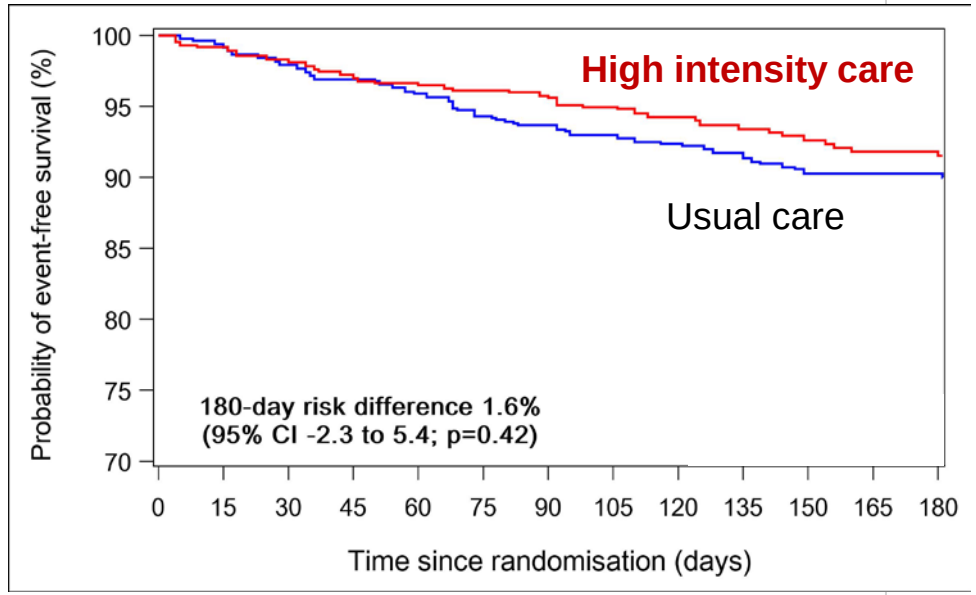
Mebazaa A et al. The Lancet 2022

STRONG-HF: Primary Endpoint

Primary endpoint:
180-Day Readmission for HF or All-Cause Death



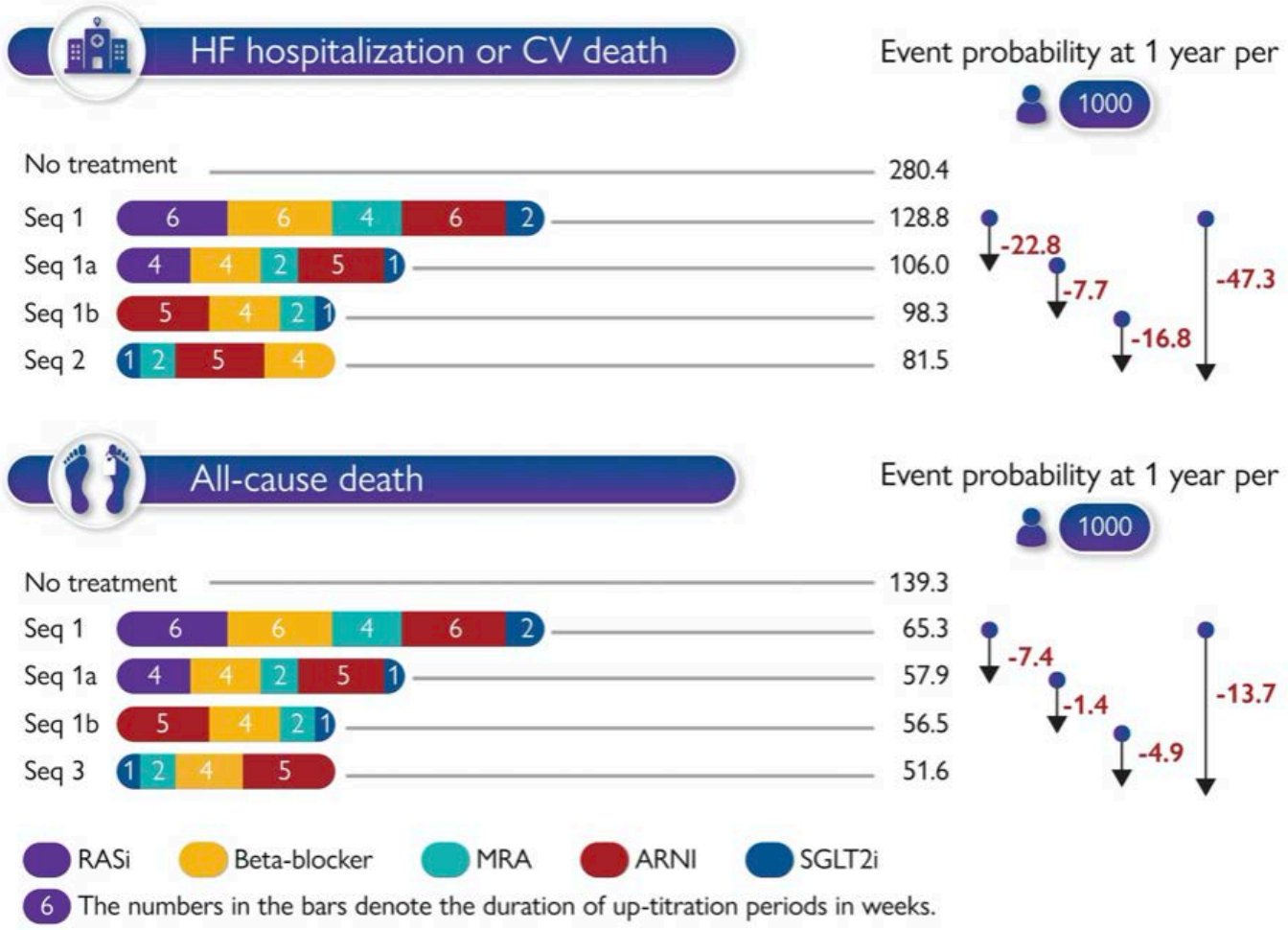
180-Day All-Cause Death



Mebazaa A et al. The Lancet 2022

Article highlight:

Accelerated up-titration and optimized ordering can prevent at least 14 deaths and 47 HF hospitalisations/CVdeaths per 1000 treated HFrEF patients over the first 12 months.



2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

PRE-HOSPITAL PHASE

- Timely institution of I.V. diuretics.
- Transfer to ED

ADMISSION PHASE

EMERGENCY DEPARTMENT

- Disposition decisions: ICU/CCU, hospital ward, early discharge.

COACH

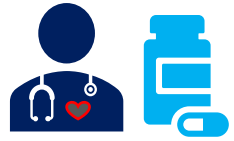
INHOSPITAL AND PRE-DISCHARGE PHASE

- Decongestion

ADVOR
CLOROTIC
EMPULSE

- Early initiation and optimisation of GDMT.

STRONG-HF



POSTDISHARGE PHASE

- Early follow-up (2 weeks post-discharge)
- GDMT optimisation

Admission phase
COACH trial: intervention vs standard care

Risk-score guided stratification of mortality risk

LOW RISK
Standardised care for 30 days

HIGH RISK
Hospital admission

EMERGENCY DEPARTMENT

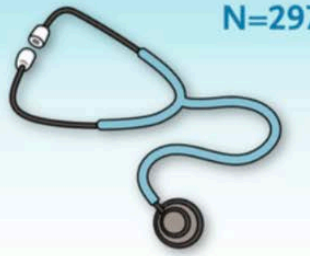
Intervention Phase

N=2480

Point-of-Care Algorithm

Control Phase

N=2972



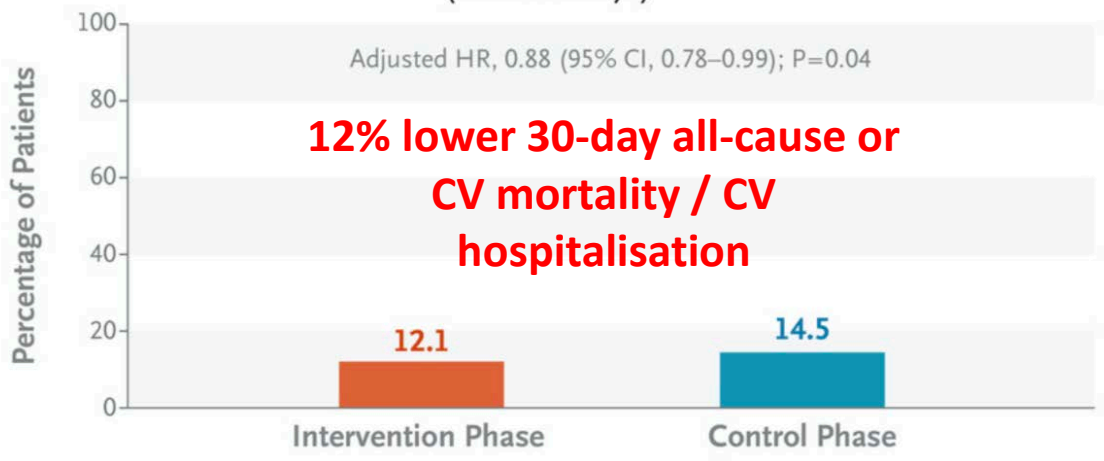
Usual Care

Clinical judgement

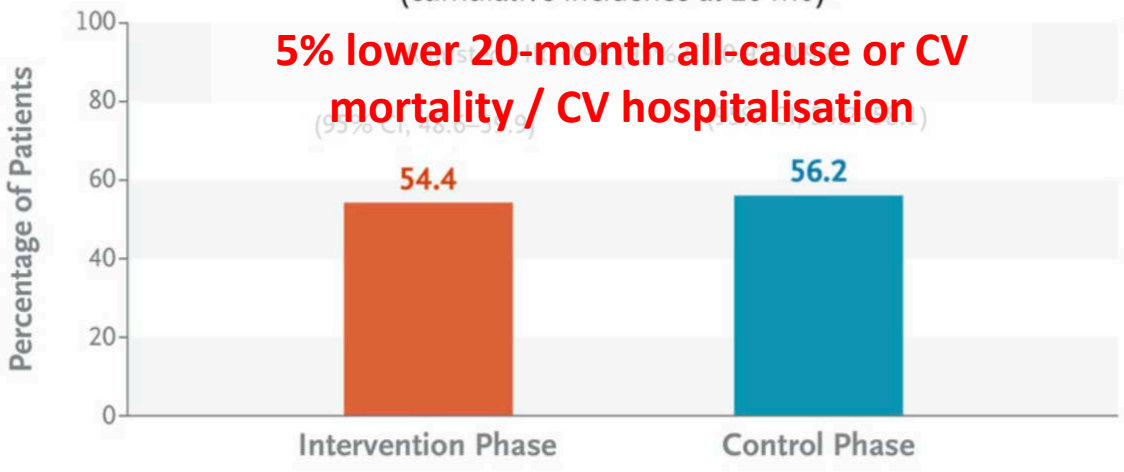
LOW RISK
Usual care for 30 days

HIGH RISK
Hospital admission

Death from Any Cause or Hospitalization for Cardiovascular Causes
(within 30 days)



Death from Any Cause or Hospitalization for Cardiovascular Causes
(cumulative incidence at 20 mo)



Lee DS et al. N Engl J Med 2023;388:22-32

CLINICAL RESEARCH

Global disparities in prescription of guideline-recommended drugs for heart failure with reduced ejection fraction

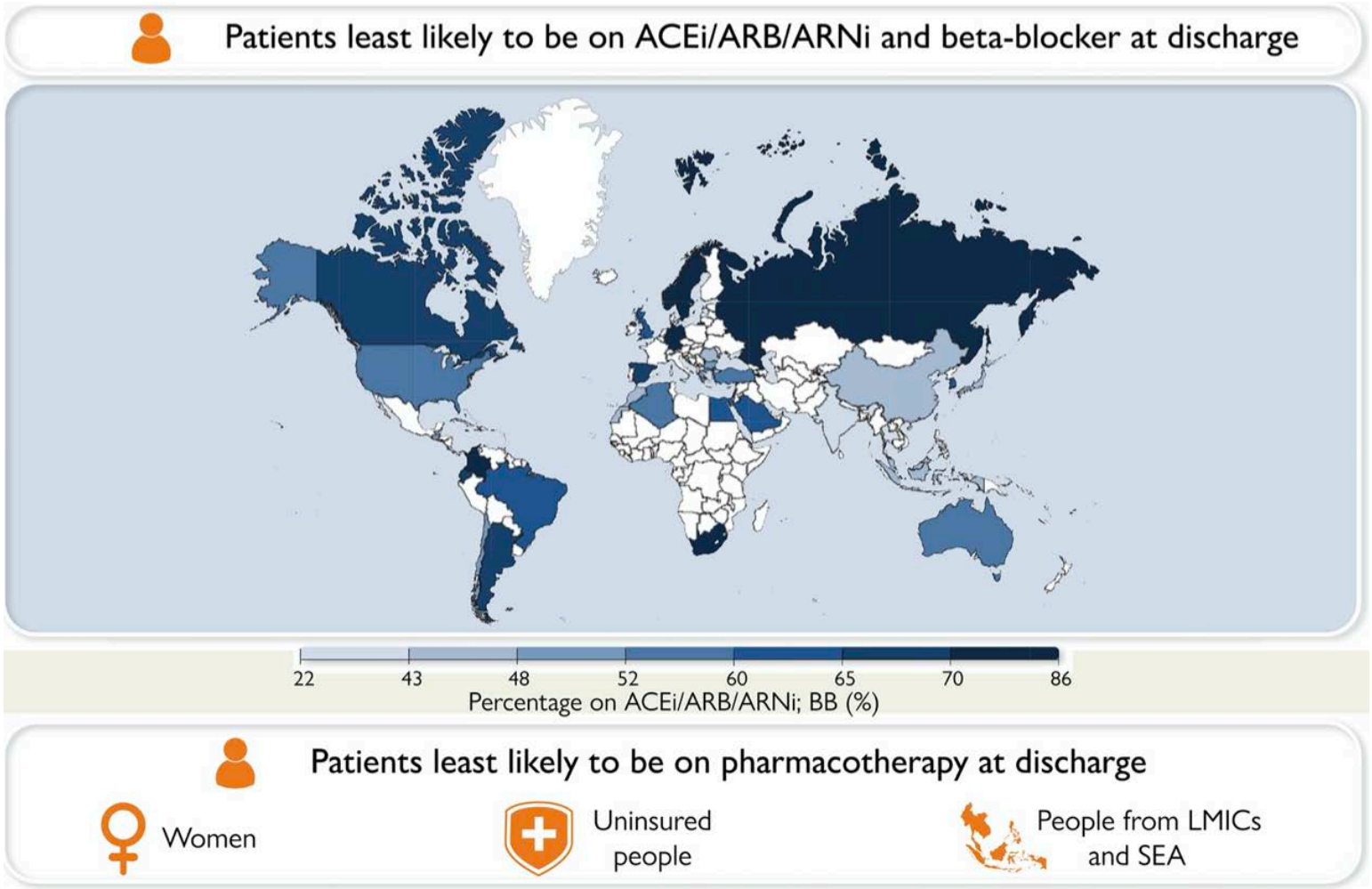
Get access >

Jasper Tromp and others

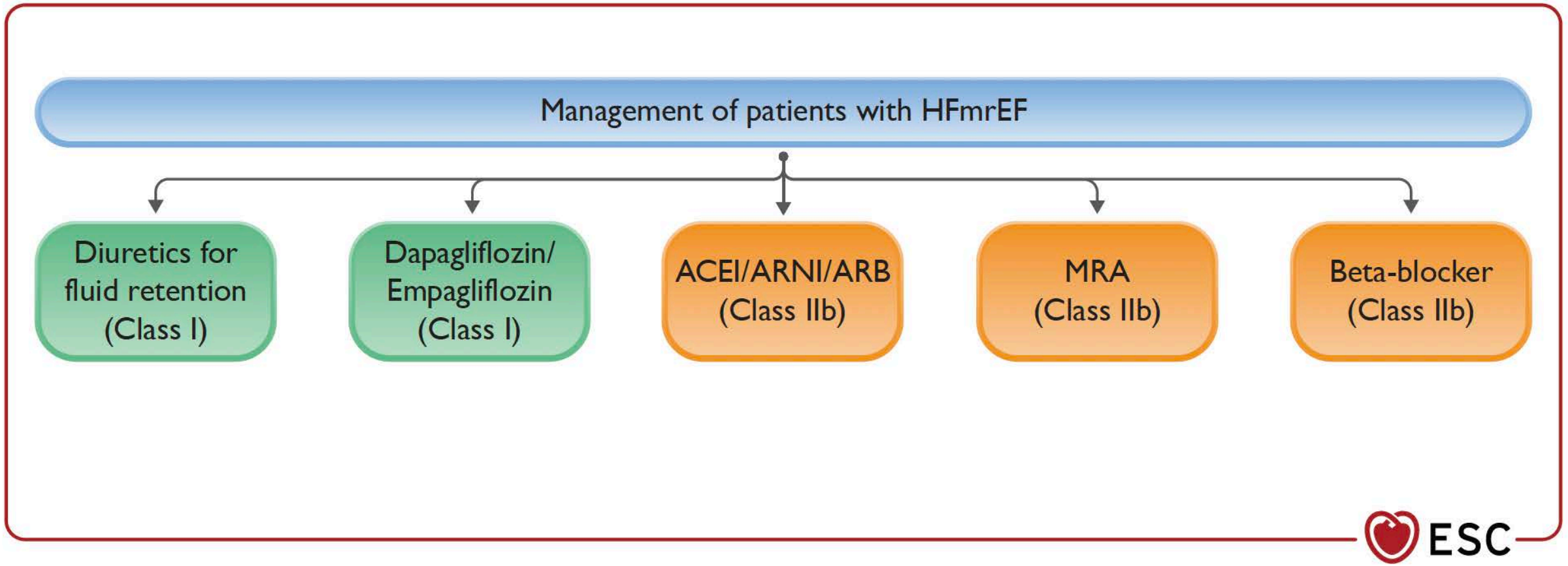
European Heart Journal, Volume 43, Issue 23, 14 June 2022, Pages 2224–2234,

Article highlight:

REPORT-HF study: Only ~37% of patients with HFrEF were discharged with at least 3 HF medications. Patients in LMICs were less likely to receive GDMT at target doses.



2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure



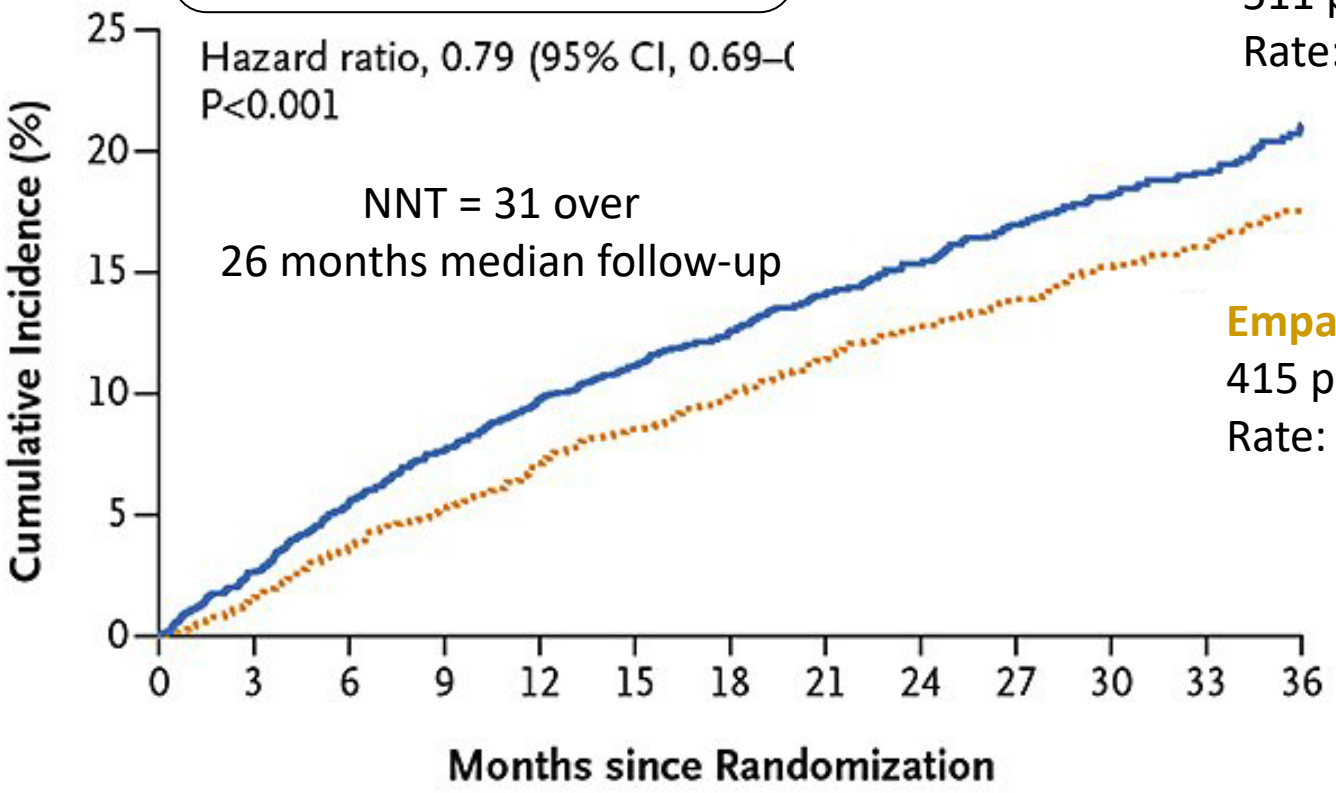
Mc Donagh T et al. European Heart Journal (2023) 00, 1–13

EMPEROR-Preserved: Results

Empagliflozin Outcome Trial in Patients with Chronic Heart Failure with Preserved Ejection Fraction

Primary composite endpoint:
Cardiovascular death or heart failure hospitalization

HR 0.79 (95% CI 0.69, 0.90)
P = 0.0003



Placebo:
511 patients with event
Rate: 8.7 per 100 patient-years

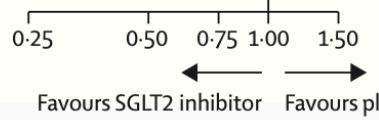
Empagliflozin:
415 patients with event
Rate: 6.9 per 100 patient-years

Impact of diabetes on the effects of sodium glucose co-transporter-2 inhibitors on kidney outcomes: collaborative meta-analysis of large placebo-controlled trials

A meta-analysis of clinical trials with patients with CKD (CREDENCE, SCORED, DAPA-CKD, EMPA-Kidney) with and without T2DM demonstrated a favourable impact of SGLT2 inhibition of CKD progression, regardless of T2DM status or the type of CKD

	Mean baseline eGFR, mL/min per 1·73m²	Events/participants		Event rate per 1000 patient-years		RR (95% CI)
		SGLT2 inhibitor	Placebo	SGLT2inhibitor	Placebo	
Diabetic kidney disease or nephropathy*						
CREDENCE	56	153/2202	230/2199	27	41	0·64 (0·52–0·79)
SCORED	44	37/5292	52/5292	5	7	0·71 (0·46–1·08)
DAPA–CKD	43	93/1271	157/1239	36	64	0·55 (0·43–0·71)
EMPA–KIDNEY	36	85/1032	133/1025	42	67	0·56 (0·43–0·74)
Subtotal	**46**	**368/9797**	**572/9755**	..	..	**0·60 (0·53–0·69)**
Ischaemic and hypertensive kidney disease						
DAPA–CKD	43	18/324	26/363	28	37	0·74 (0·40–1·36)
EMPA–KIDNEY	35	37/706	52/739	27	37	0·69 (0·45–1·05)
Subtotal	**38**	**55/1030**	**78/1102**	..	..	**0·70 (0·50–1·00)**
Glomerular disease						
DAPA–CKD	43	21/343	46/352	33	70	0·43 (0·26–0·72)
EMPA–KIDNEY	42	69/853	95/816	44	64	0·68 (0·50–0·93)
Subtotal	**42**	**90/1196**	**141/1168**	..	..	**0·60 (0·46–0·78)**
Other kidney disease or unknown						
DAPA–CKD	43	10/214	14/198	25	37	0·81 (0·35–1·83)
EMPA–KIDNEY	36	36/713	52/725	26	36	0·72 (0·47–1·10)
Subtotal	**38**	**46/927**	**66/923**	..	..	**0·74 (0·51–1·08)**
Any diagnosis						
CREDENCE	56	153/2202	230/2199	27	41	0·64 (0·52–0·79)
SCORED	44	37/5292	52/5292	5	7	0·71 (0·46–1·08)
DAPA–CKD	43	142/2152	243/2152	33	58	0·56 (0·45–0·68)
EMPA–KIDNEY	37	227/3304	332/3305	36	52	0·64 (0·54–0·76)
Total	**44**	**559/12 950**	**857/12 948**	..	..	**0·62 (0·56–0·69)**

Heterogeneity across groups of primary kidney disease: p=0·67
Trend across trials sorted by eGFR for any diagnosis: p=0·88

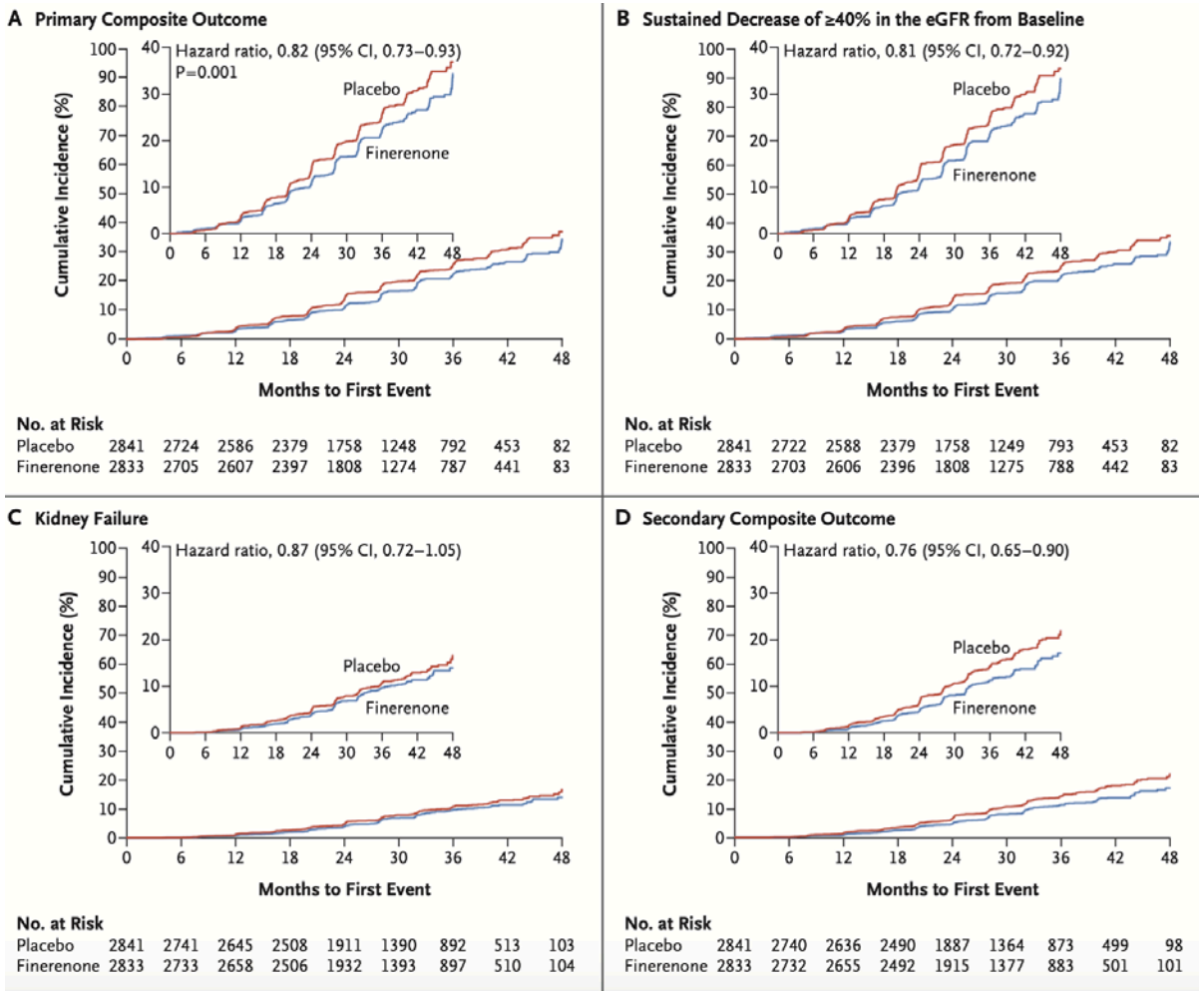


The Nuffield Department of Population Health Renal Studies Group* and the SGLT2 inhibitor Meta-Analysis Cardio-Renal Trialists' Consortium Lancet 2022; 400: 1788–801

Effect of Finerenone on Chronic Kidney Disease Outcomes in Type 2 Diabetes: FIDELIO-DKD

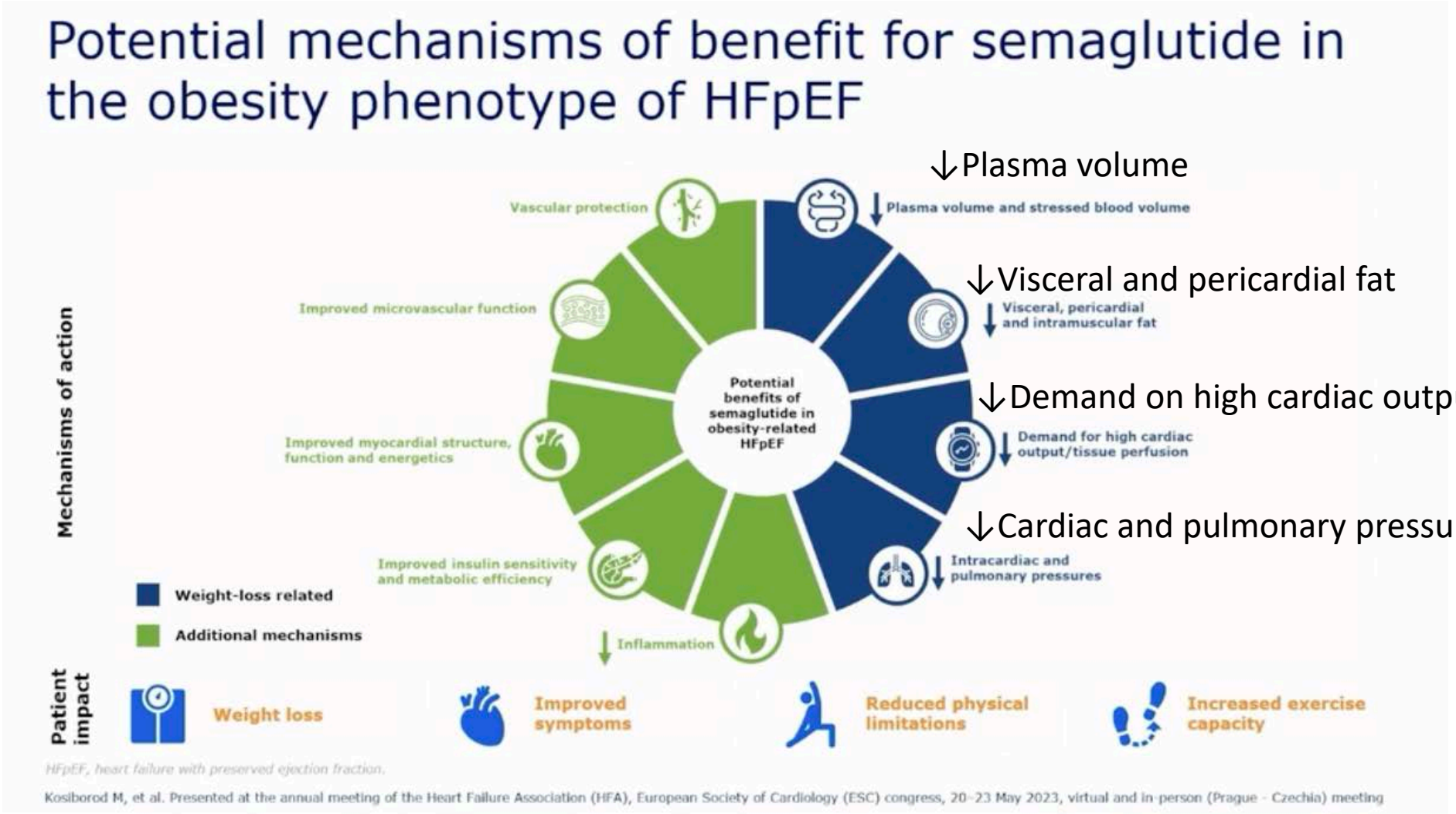
N=5734 pts with CKD and T2DM, UACR 30 to <300, eGFR 25 to <60 ml/min/1.73 m^2, and diabetic retinopathy, or UACR 300- 5000, eGFR of 25 to <75 ml/min/1.73 m^2, median FUP, 2.6 years.

In patients with CKD and T2DM, treatment with finerenone resulted in lower risks of CKD progression and cardiovascular events than placebo.



Bakris G et al.N Engl J Med 2020;383:2219-29

Design and baseline characteristics of STEP-HFpEF program: semaglutide in patients with obesity HFpEF phenotype



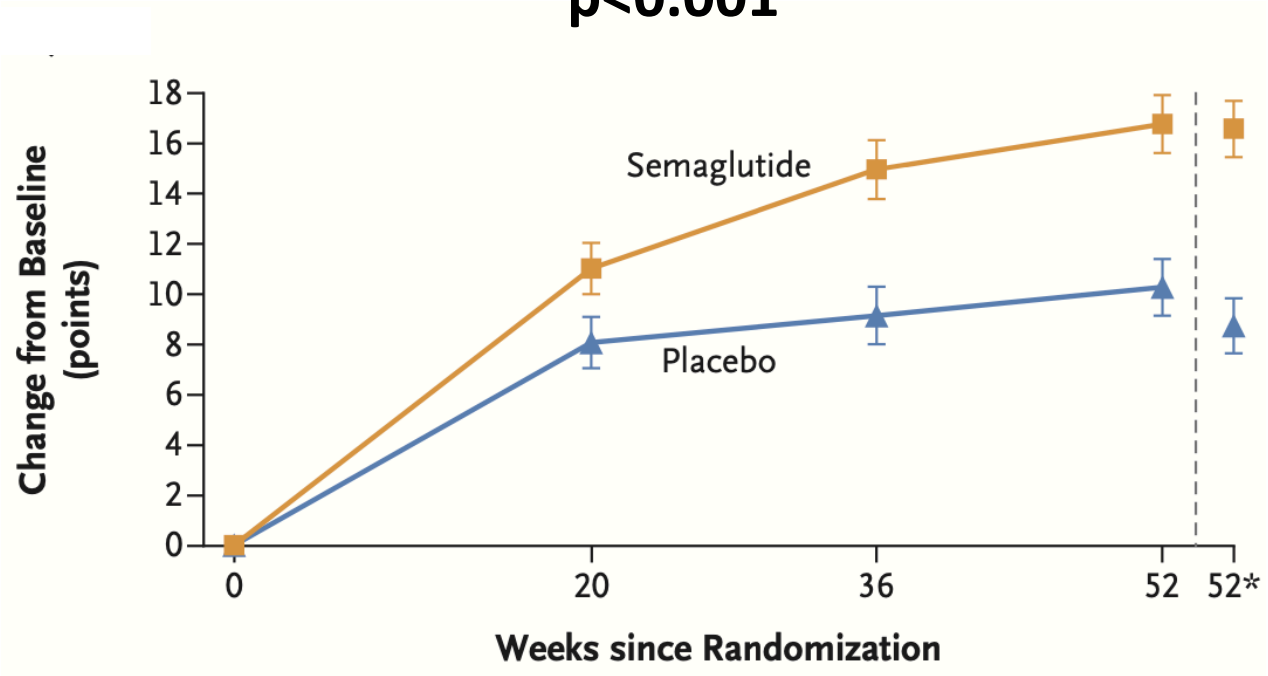
Presented by M. Kosiborod at HF 2023 Congress

STEP-HFpEF: results

N= 529 patients with HFpEF (LVEF ≥45%) and BMI ≥30 kg/m²
Semaglutide vs. placebo for 52 weeks
Dual primary end points: change from baseline in the KCCQ score and change in body weight

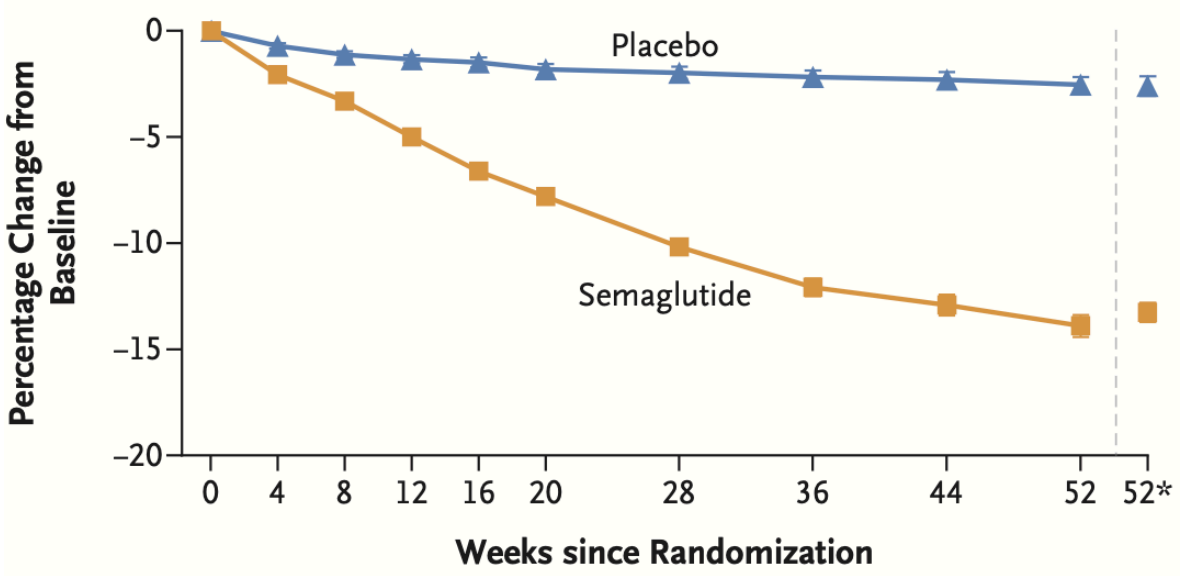
1. Change in KCCQ clinical score:

Estimated difference, 7.8 points, p<0.001



2. Change in body weight:

Estimated difference, 10.7% points, p<0.001



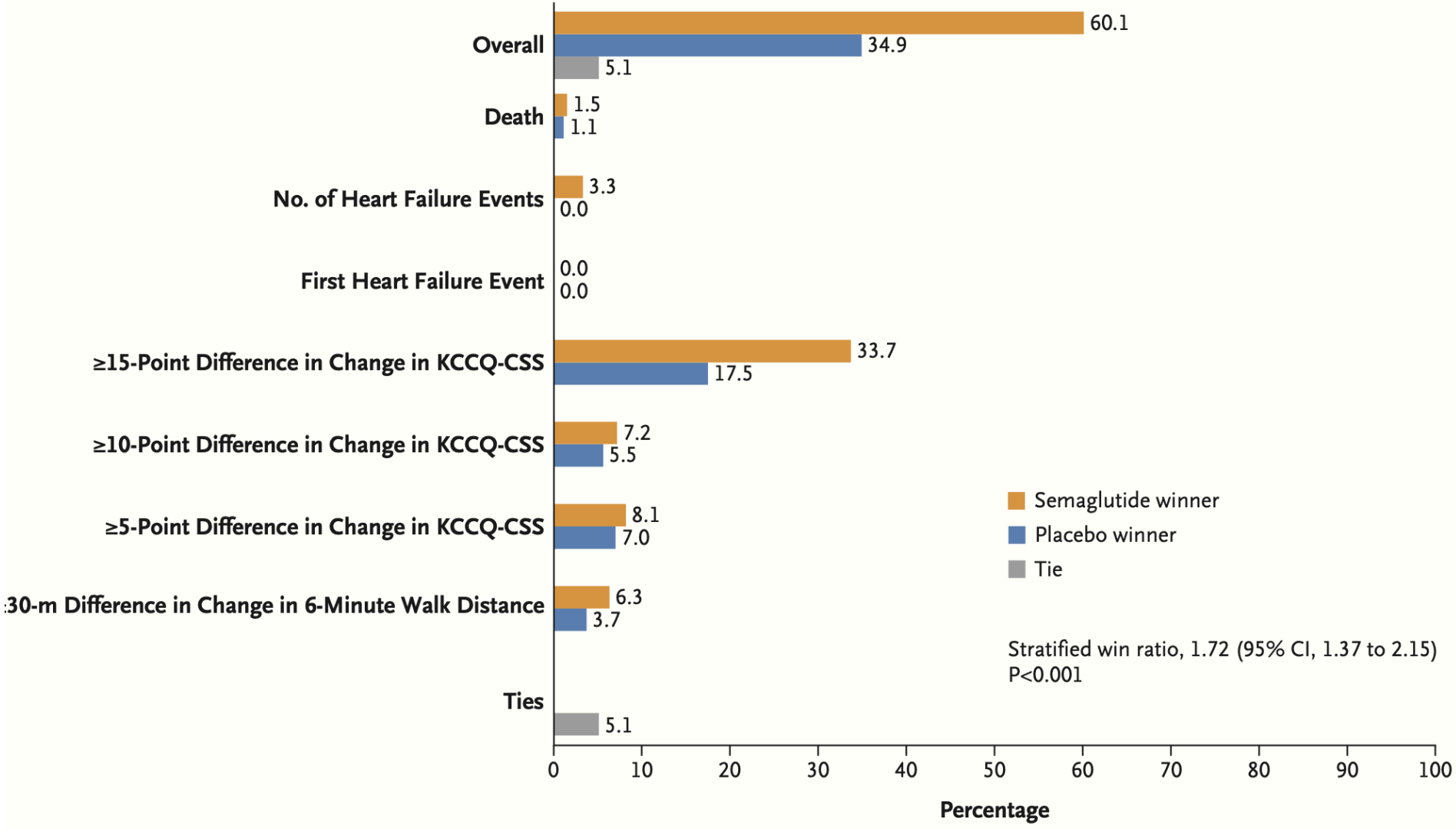
Kosiborod M et al. New England Journal of Medicine 2023. DOI: 10.1056/NEJMoa2306963

STEP-HFpEF: results

Stratified Win Ratio for Hierarchical Composite End Point

Treatment with semaglutide resulted in more wins than placebo, with a win ratio of 1.72 (95% CI, 1.37 to 2.15; P<0.001).

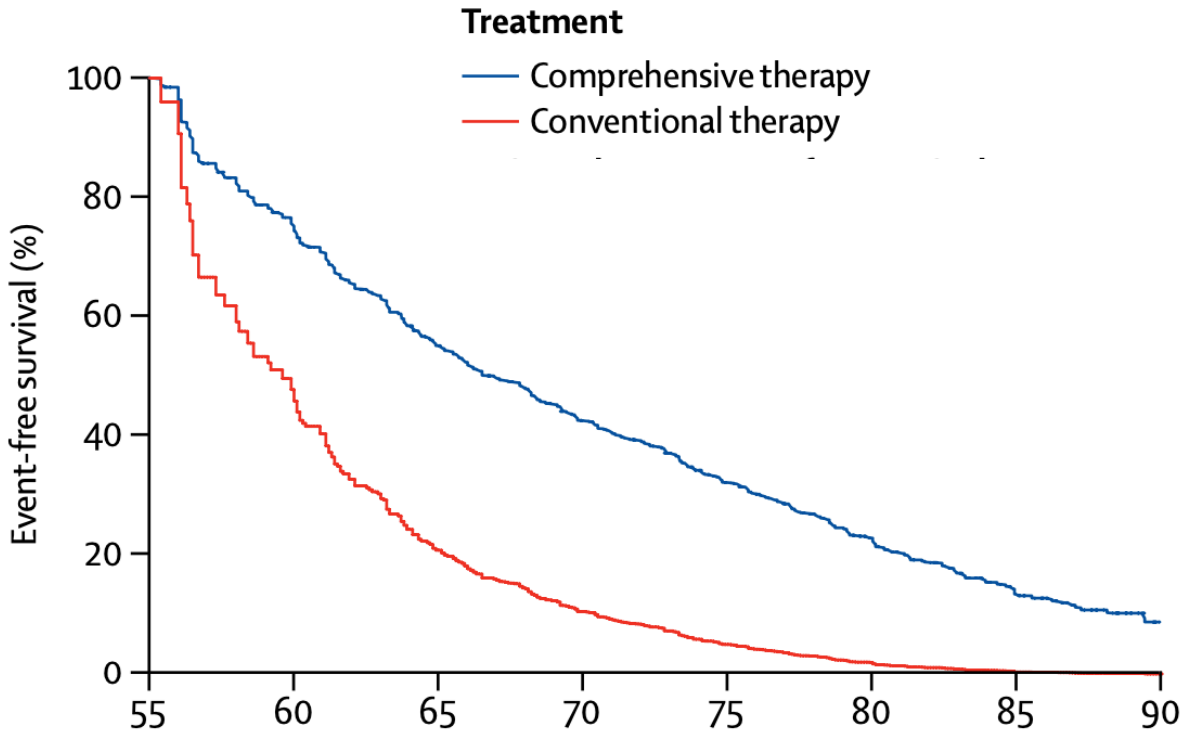
The wins favoured semaglutide over placebo for all key components of the hierarchical composite endpoint.



Kosiborod M et al. New England Journal of Medicine 2023. DOI: 10.1056/NEJMoa2306963

Conventional vs. comprehensive HFrEF medical treatment

Cross-trial analysis EMPHASIS-HF (N=2,737), PARADIGM-HF (N=8,399), and DAPA-HF (N=4,744)



Projected mean **time to first hospitalisation for HF or CV death** for patients starting at age 55

Conventional therapy 6.4 years (4.8–8.0)
ACEi/ARB+β-blocker

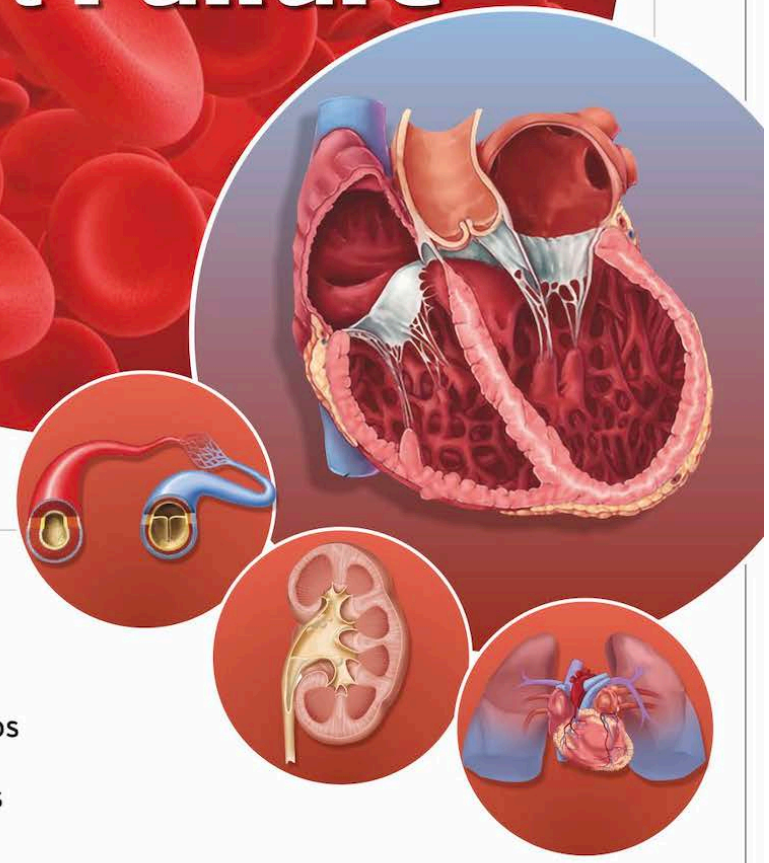
Comprehensive therapy 14.7 years (12.6–17.1) ARNi+β-blocker+MRA+SGLT2i

Difference +8.3 years (6.2–10.7) — by replacing ACEi/ARB with ARNi and adding MRA+SGLT2i

Values shown include 95% CI.
Vaduganathan et al. Lancet. 2020;396:121–8.

HFA
Heart Failure
Association

The ESC Textbook of Heart Failure



Edited by
Petar M Seferović
Andrew JS Coats
Gerasimos Filippatos
Stefan Anker
Johann Bauersachs
Giuseppe Rosano

OXFORD

ACCESS ALL CONTENT ONLINE AT
ACADEMIC.OUP.COM/ESC

ESC
European Society
of Cardiology