Mitral and tricuspid valve disease and heart failure

Francesco Maisano MD, FESC

Valve Center San Raffaele

Cardiochirurgia Università Vita Salute

Heart Valve Center

Ospedale San Raffaele

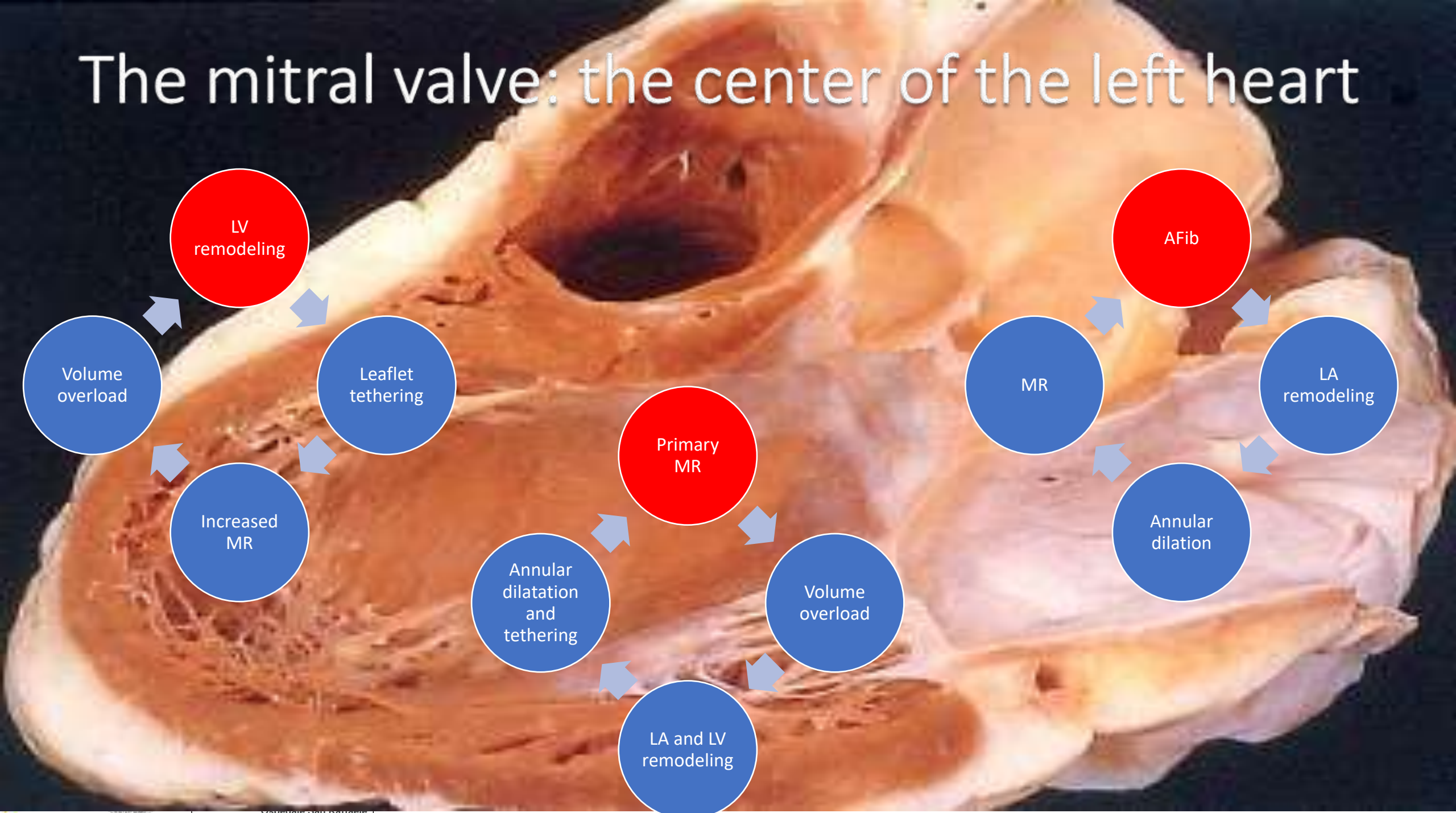
Disclosure Statement of Financial Interest and Potential for Conflicts of Interest

I, Francesco Maisano, have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation

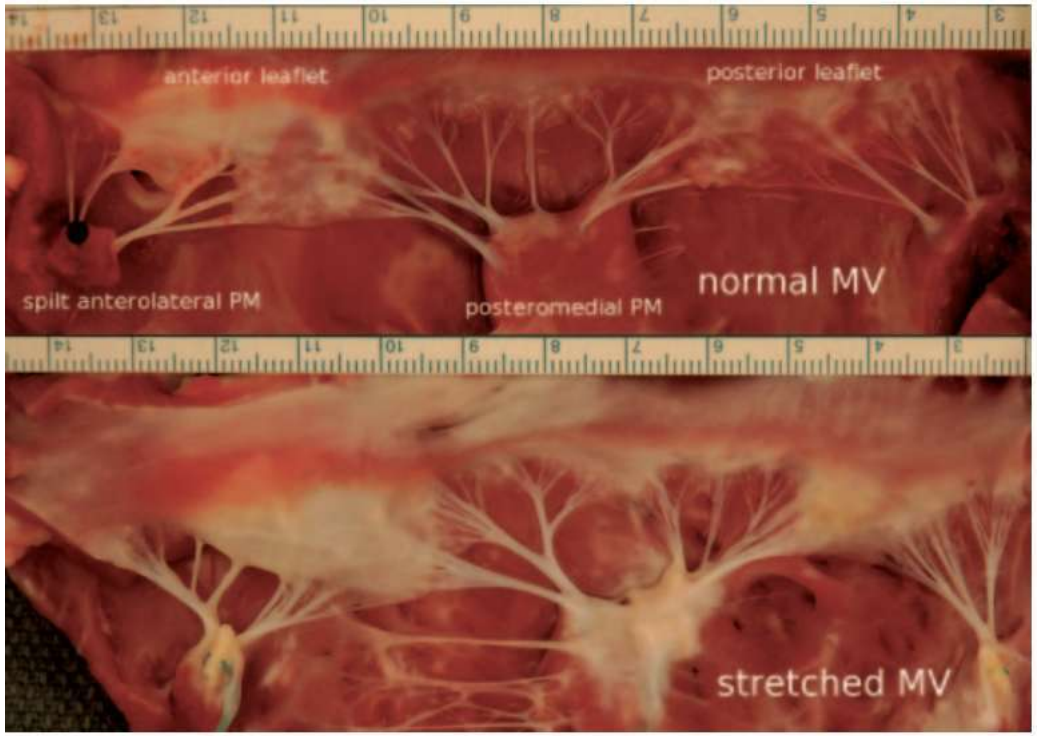
Grant and/or Research Support	Abbott (Steering Committee of EXPAND G4 and CoPI EXPAND); Medtronic; Edwards Lifesciences; Biotronik; Boston Scientific Corporation, NVT, Terumo, Roche, Valgen, Venus
Consulting fees, Honoraria:	Abbott; Medtronic; Edwards Lifesciences; Swissvortex; Perifect; Xeltis; Transseptal s solutions; Cardiovalve, Magenta, Croivalve
Royalty Income/IP Rights	Edwards Lifesciences (FMR surgical annuloplasty)
shareholder of	Cardiovalve, Magenta, SwissVortex, Transseptalsolutions,Occlufit, 4Tech, Perifect

Heart Valve Center
Ospedale San Raffaele

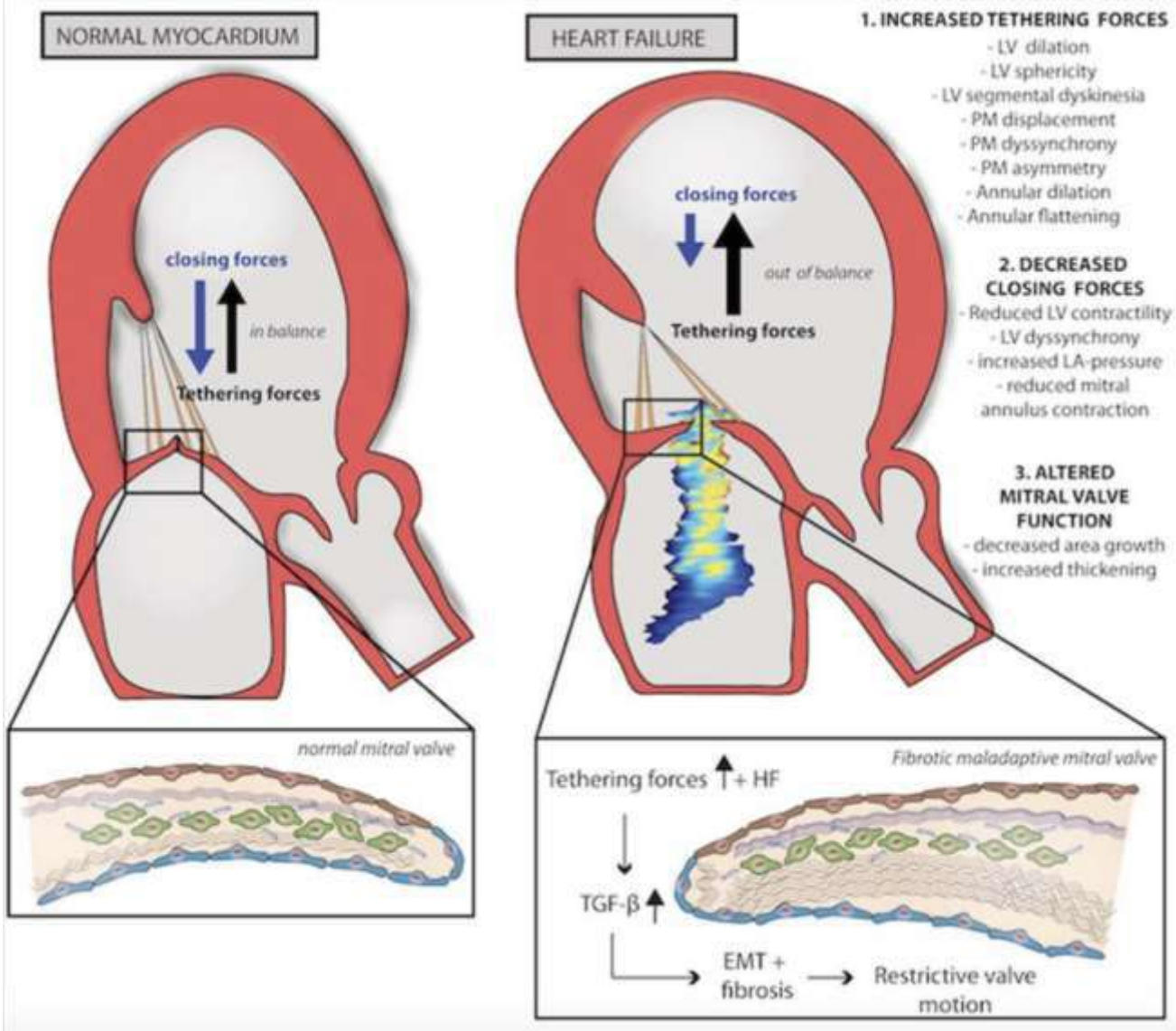
The mitral valve: the center of the left heart



A valve is a lively structure

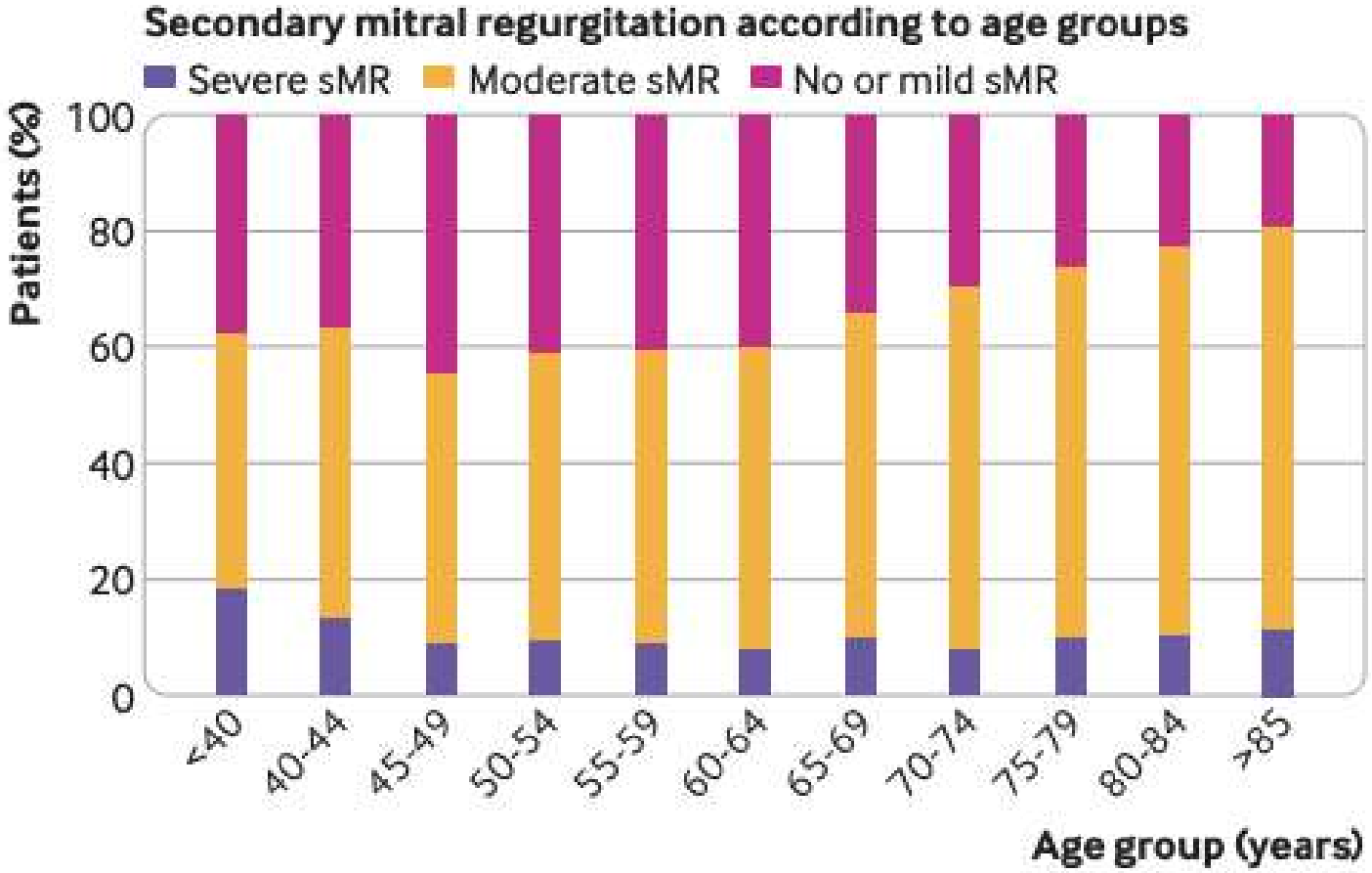


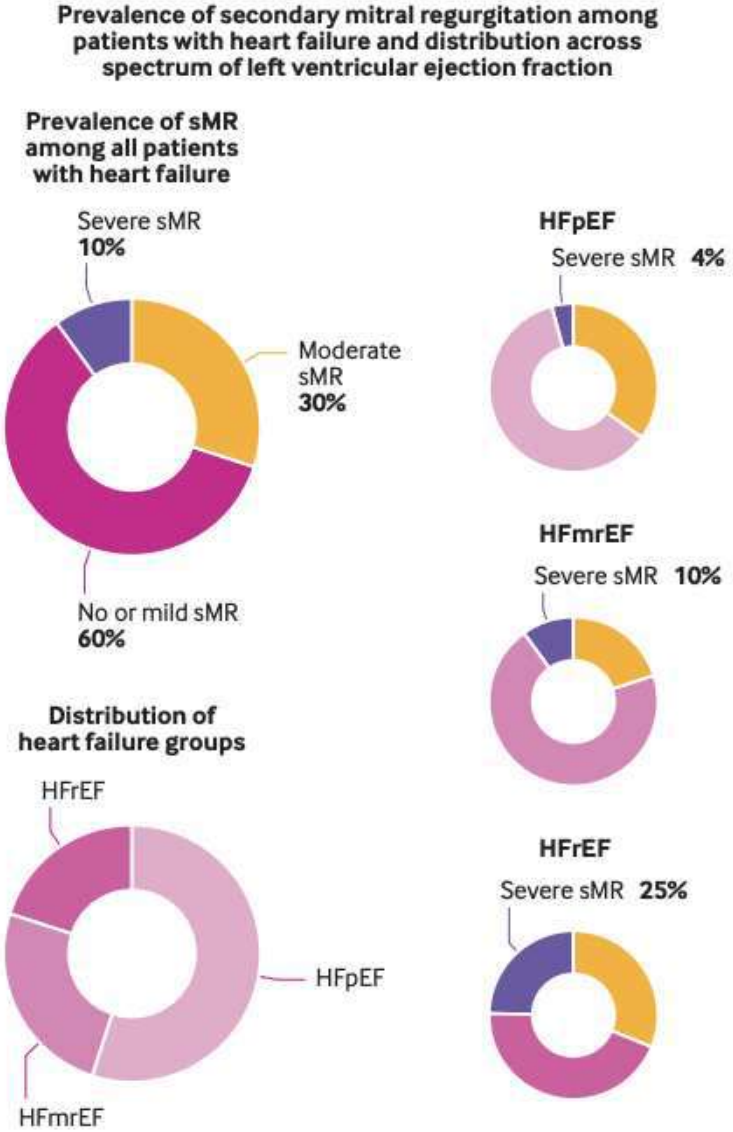
Dal Bianco et al, Circulation. 2009;120:334-342.



Heart Valve Center
Ospedale San Raffaele

Prevalence of AV valve regurgitation in HF

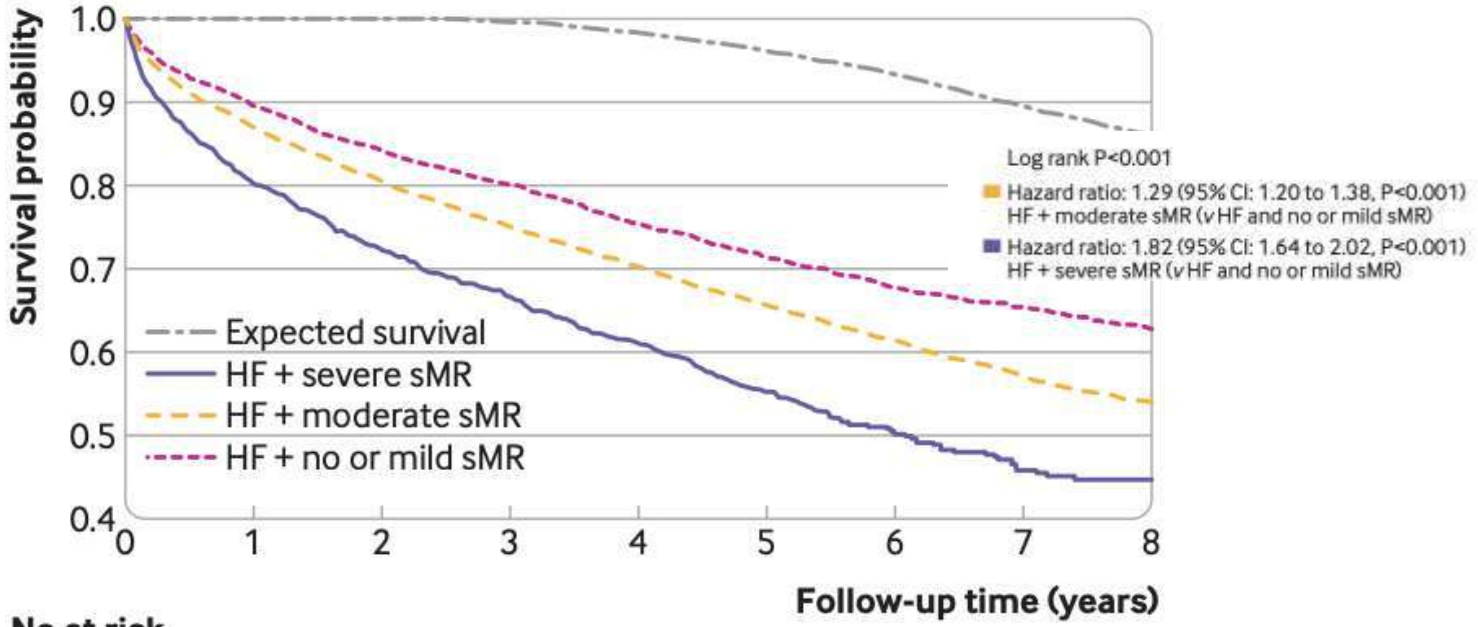




Bartko et al, BMJ. 2021;373:n1421.

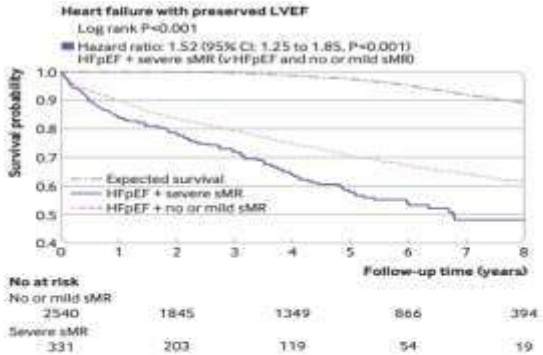
Heart Valve Center
Ospedale San Raffaele

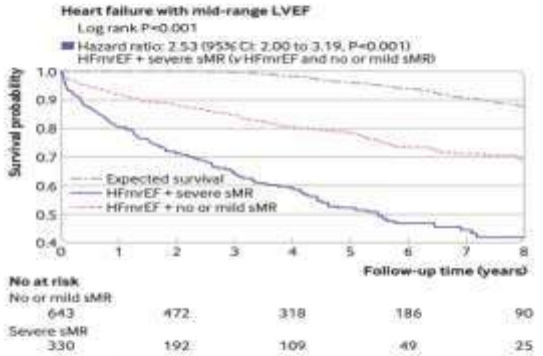
Long term survival analysis comparing patients with heart failure with no/mild, moderate, or severe SMR

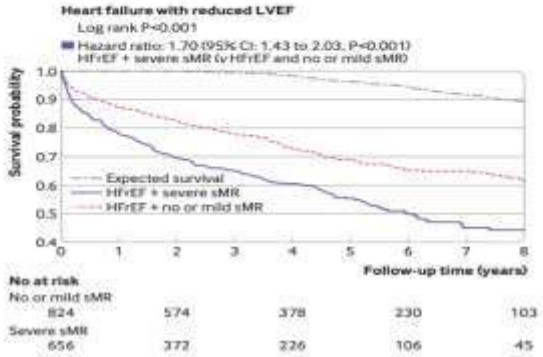


No at risk

No or mild sMR				
4007	2891	2045	1282	587
Moderate sMR				
7899	5364	3634	2082	906
Severe sMR				
1317	764	454	210	89







Heart Valve Center
Ospedale San Raffaele

Bartko et al, BMJ. 2021;373:n1421.

STR, presumed innocence…

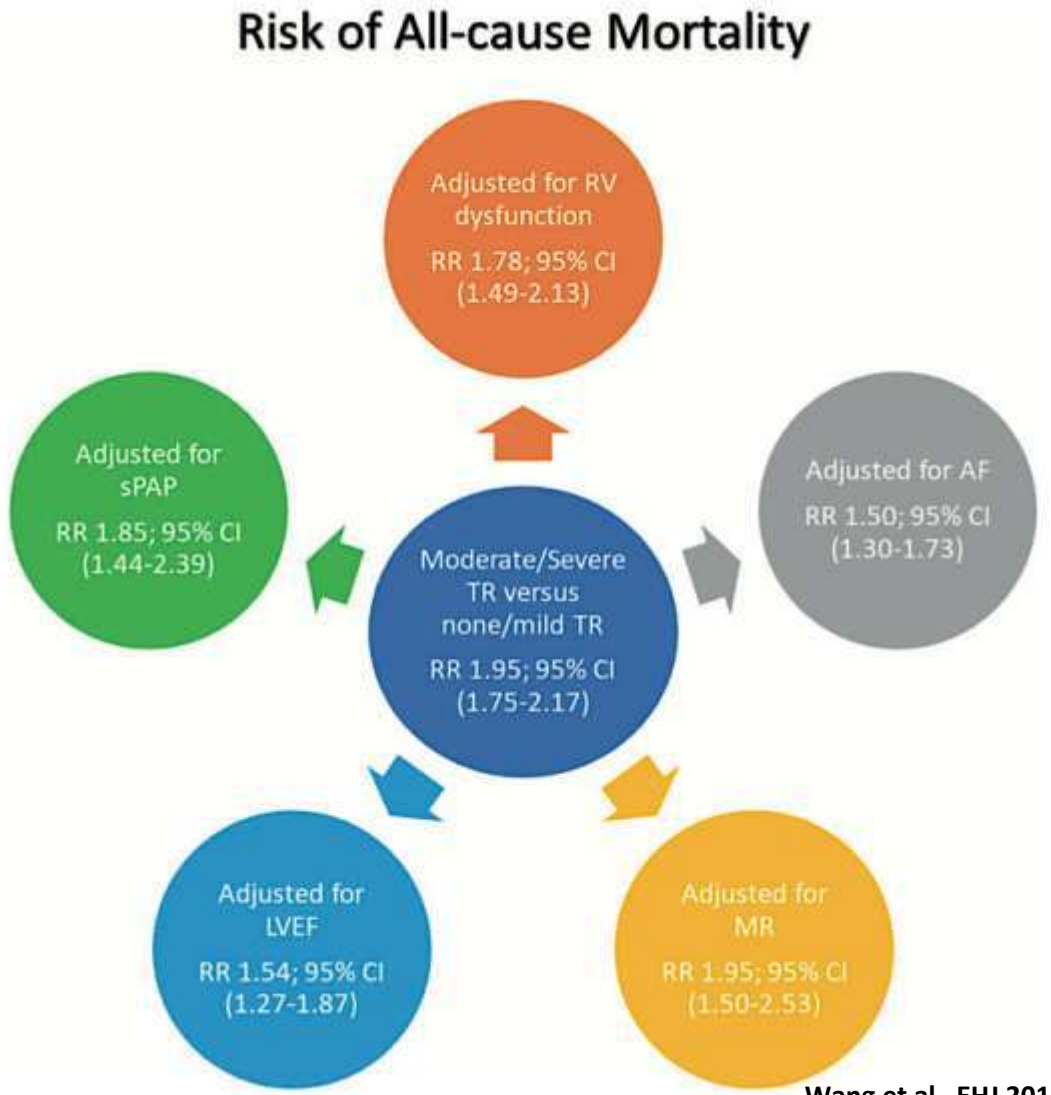
Conservative Management of Tricuspid Regurgitation in Patients Undergoing Mitral Valve Replacement

By Nina S. Braunwald, M.D., John Ross, Jr., M.D., and Andrew G. Morrow, M.D.

Summary:

In many patients with advanced mitral valve disease, associated tricuspid regurgitation is of a functional nature and secondary to right ventricular hypertension and dilatation of the tricuspid annulus. The present results indicate that in such patients tricuspid regurgitation will improve or disappear after mitral replacement and that tricuspid valve replacement is seldom necessary.

Circulation 1967;35:I-63



Wang et al, EHJ 2019 476-484

Heart Valve Center
Ospedale San Raffaele

STR matters because it is prevalent!

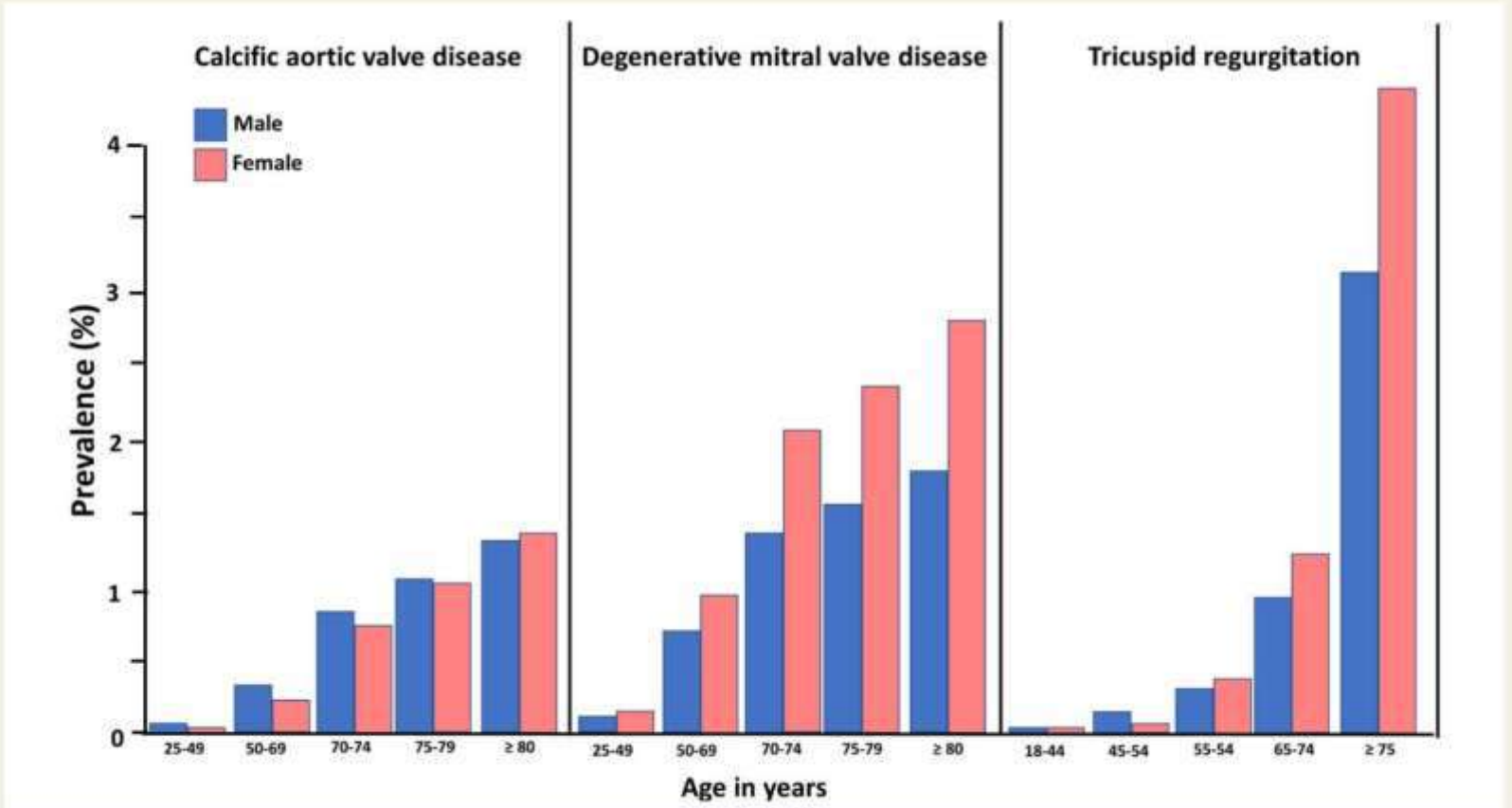


Figure 1 Age-specific and sex-specific prevalence of calcific aortic valve disease, degenerative mitral valve disease and tricuspid regurgitation. From Coffey et al. and Topilsky et al.[5,6]

Prevalence of >moderate TR

1% patients aged 65-74 years

4% patients >75years

Prevalence strongly correlated with age

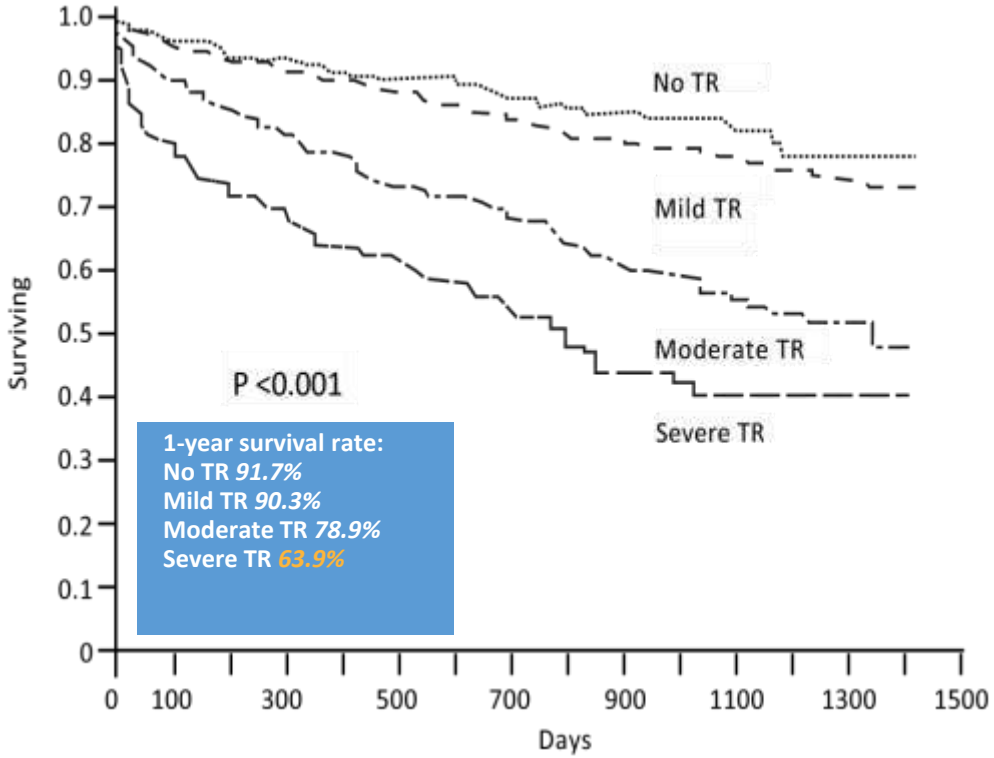
Is higher in women than men

Toplisky et al. JACC Cardiovasc Imaging 2019

Heart Valve Center
Ospedale San Raffaele

TR is a Severe Disease with Impact on Short Long-term Survival in Patients with Chronic Heart Failure

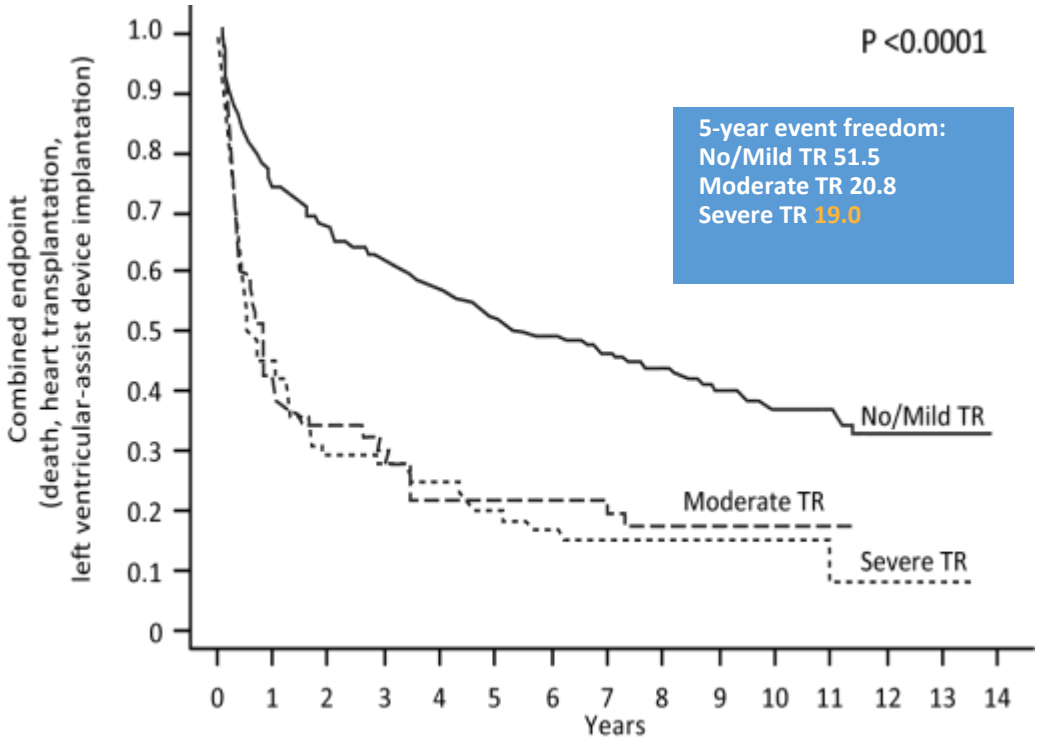
Retrospective analysis of 5,223 patients (age 66.5 ± 12.8 years) adjusted for age, LVEF, inferior vena cava size, and RV size and function



1-year survival rate:
No TR *91.7%*
Mild TR *90.3%*
Moderate TR *78.9%*
Severe TR *63.9%*

Nath et al. *J Am Coll Cardiol 2004;43:405–09*

Prospective analysis of 576 consecutive patients with CHF (age 56.4+ 11.2 years)

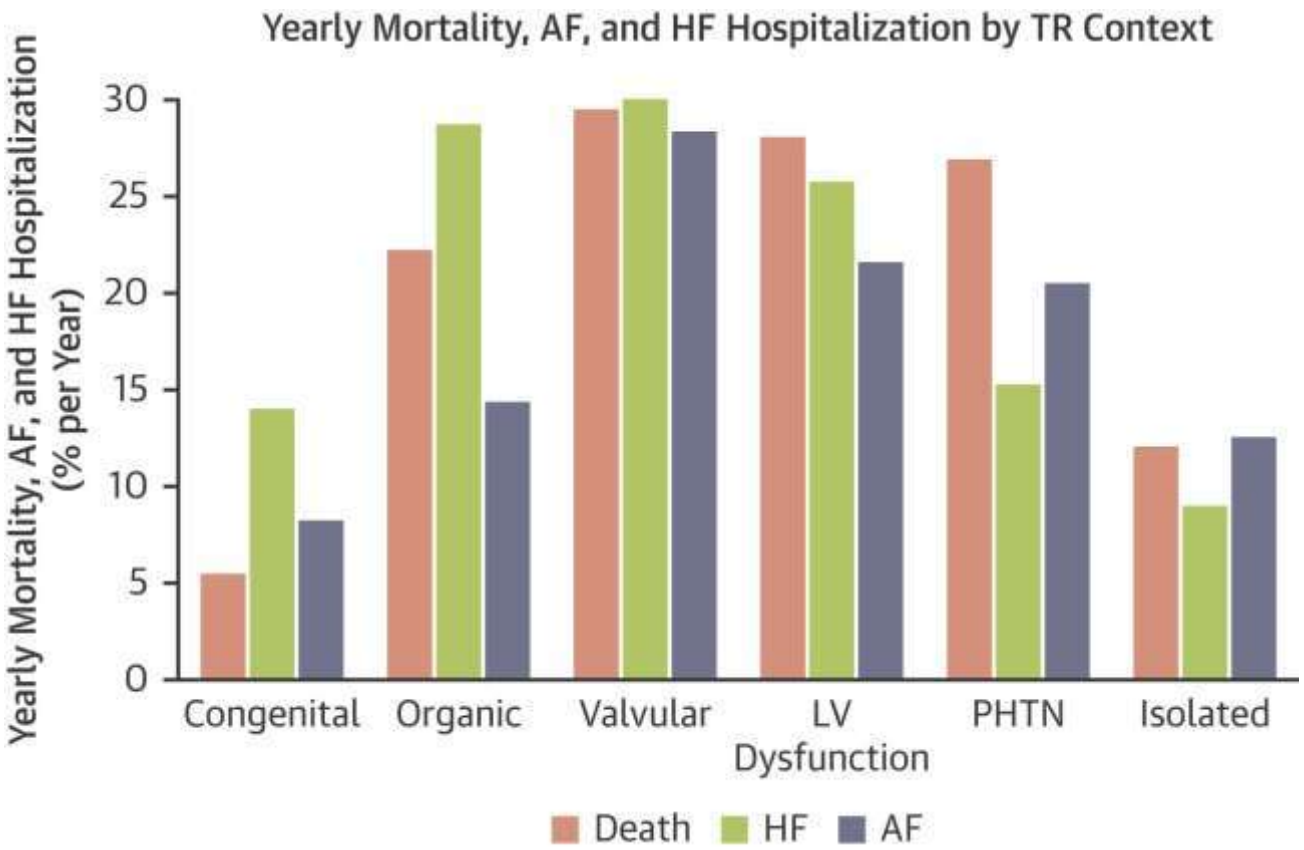


5-year event freedom:
No/Mild TR 51.5
Moderate TR 20.8
Severe TR 19.0

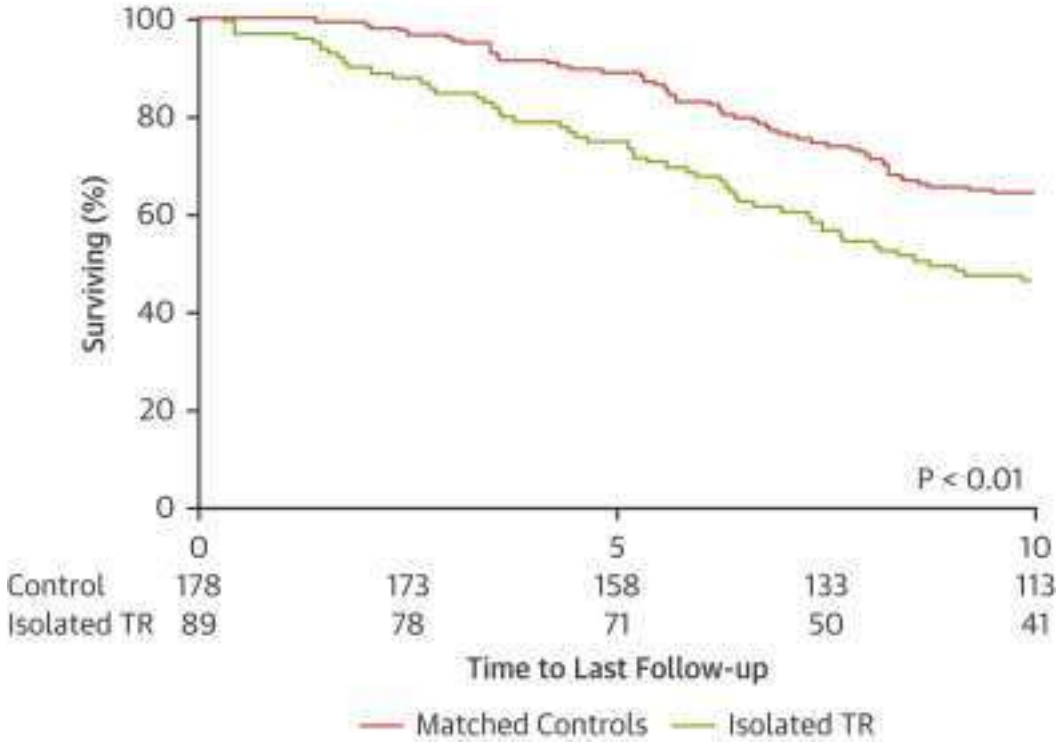
Neuhold et al. *Eur Heart J* 2013;34:844–52

Heart Valve Center
Ospedale San Raffaele

TR is important because it is associated with increased mortality.



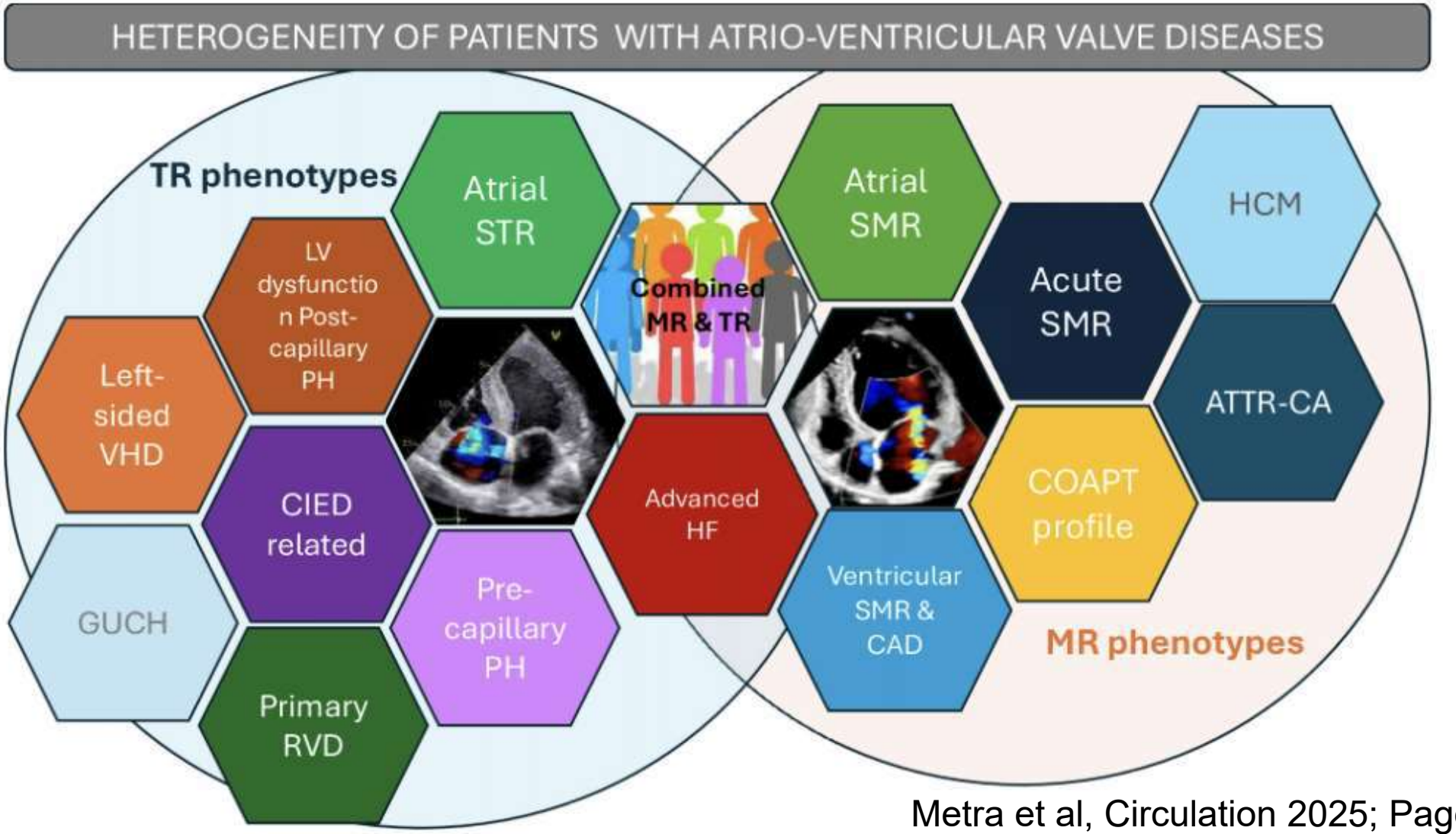
Excess mortality with TR



Toplisky et al. JACC Cardiovasc Imaging 2019

Heart Valve Center
Ospedale San Raffaele

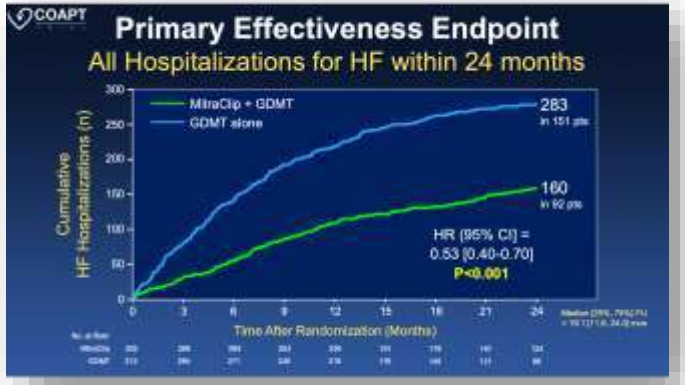
Profiling and phenotyping

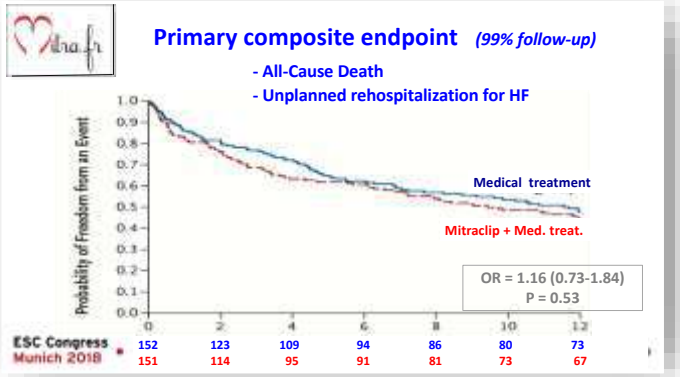


Metra et al, Circulation 2025; Pages 1342-1363

Treating SMR: COAPT vs Mitra-FR phenotype

Two randomized trials, MITRA-FR and COAPT, evaluated the effectiveness of percutaneous edge-to-edge mitral valve repair plus OMT compared to OMT alone, in symptomatic patients with reduced LVEF (15–40% in MITRA-FR and 20–50% in COAPT) and moderate-to-severe or severe SMR [effective regurgitant orifice area (EROA) ≥ 20 mm^2 in MITRA-FR and EROA ≥ 30 mm^2 in COAPT].[610–612] MITRA-FR failed to show any benefit from the intervention on all-cause mortality or HF hospitalization at 12 months (primary endpoint; HR 1.16, 95% CI 0.73–1.84) and at 24 months.[610,611] In contrast, COAPT showed a significant reduction in hospitalization for HF at 24 months (primary endpoint; HR 0.53, 95% CI 0.40–0.70) and mortality (secondary endpoint; HR 0.62, 95% CI 0.46–0.82).[612] Differences in patient selection, concomitant MT, echocardiographic assessment, procedural issues and severity of SMR in relation to the degree of LV dilatation may be responsible for the diverging results of the MITRA-FR and COAPT trials.[613–615] Thus, percutaneous edge-to-edge mitral valve repair should be considered for outcome improvement only in carefully selected patients who remain symptomatic (NYHA class II–IV) despite OMT, with moderate-to-severe or severe SMR (EROA ≥30 mm^2), favourable anatomical conditions, and fulfilling the inclusion criteria of the COAPT study (i.e. LVEF 20–50%, LV end-systolic diameter <70 mm, systolic pulmonary pressure <70 mmHg, absence of moderate or severe RV dysfunction, absence of severe TR, absence of haemodynamic instability) (*Figure 17*).[615,616]

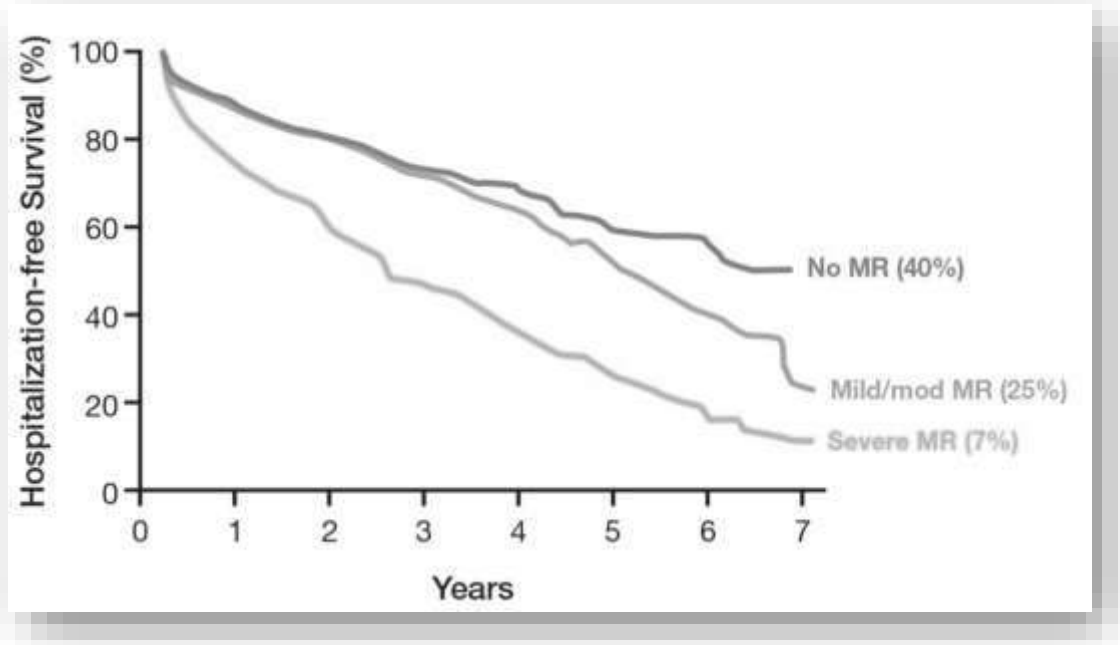




TEER should be considered in selected symptomatic patients, not eligible for surgery and fulfilling criteria suggesting an increased chance of responding to the therapy.	IIa
In high-risk symptomatic patients not eligible for surgery and not fulfilling the criteria suggesting an increased chance of responding to TEER, the Heart Team may consider in selected cases a TEER procedure or other trans-catheter valve therapy if applicable, after careful evaluation for ventricular assist device or heart transplant.	IIb

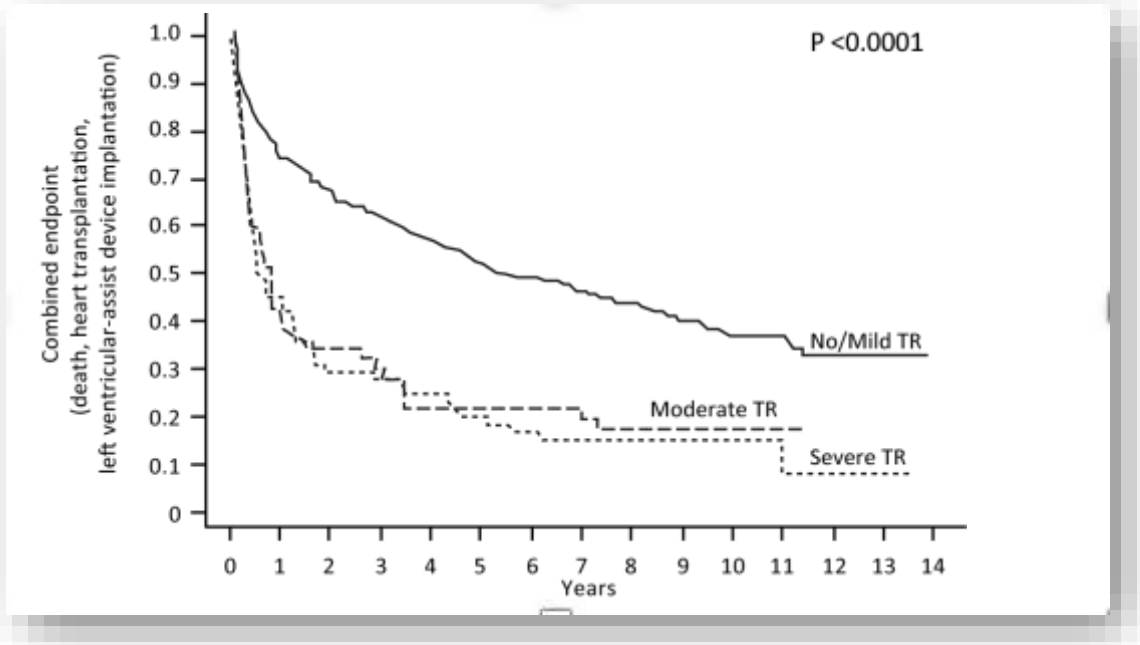
Prognosis is depending on severity of TR/MR

MR



Rossi et al, Heart. 2011;97(20):1675-1680.

TR



Neuhold et al. Eur Heart J 2013;34:844–52

Heart Valve Center
Ospedale San Raffaele

Staging according to chamber involvement

JACC: CARDIOVASCULAR INTERVENTIONS VOL. 16, NO. 2, 2023
© 2023 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER

NEW RESEARCH PAPER

STRUCTURAL

Staging Heart Failure Patients With Secondary Mitral Regurgitation Undergoing Transcatheter Edge-to-Edge Repair

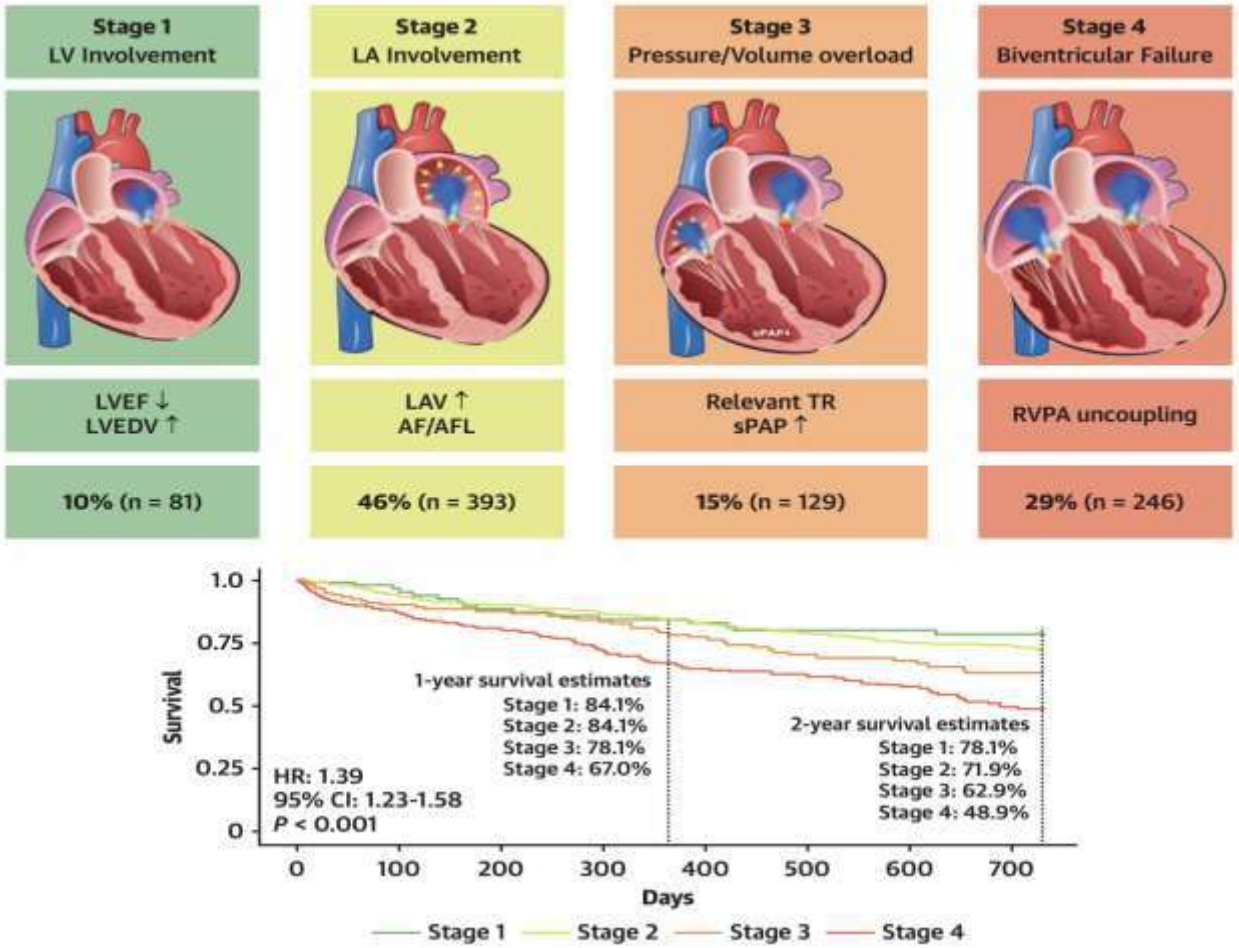
Lukas Stolz, MD,[a] Philipp M. Doldi, MD,[a,b] Mathias Orban, MD,[b] Nicole Karam, MD,[c] Tania Puscas, MD,[c] Mirjam G. Wild, MD,[a] Aniela Popescu, MD,[d] Ralph Stephan von Bardeleben, MD,[d] Christos Iliadis, MD,[e] Stephan Baldus, MD,[e] Marianna Adamo, MD,[f] Holger Thiele, MD,[g] Christian Besler, MD,[f] Matthias Unterhuber, MD,[f] Tobias Ruf, MD,[d] Roman Pfister, MD,[e] Satoshi Higuchi, MD,[a] Benedikt Koell, MD,[b,c] Christina Giannini, MD,[c] Anna Petronio, MD,[c] Mohammad Kassar, MD,[b] Ludwig T. Weckbach, MD,[a,b] Christian Butter, MD,[c] Thomas J. Stocker, MD,[a,b] Michael Neuss, MD,[c] Bruno Melica, MD,[c] Daniel Braun, MD,[a] Stephan Windecker, MD,[b] Steffen Massberg, MD,[a,b] Fabien Praz, MD,[b] Micheal Näbauer, MD,[a] Daniel Kalbacher, MD,[b,c] Philipp Lurz, MD,[g] Marco Metra, MD,[f] Jeroen J. Bax, MD,[g,h] Jörg Hausleiter, MD,[a,b] on behalf of the EuroSMR Investigators

ABSTRACT

BACKGROUND Secondary mitral regurgitation (SMR) is a progressive disease with characteristic pathophysiological changes that may influence prognosis. Although the staging of SMR patients suffering from heart failure with reduced ejection fraction (HFrEF) according to extramitral cardiac involvement has prognostic value in medically treated patients, such data are so far lacking for edge-to-edge mitral valve repair (M-TEER).

OBJECTIVES This study sought to classify M-TEER patients into disease stages based on the phenotype of extramitral cardiac involvement and to assess its impact on symptomatic and survival outcomes.

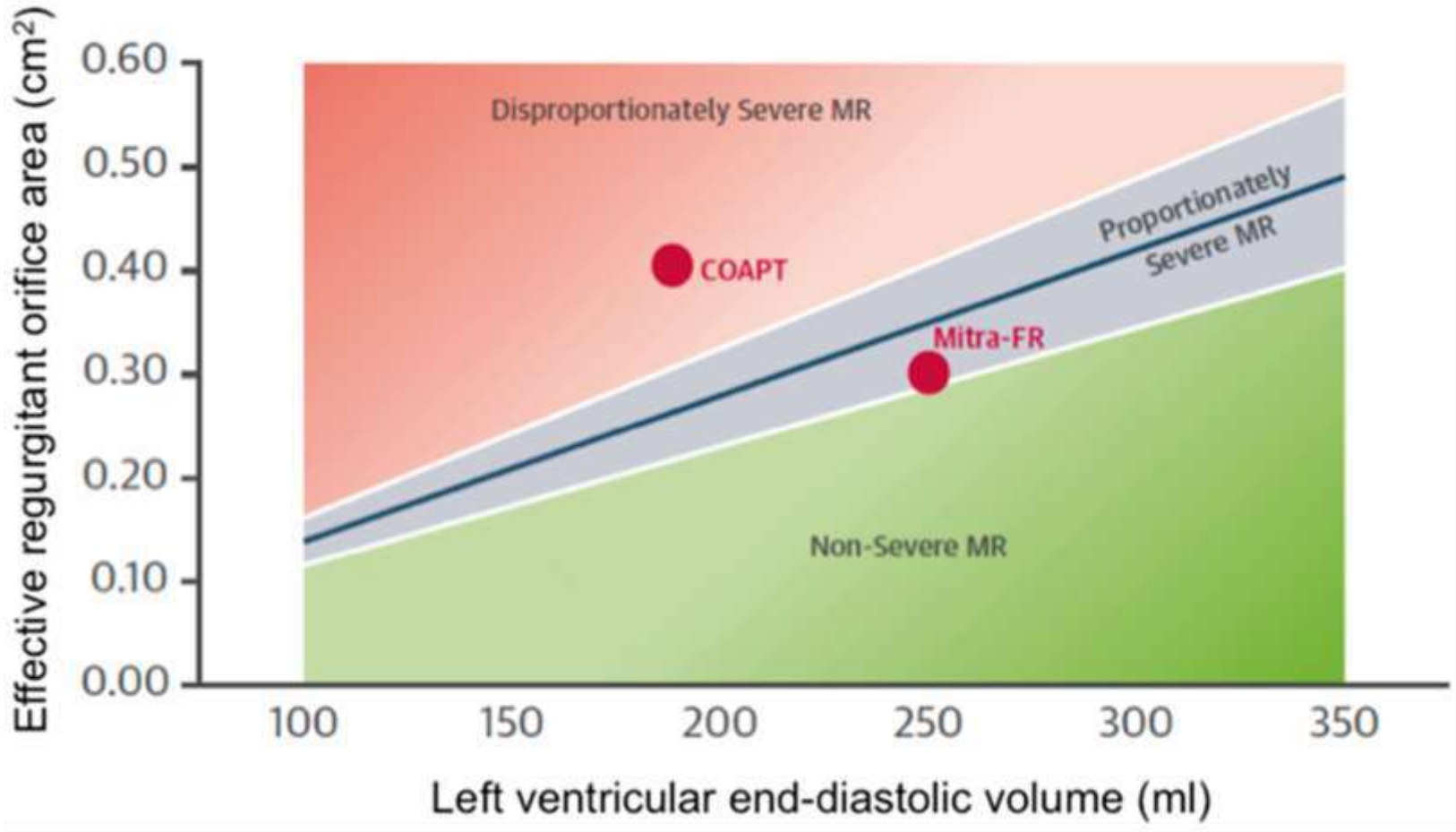
METHODS Based on echocardiographic and clinical assessment, patients were assigned to 1 of the following HFrEF-SMR groups: left ventricular involvement (Stage 1), left atrial involvement (Stage 2), right ventricular volume/pressure overload (Stage 3), or biventricular failure (Stage 4). A Cox regression model was implemented to investigate the impact of HFrEF-SMR stages on 2-year all-cause mortality. The symptomatic outcome was assessed with New York Heart As-



Stolz L, et al. J Am Coll Cardiol Intv. 2023;16(2):140-151.

Heart Valve Center
Ospedale San Raffaele

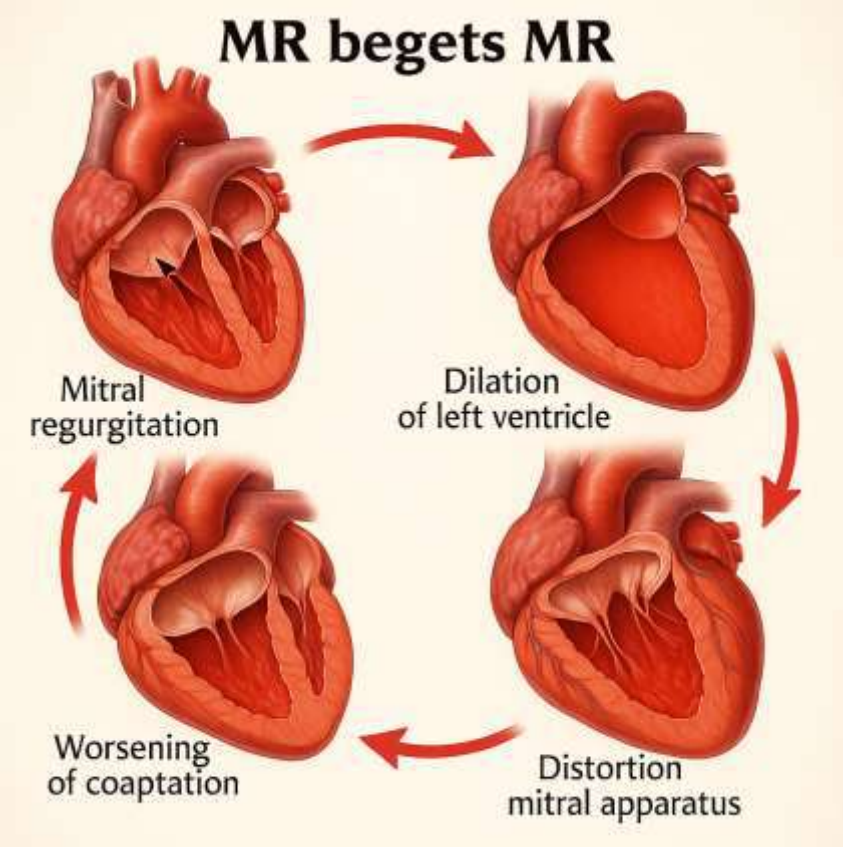
Disproportionately Severe FMR

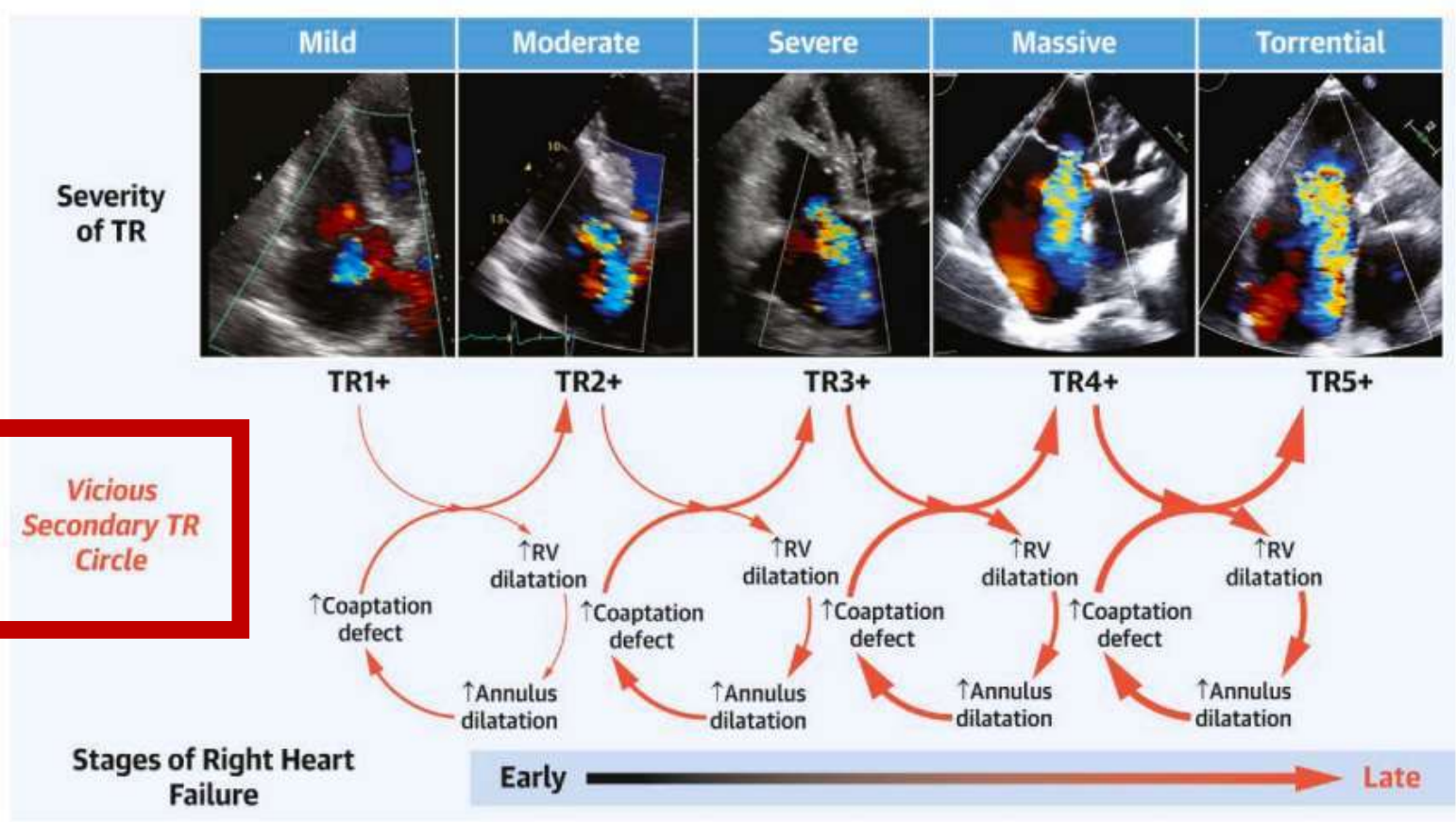


Heart Valve Center
Ospedale San Raffaele

. Adapted from Graybun et al. JACC Cardiovasc Imaging. 2018 Dec 6. pii: S1936-878X(18)31017-9.

TR begets TR… progressive chamber dilation to compensate inefficient forwards stroke volume





Heart Valve Center
Ospedale San Raffaele

RESHAPE II

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

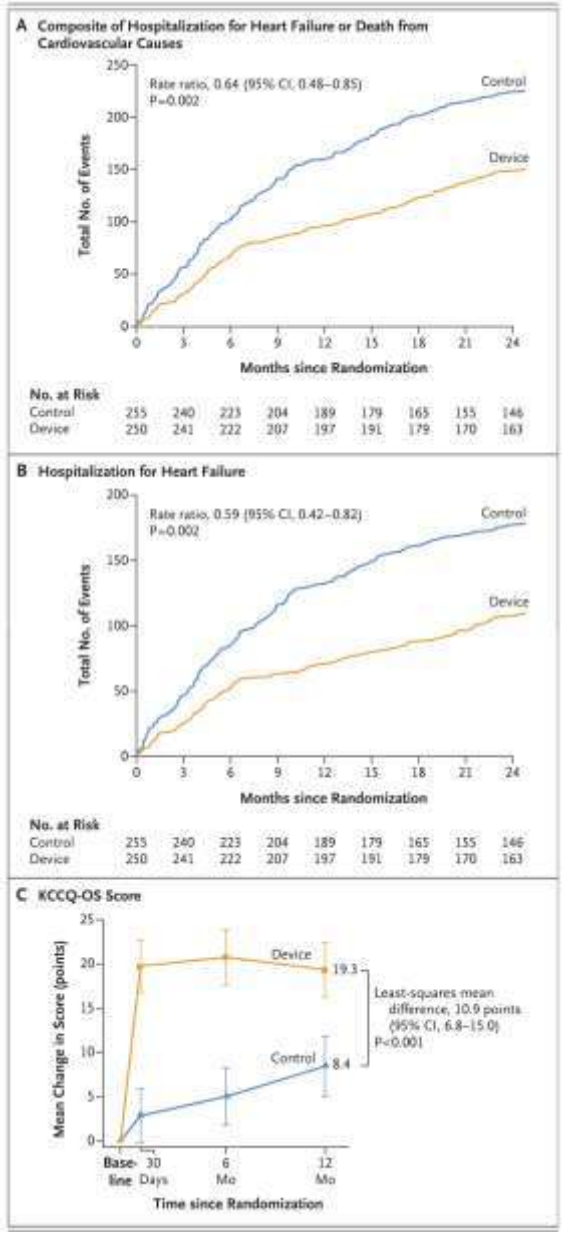
Transcatheter Valve Repair in Heart Failure with Moderate to Severe Mitral Regurgitation

S.D. Anker, T. Friede, R.-S. von Bardeleben, J. Butler, M.-S. Khan, M. Diek, J. Heinrich, M. Geyer, M. Placzek, R. Ferrari, W.T. Abraham, O. Alfieri, A. Auricchio, A. Bayes-Genis, J.G.F. Cleland, G. Filippatos, F. Gustafsson, W. Haverkamp, M. Kelm, K.-H. Kuck, U. Landmesser, A.P. Maggioni, M. Metra, V. Ninios, M.C. Petrie, T. Rassaf, F. Ruschitzka, U. Schäfer, P.C. Schulze, K. Spargias, A. Vahanian, J.L. Zamorano, A. Zeiher, M. Karakas, F. Koehler, M. Lainscak, A. Öner, N. Mezilis, E.K. Theofilogiannakos, I. Ninios, M. Chrissoheris, P. Kourkoveli, K. Papadopoulos, G. Smolka, W. Wojakowski, K. Reczuch, F.J. Pinto, Ł. Wiewiórka, Z. Kalarus, M. Adamo, E. Santiago-Vacas, T.F. Ruf, M. Gross, J. Tongers, G. Hasenfuss, W. Schillinger, and P. Ponikowski, for the RESHAPE-HF2 Investigators*

ABSTRACT

BACKGROUND

Whether transcatheter mitral-valve repair improves outcomes in patients with heart failure and functional mitral regurgitation is uncertain.



Heart Valve Center
Ospedale San Raffaele

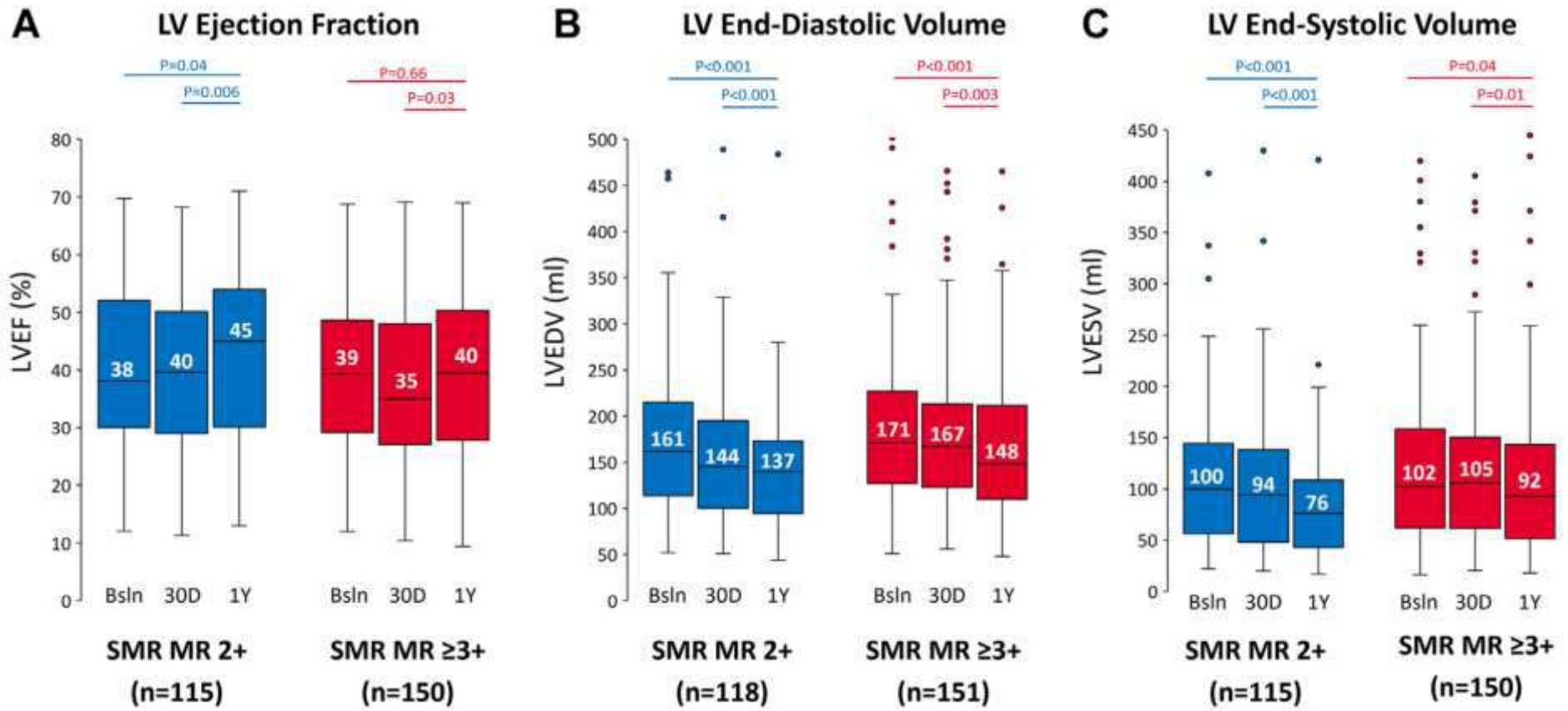
TABLE 1 Baseline Characteristics and 2-Year Outcomes in 3 Randomized Trials of M-TEER in FMR

	COAPT (n = 614)	MITRA-FR (n = 304)	RESHAPE-HF2 (n = 505)
Mean age, y	72	70	70
Male	72	75	80
Etiology			
Ischemic	61	59	65
Nonischemic	39	41	35
NYHA functional class III/IV	61	67	75
HFH within prior 12 months	57	100[a]	66
Mean LVEF, %	31	33	31
Mean LVEDV, mL	193	250	211
Mean EROA, cm^2	0.40	0.31	0.25
Baseline HF medical therapy	Maximally tolerated, independent committee confirmed	Community management per EU guidelines	Optimally managed (investigator assessed)
Follow-up HF medical therapy	Few changes	Not collected	Not collected
2-y mortality, control group	46.1	34.2	29.6
Reduction with M-TEER[b]	0.62 (0.46-0.82)	1.02 (0.70-1.50)	0.73 (0.51-1.05)
2-y all HFHs, control group, per 100 patient-y	67.9	106.9	46.6
Reduction with M-TEER[b]	0.53 (0.40-0.70)	0.87 (0.56-1.35)	0.62 (0.46-0.83)

STONE JACC 2024

Expanded registry, FMR cohort,

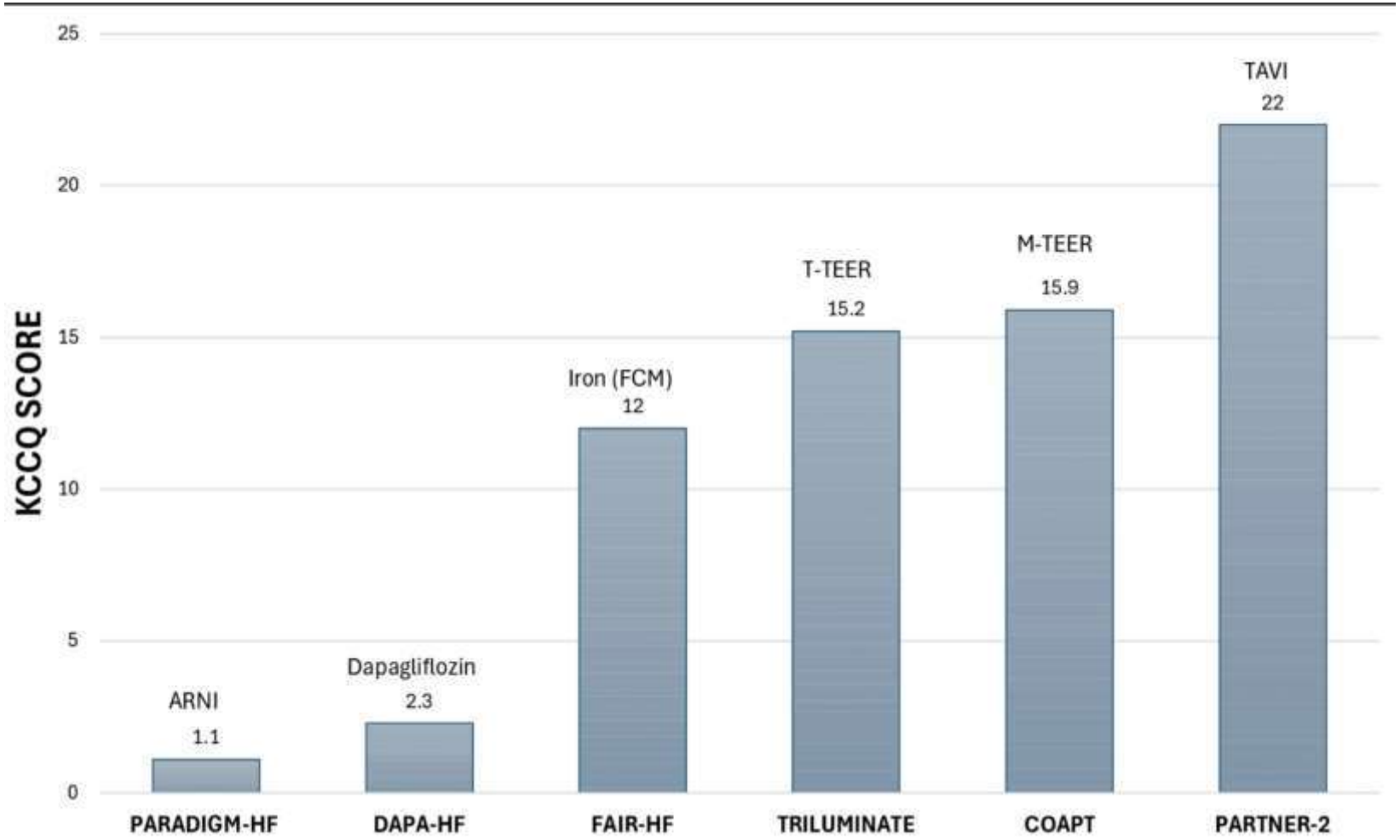
Significant Left Ventricular Remodeling in Subjects With SMR and Baseline MR 2+ Through 1 Year



Heart Valve Center

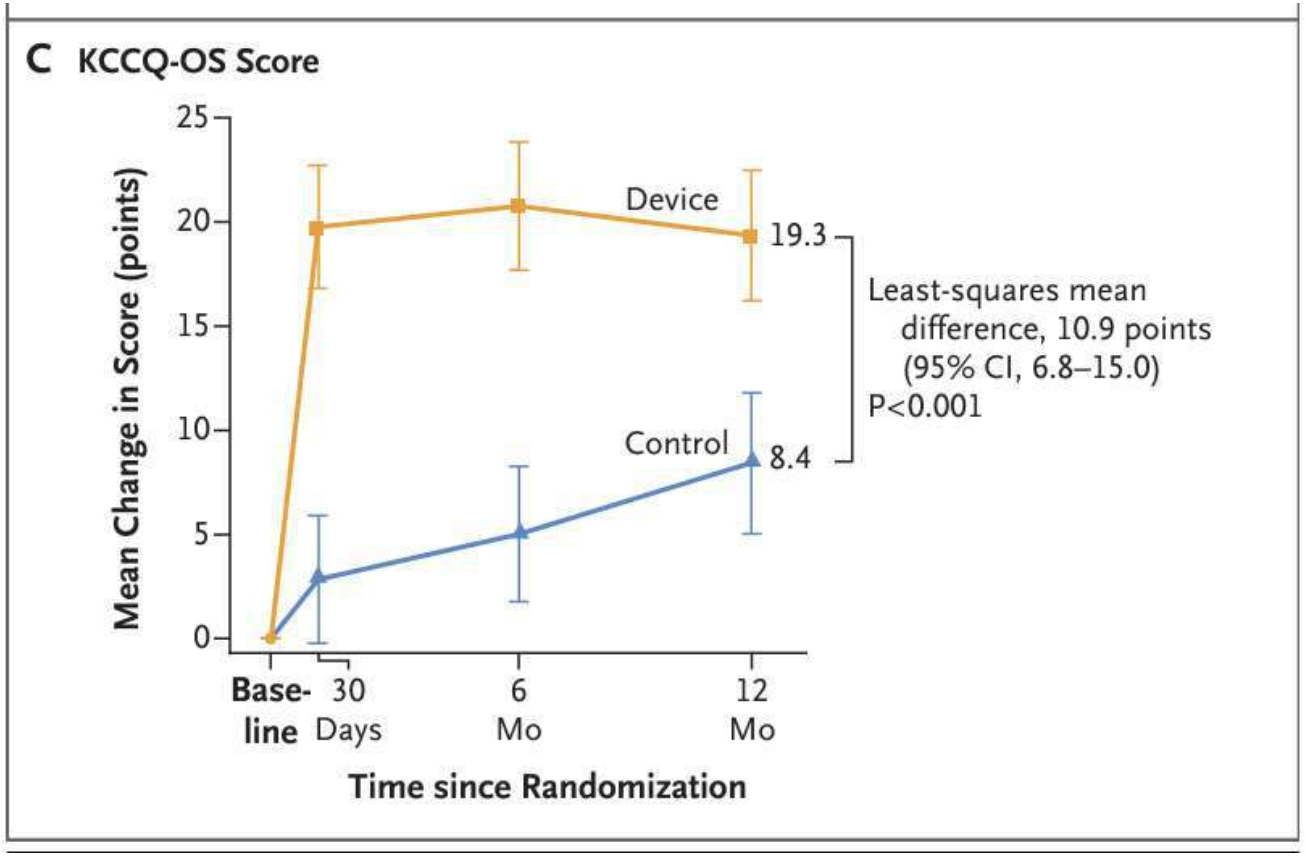
Ospedale San Raffaele

Treating AV regurgitation improves symptoms and quality of life



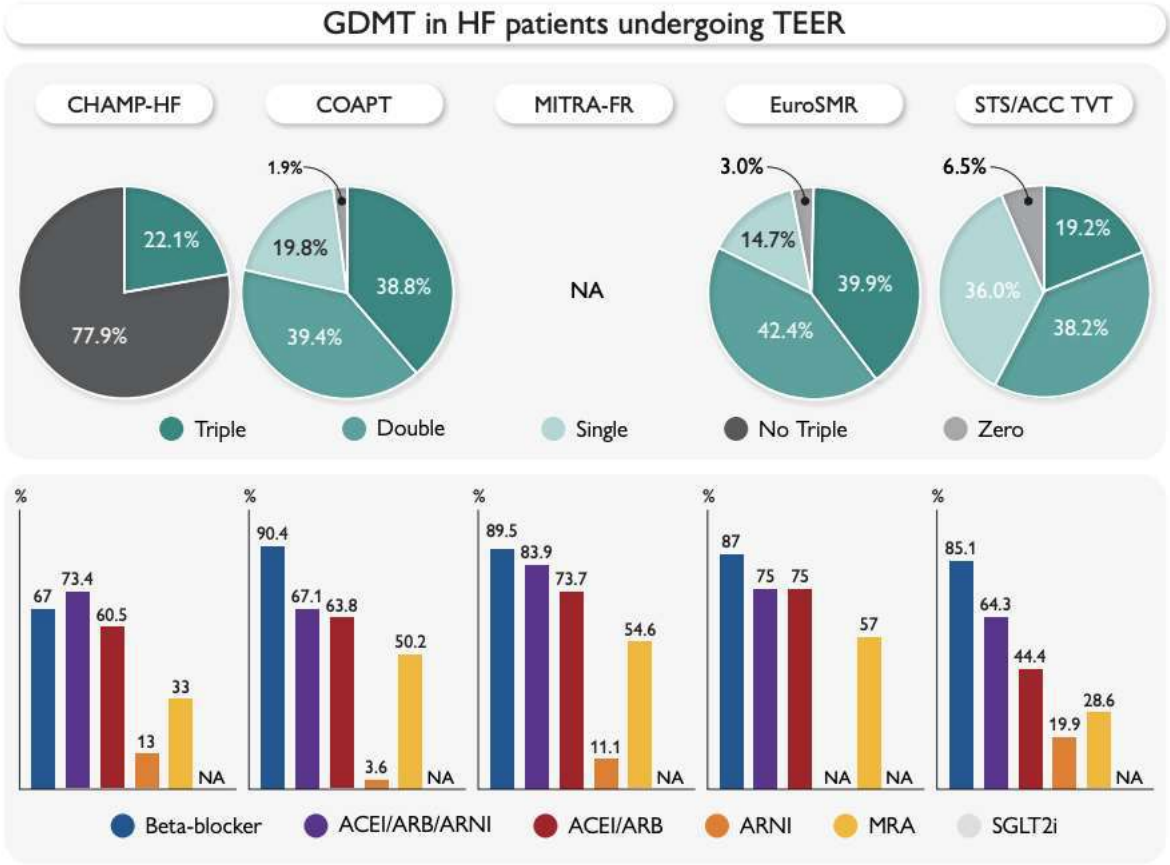
Heart Valve Center
Ospedale San Raffaele

QoL improvement in RESHAPE II

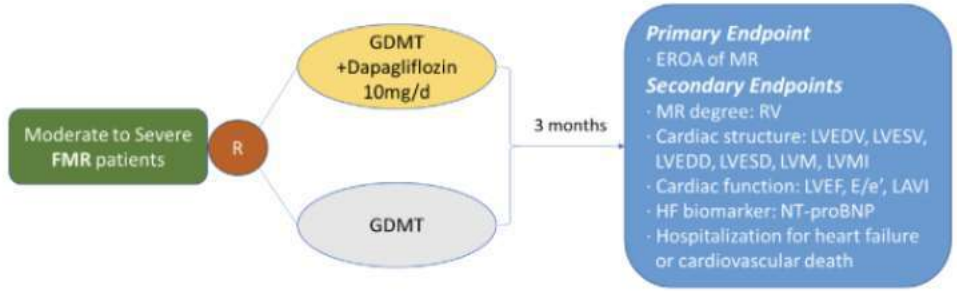


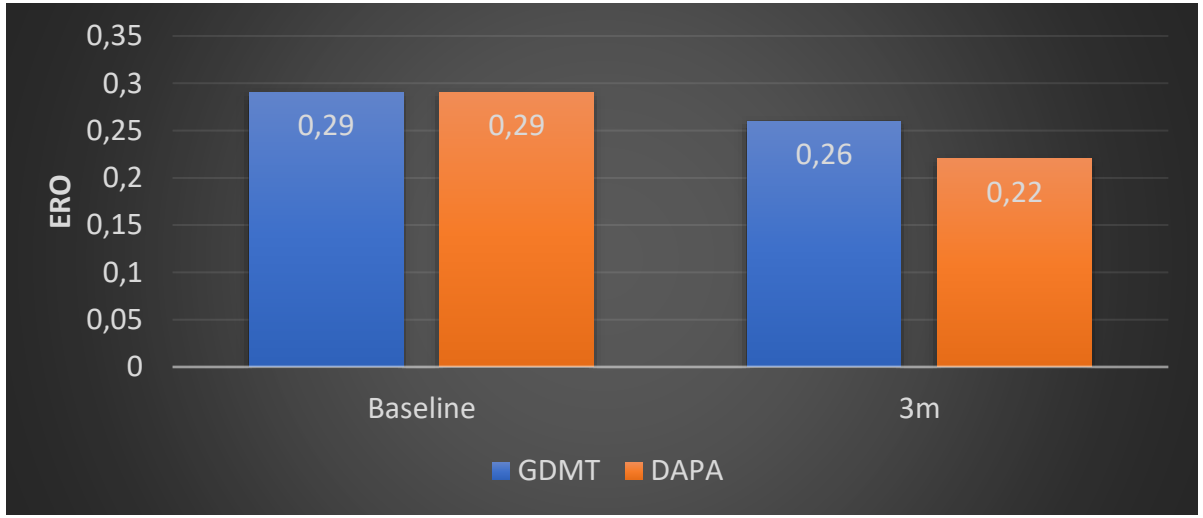
Heart Valve Center
Ospedale San Raffaele

GDMT in patients with HF undergoing M-TEER



DEFORM TRIAL

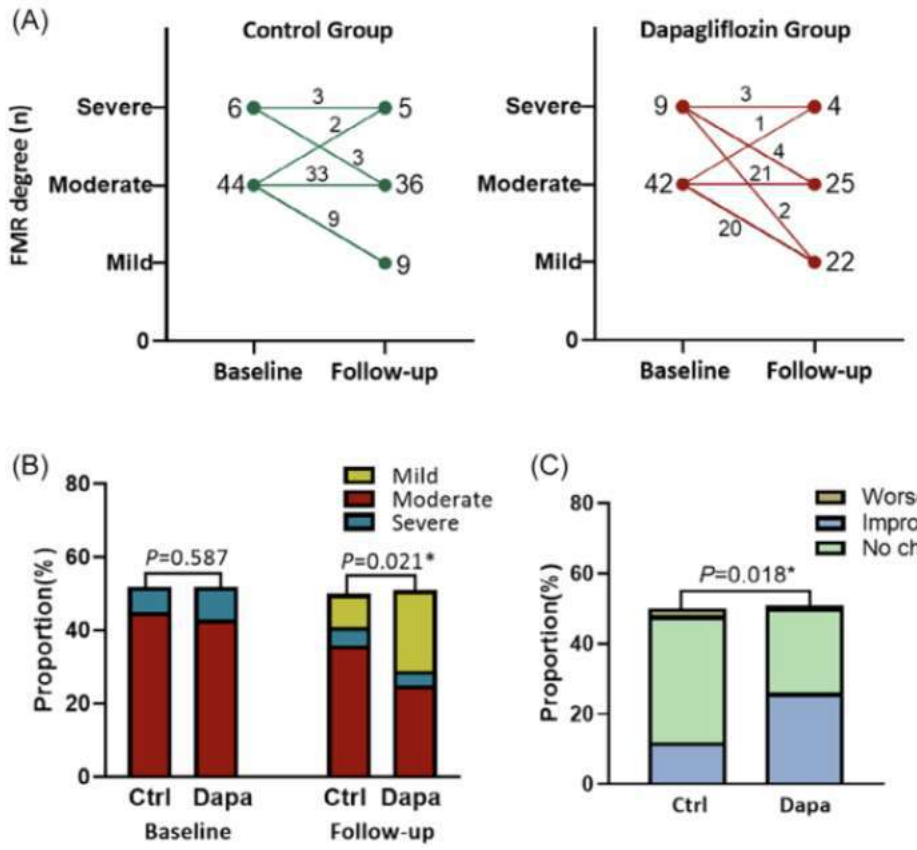


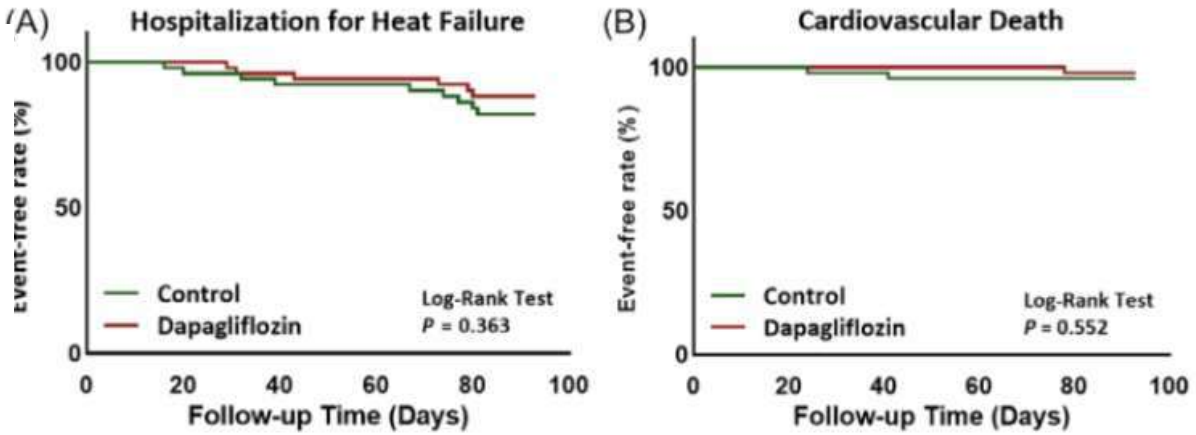


Tomii D et al. European Heart Journal (2023) 44, 4662–4664
Huang Z et al, ESC Heart Failure 2025

Heart Valve Center
Ospedale San Raffaele

DAPA inpts with MR





C)

	N	HR(95%CI)	*P* value
Hospitalization for Heart Failure			0.368
Control Group	8/52	1.00(reference)	
Dapagliflozin Group	5/52	0.60(0.20-1.83)	
Cardiovascular Death			0.561
Control Group	2/52	1.00(reference)	
Dapagliflozin Group	1/52	0.49(0.04-5.41)	

Heart Valve Center
Ospedale San Raffaele

Huang Z et al, ESC Heart Failure 2025

JACC: HEART FAILURE
VOL. 8, NO. 9, 2020

PUBLISHED BY ELSEVIER

CLINICAL RESEARCH

Care Gaps in Adherence to Heart Failure Guidelines

Clinical Inertia or Physiological Limitations?

Marilyne Jarjour, MSc,[a] Christine Henri, MD,[b] Simon de Denus, BPharm, PhD,[b] Annik Fortier, MSc,[b] Nadia Bouabdallaoui, MD, PhD(c),[b] Anil Nigam, MD,[a] Eileen O'Meara, MD,[a] Charaf Ahnadi, PhD,[c] Michel White, MD,[b] Patrick Garceau, MD,[b] Normand Racine, MD,[b] Marie-Claude Parent, MD,[b] Mark Liszkowski, MD,[a] Geneviève Giraldeau, MD,[a] Jean-Lucien Rouleau, MD,[a] Anique Ducharme, MD, MSc[a]

ABSTRACT

OBJECTIVES This study evaluated the impact of clinical and physiological factors limiting treatment optimization toward recommended medical therapy in heart failure (HF).

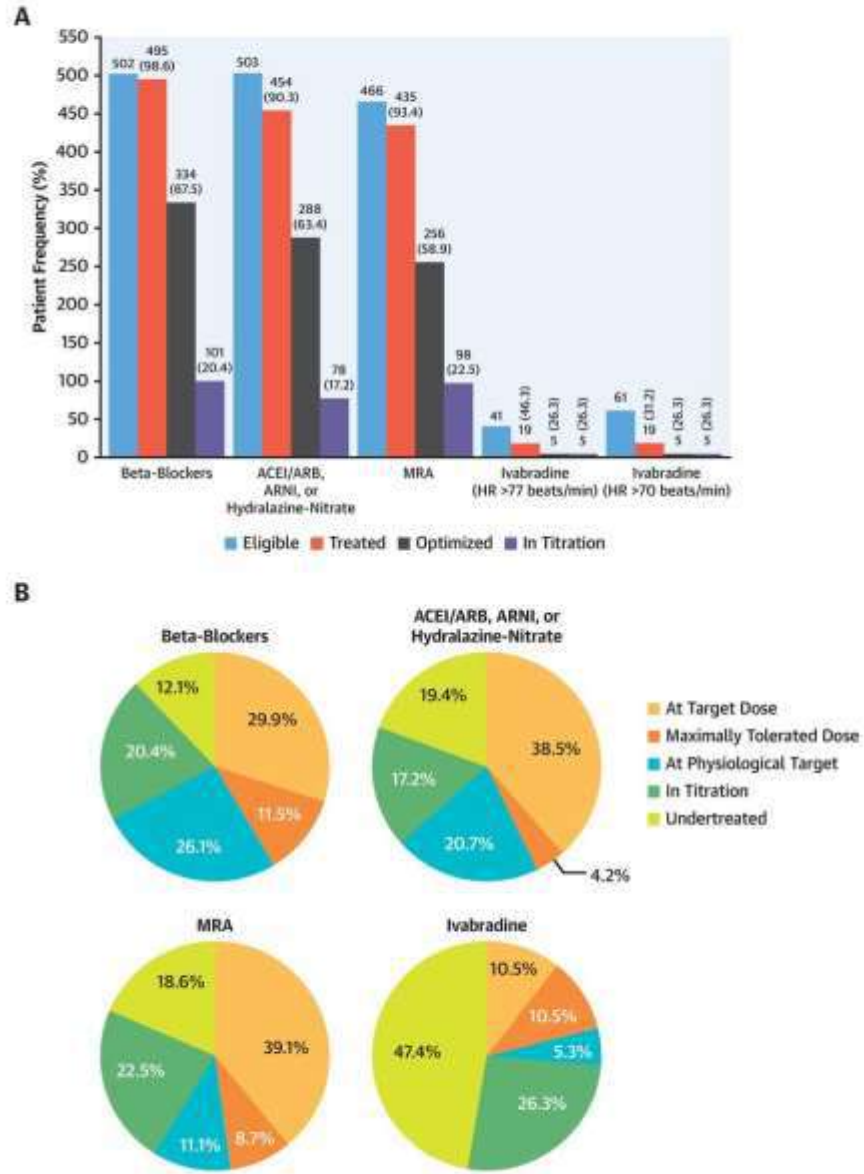
BACKGROUND Although guidelines aim to assist physicians in prescribing evidence-based therapies and to improve outcomes of patients with HF and reduced ejection fraction (HFrEF), gaps in clinical care persist.

METHODS Medical records of all patients with HFrEF followed for at least 6 months at the authors' HF clinic (n = 511) allowed for drug optimization and were reviewed regarding the prescription rates of recommended pharmacological agents and devices (implantable cardioverter-defibrillator [ICD] or cardiac resynchronization therapy [CRT]). Then, an algorithm integrating clinical (New York Heart Association [NYHA] functional class, heart rate, blood pressure and biologic parameters (creatinine, serum potassium) based on the inclusion/exclusion criteria of landmark trials guiding these recommendations) was applied for each agent and device to identify potential explanations for treatment gaps.

RESULTS Gross prescription rates were high for beta-blockers (98.6%), mineralocorticoid receptor antagonist (MRA) (93.4%), vasodilators (90.3%), ICDs (75.1%), and CRT (82.1%) among those eligible, except for ivabradine (46.3%, n = 41). However, achievement of target physiological doses was lower (beta-blockers, 67.5%; MRA, 58.9%; and vasodilators, 63.4%), and one-fifth of patient dosages were still being up-titrated. Suboptimal doses were associated with older age (odds ratio [OR]: 1.221; p < 0.0001) and history of stroke or transient ischemic attack (TIA) (no vs. yes, OR: 0.264; p = 0.0336).

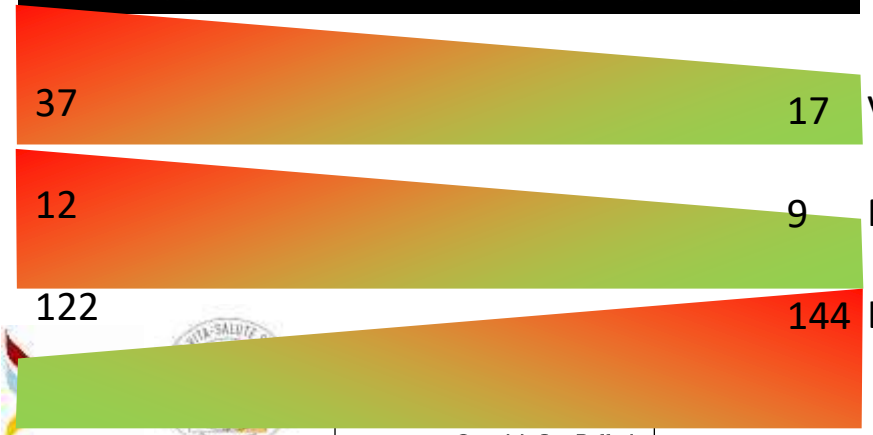
CONCLUSIONS Gaps in adherence to guidelines exist in specialized HF setting and are mostly explained by limiting physiological factors rather than inertia. Older age and history of stroke/TIA, potential markers of frailty, are associated with suboptimal doses of guideline-directed medical therapy, suggesting that an individualized rather than a "one-size-fits-all" approach may be required. (J Am Coll Cardiol HF 2020;8:725-38) © 2020 by the American College of Cardiology Foundation.

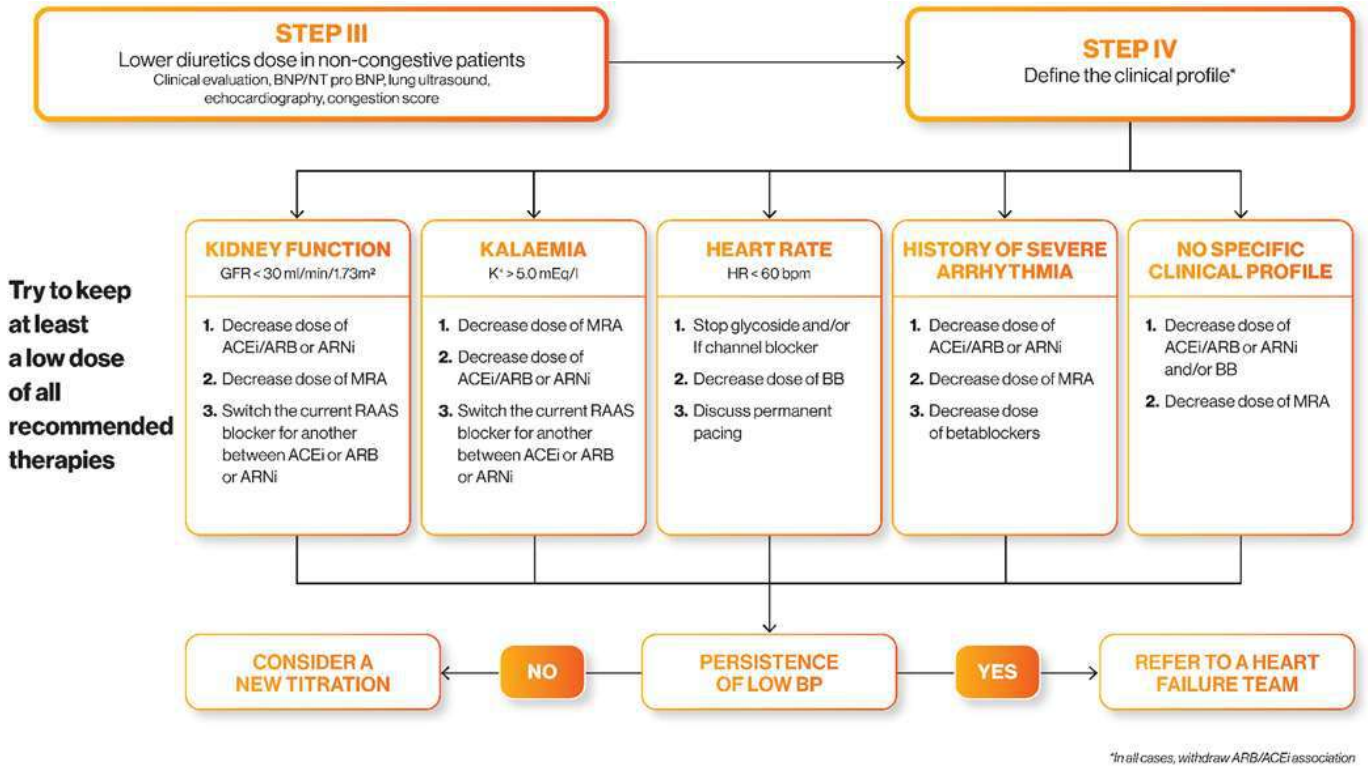
CENTRAL ILLUSTRATION: Use and Doses of GDMT in Ambulatory HFrEF Patients



Jarjour, M. et al. J Am Coll Cardiol HF. 2020;8(9):725-38.

A modern target: to improve compliance





UPTITRATION

JACC: CARDIOVASCULAR INTERVENTIONS
© 2023 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER
VOL. 16, NO. 8, 2023

NEW RESEARCH PAPER

STRUCTURAL

Impact of Transcatheter Edge-to-Edge Mitral Valve Repair on Guideline-Directed Medical Therapy Uptitration

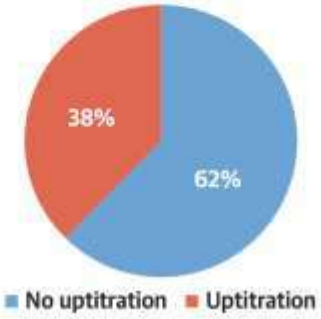
Marianna Adamo, MD,[a,*] Daniela Tomasoni, MD,[a,*] Lukas Stolz, MD,[b] Thomas J. Stocker, MD,[b] Edoardo Pancaldi, MD,[a] Benedikt Koell, MD,[c] Nicole Karam, MD,[d] Christian Besler, MD,[e] Cristina Giannini, MD,[f] Francisco Sampaio, MD,[g] Fabien Praz, MD,[h] Tobias Ruf, MD,[i] Louis Pechmajou, MD,[d] Michael Neuss, MD,[j] Christos Iliadis, MD,[k] Stephan Baldus, MD,[k] Christian Butter, MD,[l] Daniel Kalbacher, MD,[c] Philipp Lurz, MD,[e] Bruno Melica, MD,[g] Anna S. Petronio, MD,[f] Ralph Stephan von Bardeleben, MD,[j] Stephan Windecker, MD,[b] Javed Butler, MD,[l] Gregg C. Fonarow, MD,[m] Jörg Hausleiter, MD,[n,†] Marco Metra, MD[a,†]

ABSTRACT

BACKGROUND Guideline-directed medical therapy (GDMT) optimization is mandatory before transcatheter edge-to-edge mitral valve repair (M-TEER) in patients with secondary mitral regurgitation (SMR) and heart failure (HF) with reduced ejection fraction (HFrEF). However, the effect of M-TEER on GDMT is unknown.

CENTRAL ILLUSTRATION Prevalence, Predictors, and Impact on Outcomes of Guideline-Directed Medical Therapy Uptitration After Mitral Transcatheter Edge-to-Edge Repair

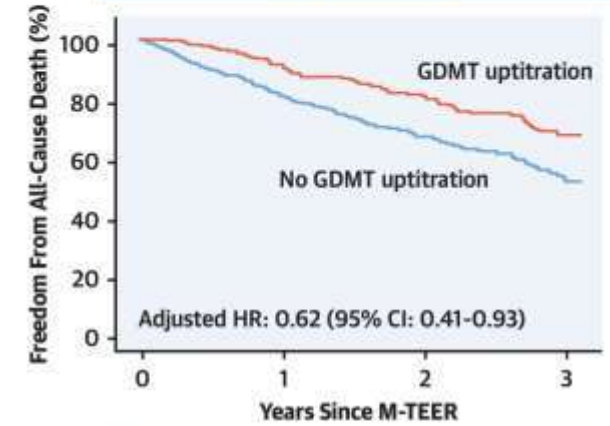
GDMT Uptitration After M-TEER

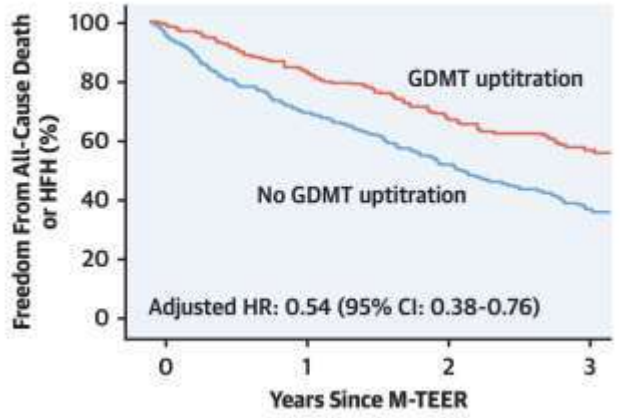


Predictors of GDMT Uptitration

Variables*	OR (95% CI)	*P* Value
NT-proBNP	1.16 (0.56-2.41)	0.695
Systolic pulmonary artery pressure	0.99 (0.97-1.02)	0.513
Previous myocardial infarction	0.81 (0.38-1.75)	0.593
Mean arterial blood pressure	1.00 (0.98-1.02)	0.868
Glomerular filtration rate	1.01 (0.99-1.02)	0.280
MR reduction of at least 3 grades	1.71 (1.08-2.71)	0.022
NYHA improvement (≥1 class)	0.66 (0.35-1.25)	0.200

Association Between GDMT Uptitration and Outcomes



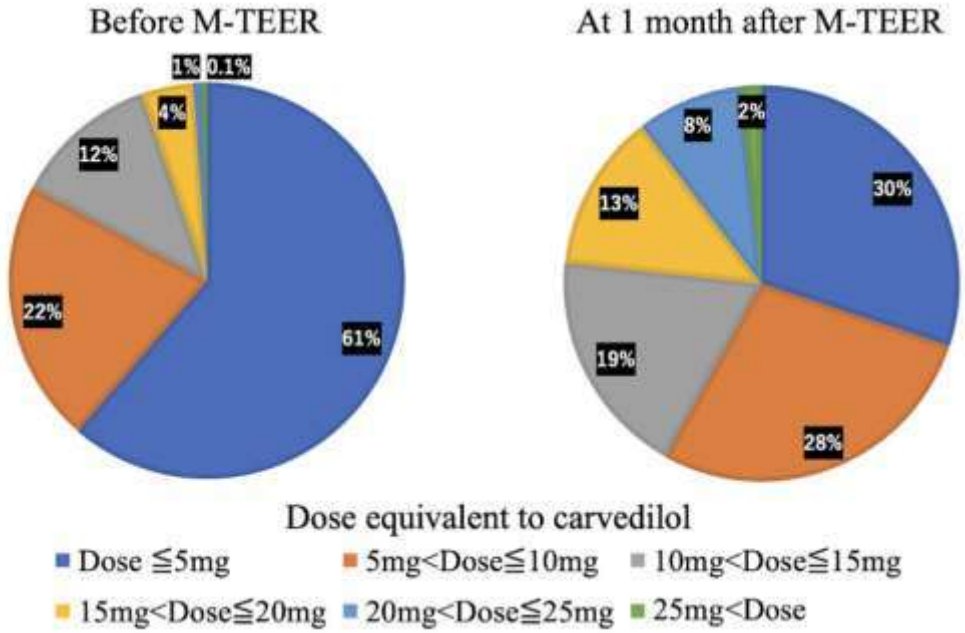


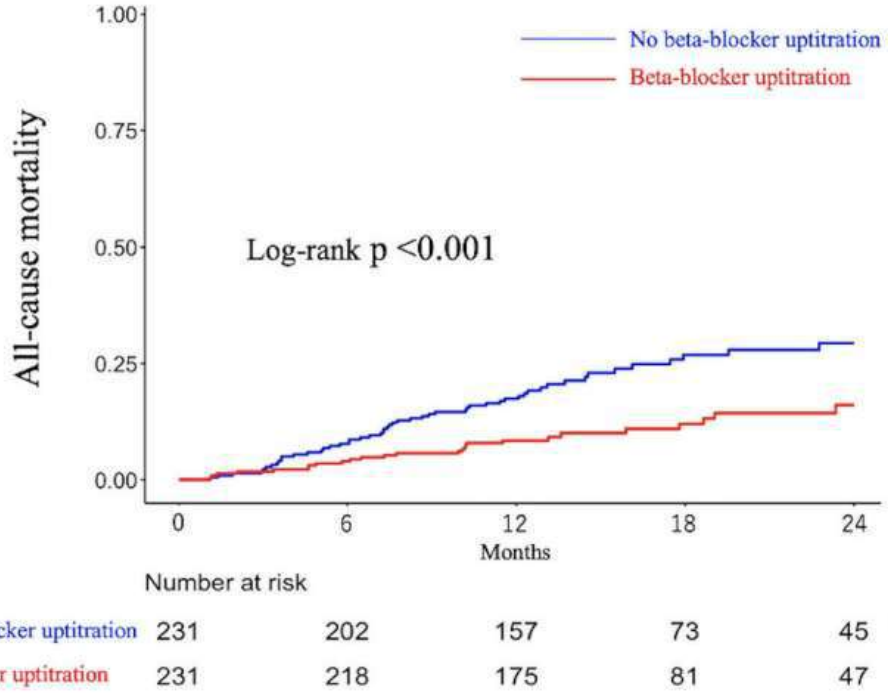
Adamo M, et al. J Am Coll Cardiol Intv. 2023;16(8):896-905.

Heart Valve Center
Ospedale San Raffaele

The OCEAN-mitral registry

- Impact of beta-blocker uptitration on patients after M-TEER for SMR





Beta-blocker uptitration and 2-year clinical outcomes.

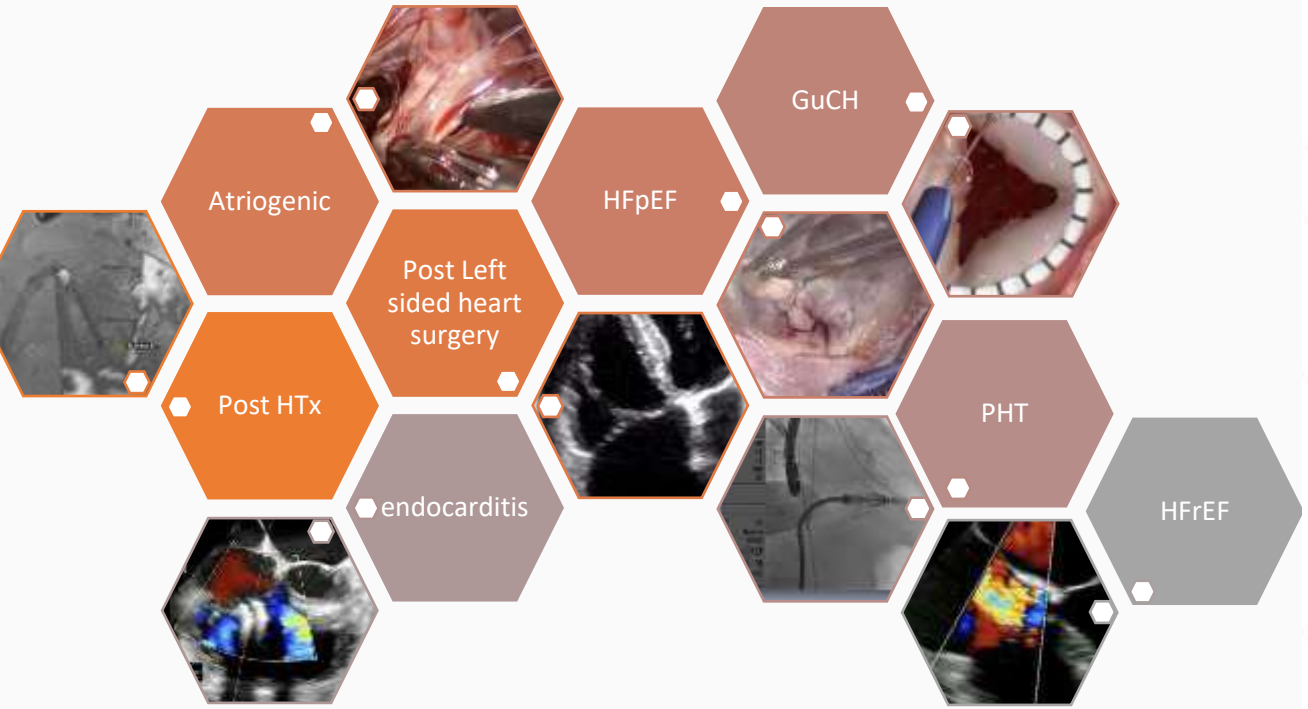
2-year clinical outcomes	Unadjusted		Multivariable Cox proportional hazards regression analyses		Propensity score matching analyses	
	HR (95 % CI)	P value	HR (95 % CI)	P value	HR (95 % CI)	P value
All-cause mortality	0.69 (0.46–1.02)	0.067	0.55 (0.36–0.84)	0.006	0.46 (0.28–0.73)	0.0012
Cardiovascular mortality	0.58 (0.35–0.97)	0.041	0.45 (0.26–0.79)	0.0064	0.40 (0.22–0.73)	0.0027
Non-cardiovascular mortality	0.92 (0.49–1.72)	0.81	0.84 (0.44–1.60)	0.59	0.58 (0.26–1.28)	0.18
Heart failure hospitalization	0.83 (0.61–0.14)	0.26	0.72 (0.52–1.01)	0.061	0.66 (0.44–0.98)	0.044

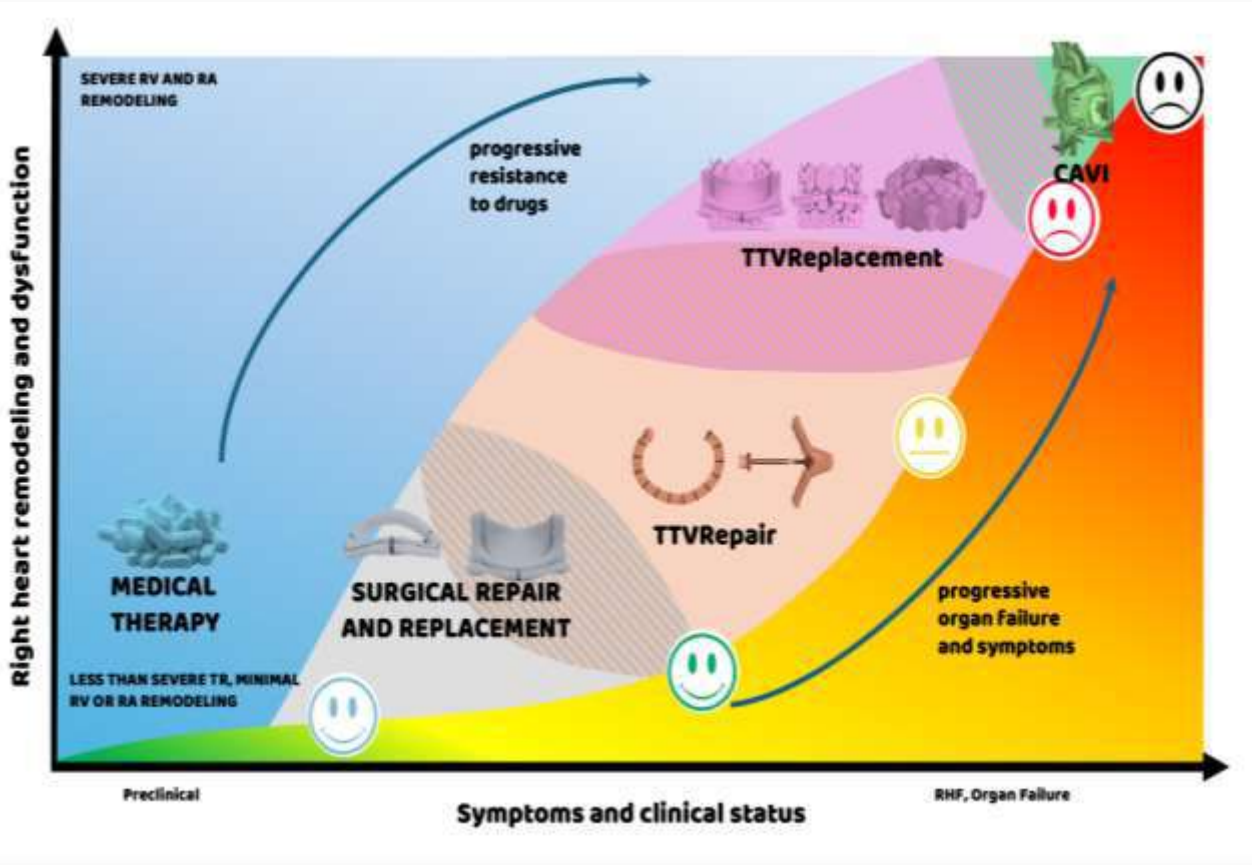
CI = confidence interval; HR = hazard ratio.

Saito, Tetsuya et al. International Journal of Cardiology, Volume 418, 132595


Master Course
in Heart Failure
25
BAKU
Baku Marriott Hotel Boulevard
30th May - 1st June
Azerbaijan Society of Cardiology
ZURICH HEART HOUSE
LONDON HEART HOUSE
Guy's and St Thomas'
HFA
Heart Failure Association
Starting Drugs in Heart Failure:
Which ones, how fast and in what order?
University of Zurich
Imperial College London
What could be the future of HF Management?
RAAS Inhibitors, ARNI
Betablockers
Aldosterone Synthase Inhibitors
SGLT2 Inhibitors
GLP-1/GIP Agonist
CGMP-Activators
Basic Therapy
BMI>27
???

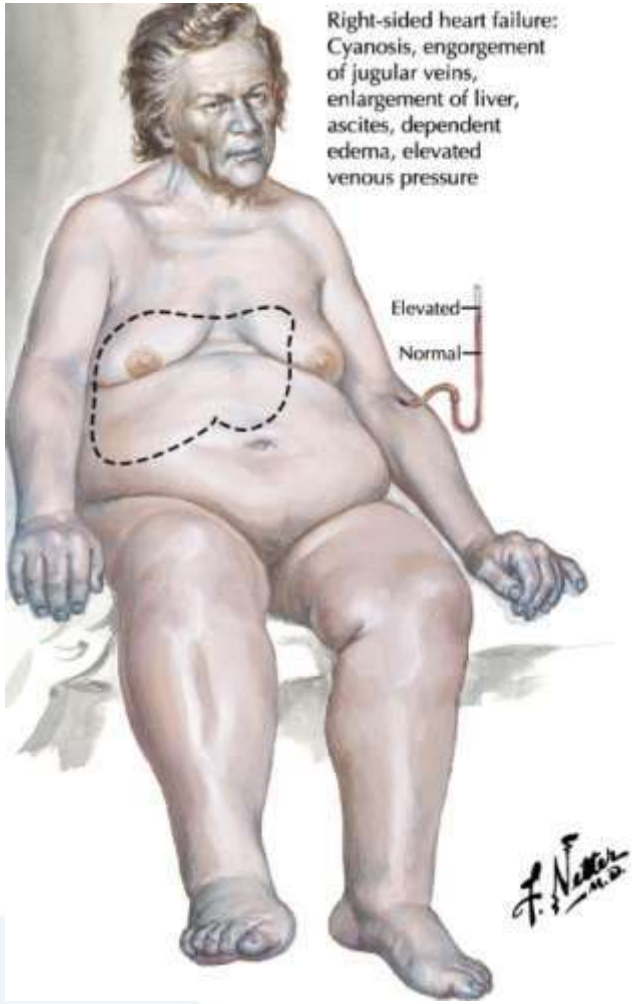
And TR????
Different phenotypes, pathways, prognoses, treatments

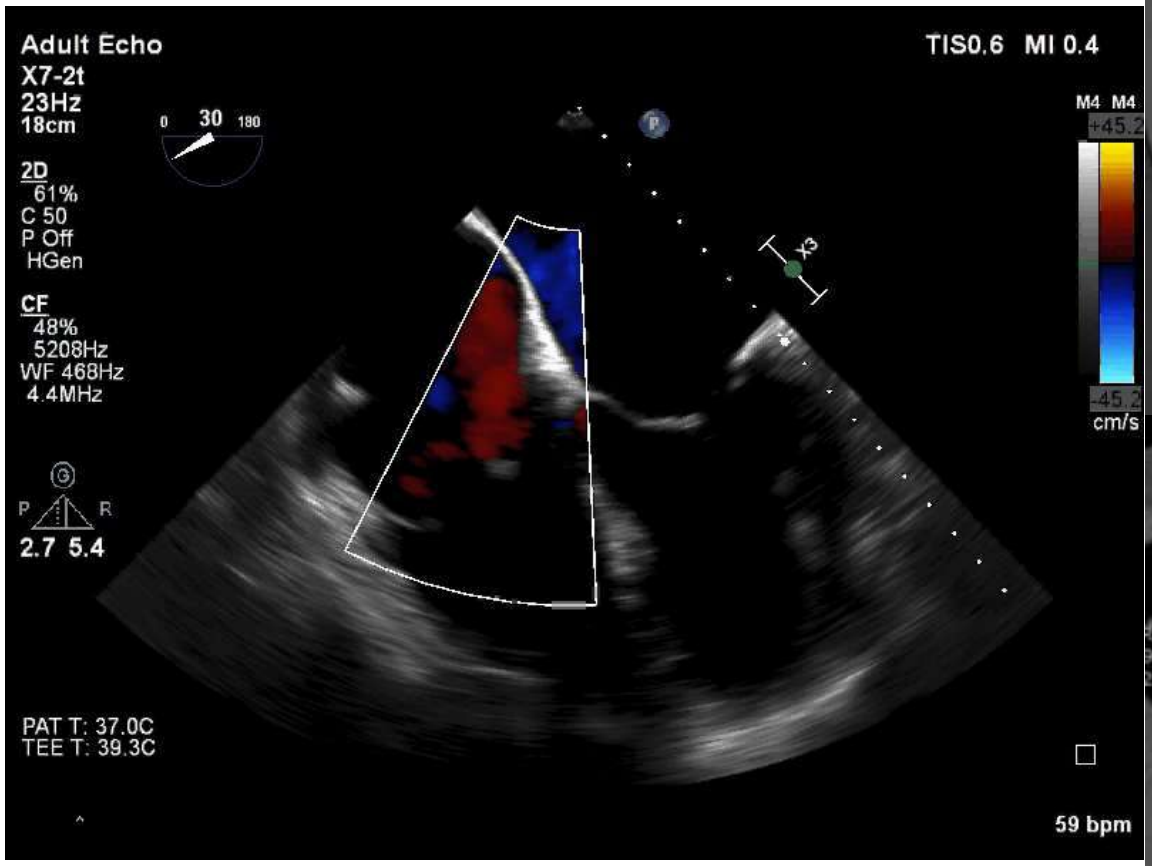


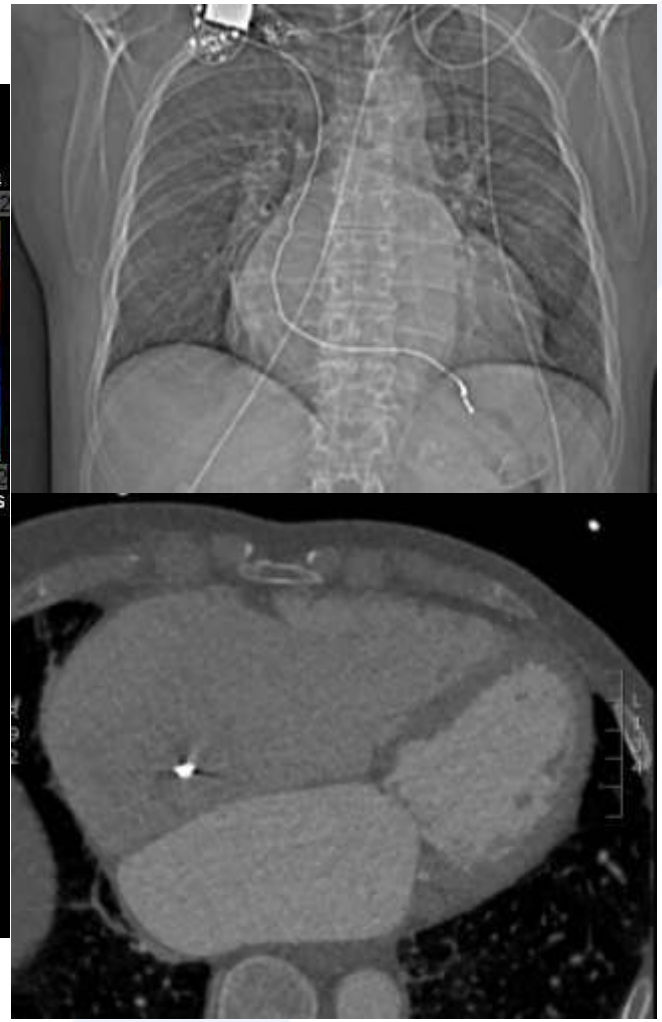


Maisano F et al, European Heart Journal (2024) 45, 876–894

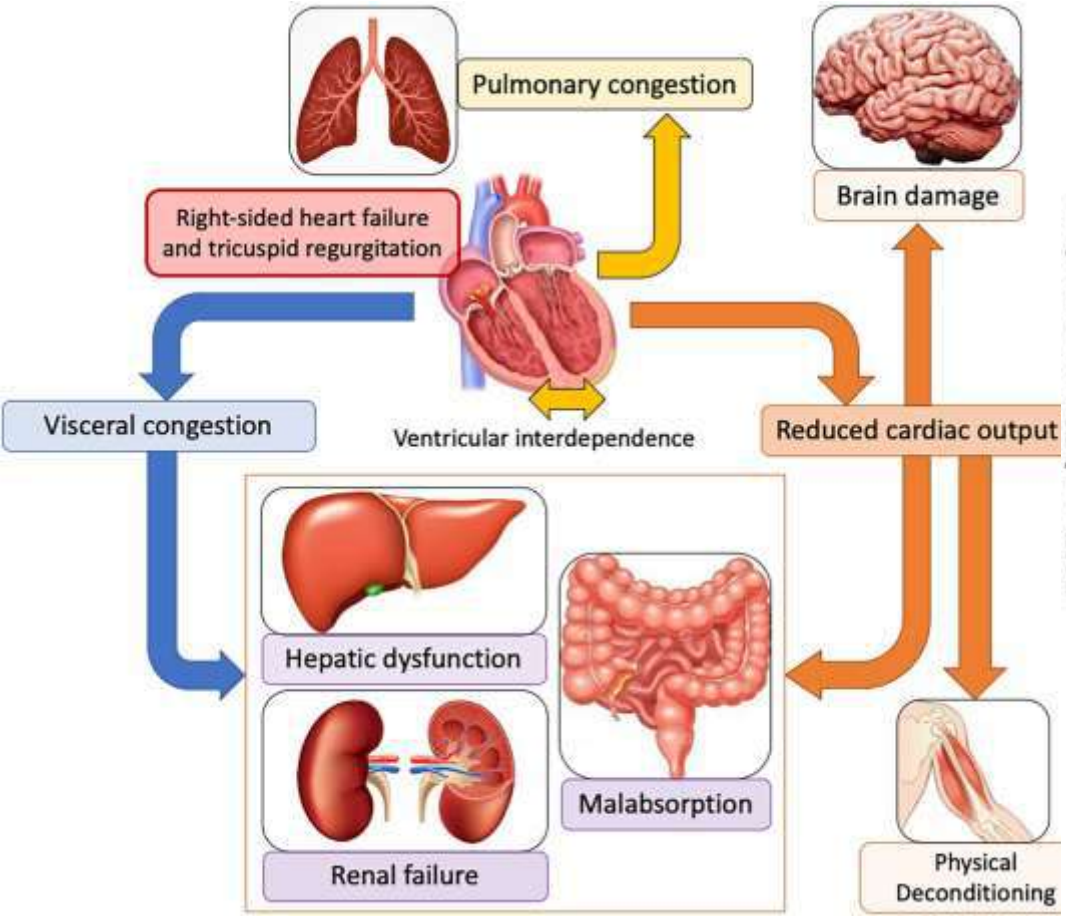
Tricuspid regurgitation is a slow-progressing disease

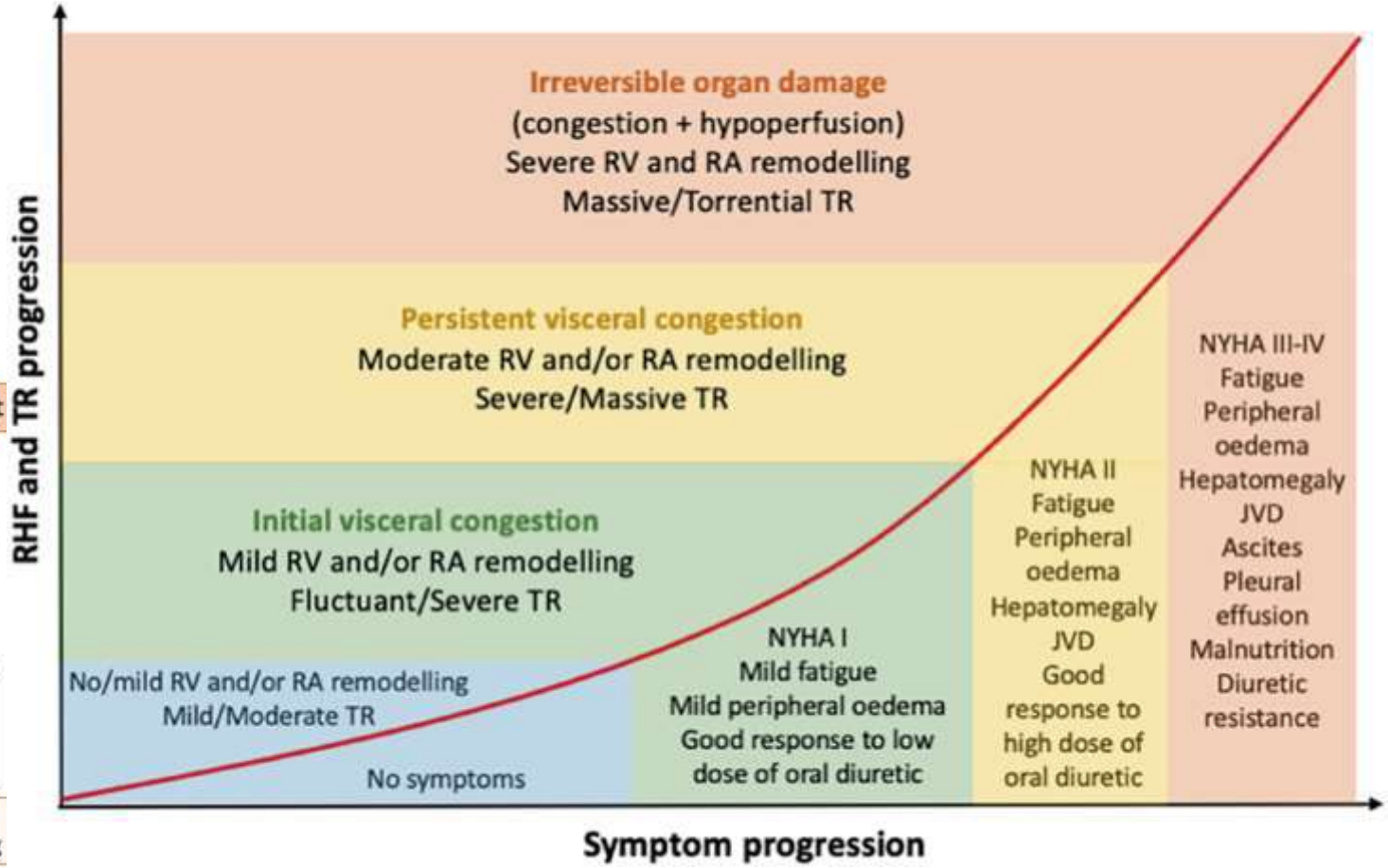






TR and organ damage



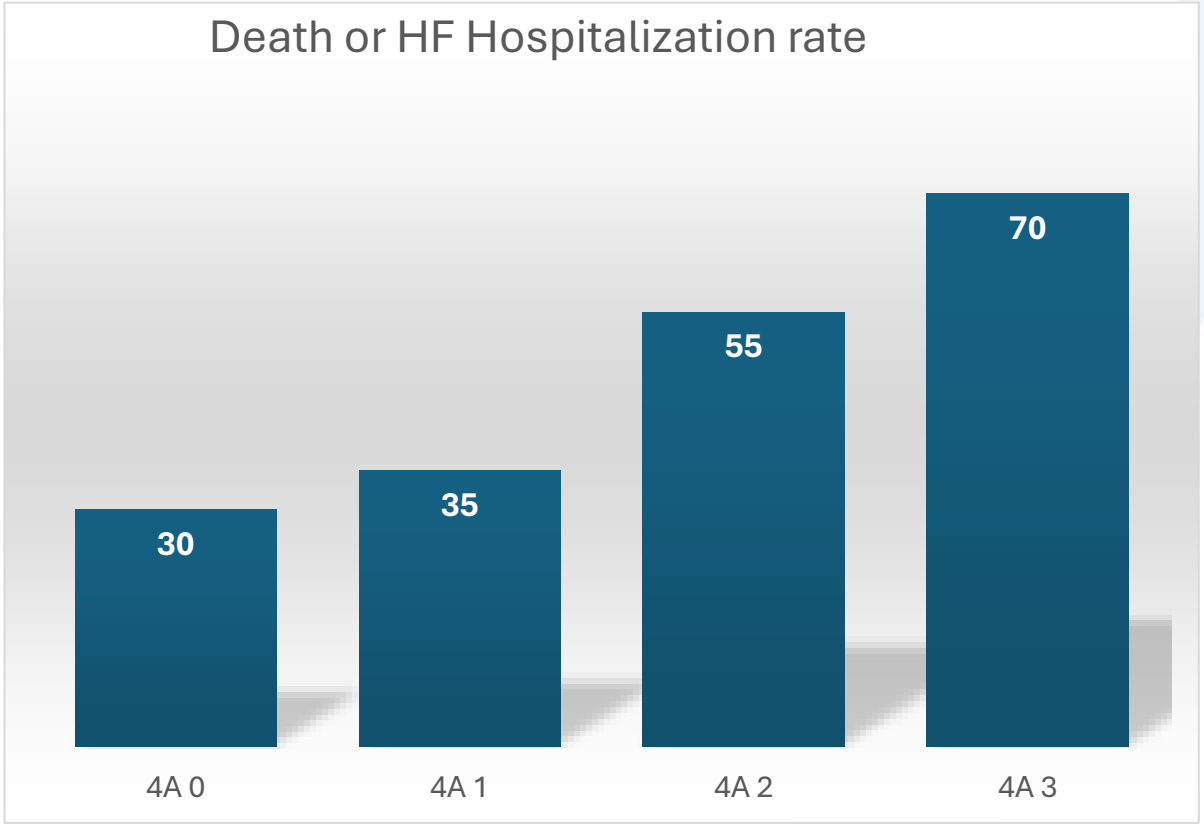


Heart Valve Center
Ospedale San Raffaele

Adamo M et al, European Journal of Heart Failure (2024) doi:10.1002/ejhf.3106

4A score, Unusual indicators for an insidious pathology

135 pts, 2 yrs median follow-up, combined endpoint CV mortality or HF admission



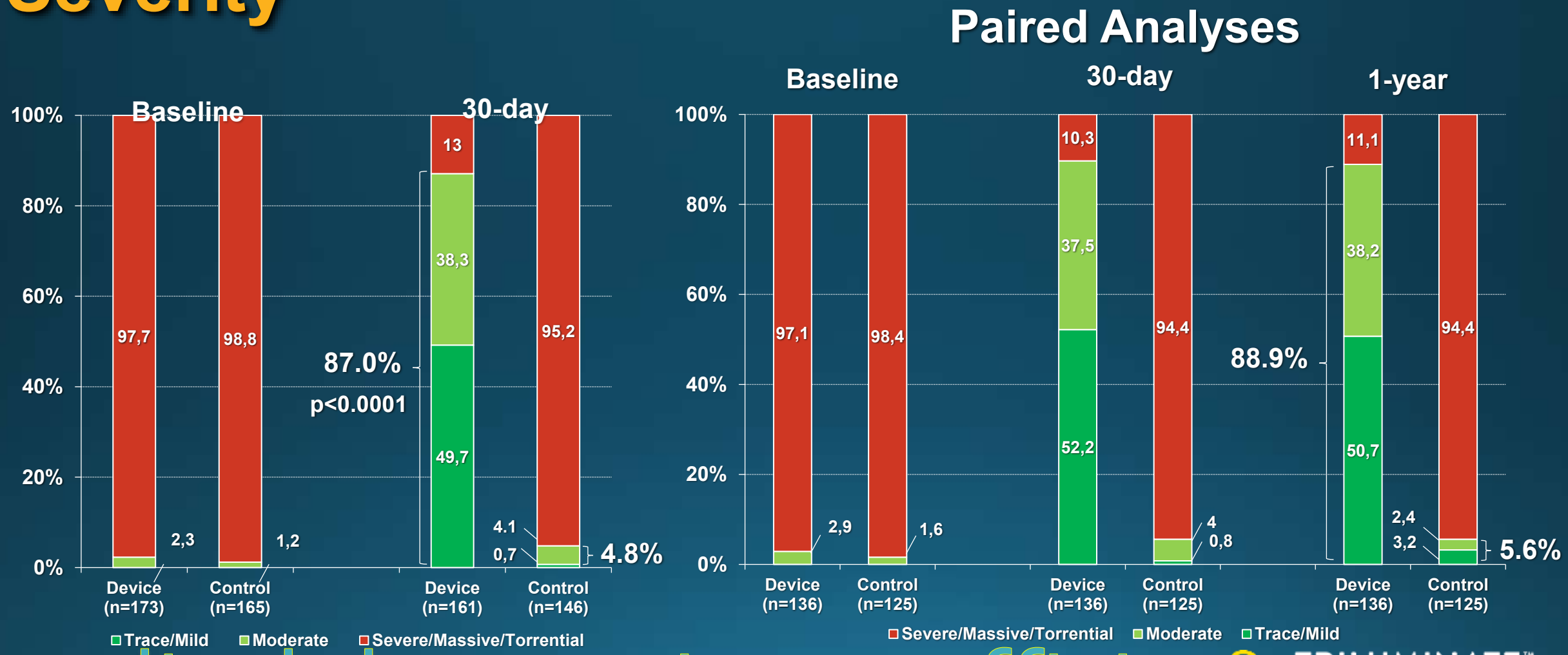
Gómez et al. Revista Española de Cardiología 2023

- Pathophysiology of Functional Tricuspid Regurgitation

Figure 2 Pathophysiology of functional tricuspid regurgitation.

Taramasso EHJ 2017

TRILUMINATE trial: Reduction in TR Severity

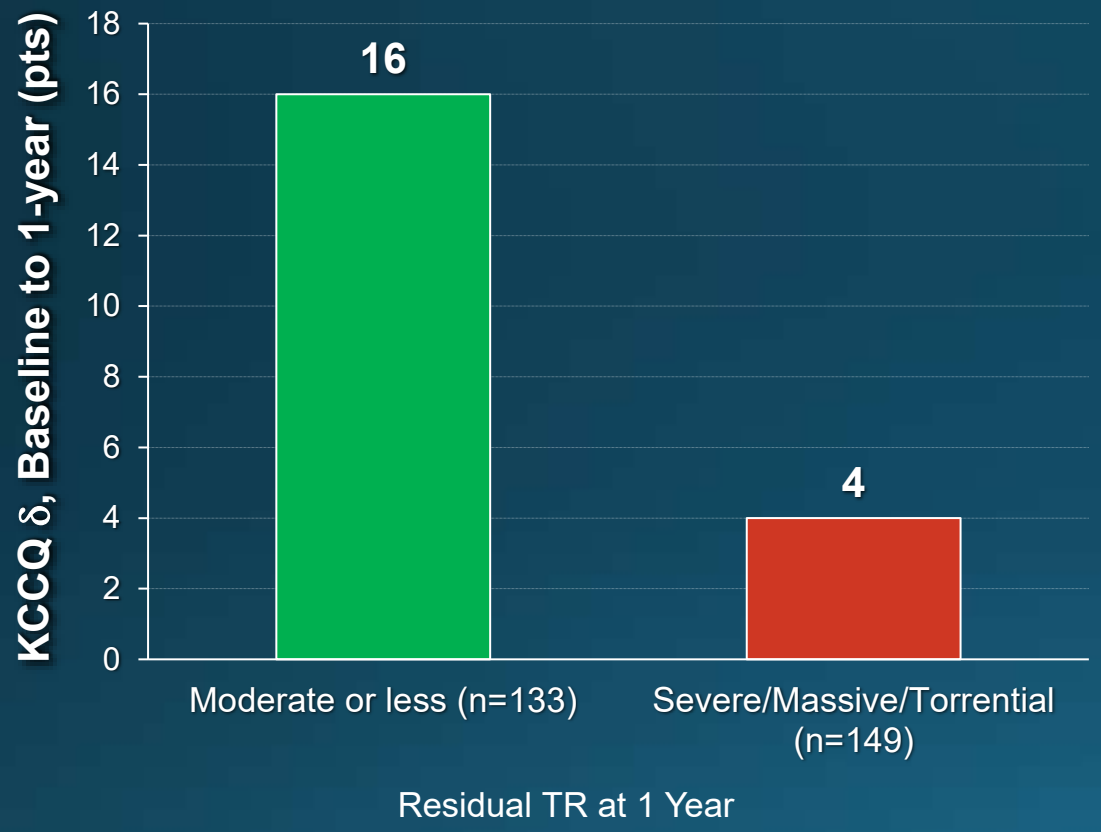


medical therapy is not efficient

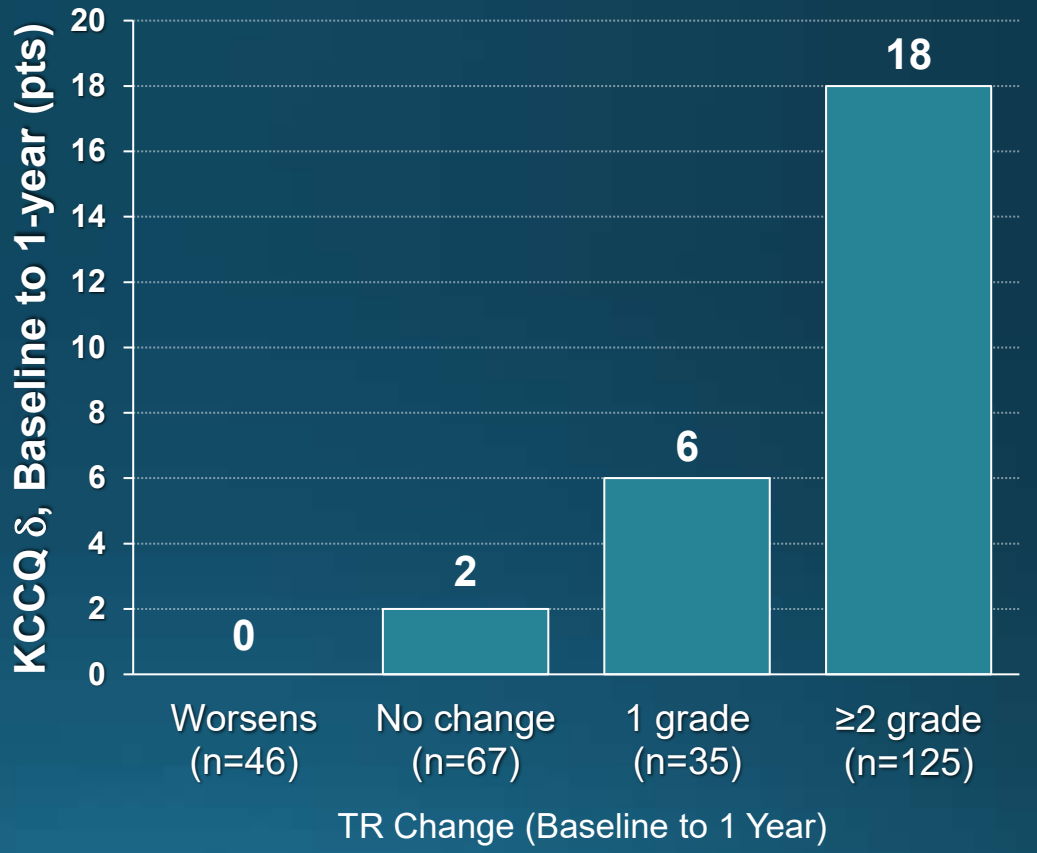
TRILUMINATE™ PIVOTAL TRIAL

Relationship between TR and Quality of Life

Change in KCCQ vs Residual TR at 1-yr



Change in KCCQ vs Change in TR severity

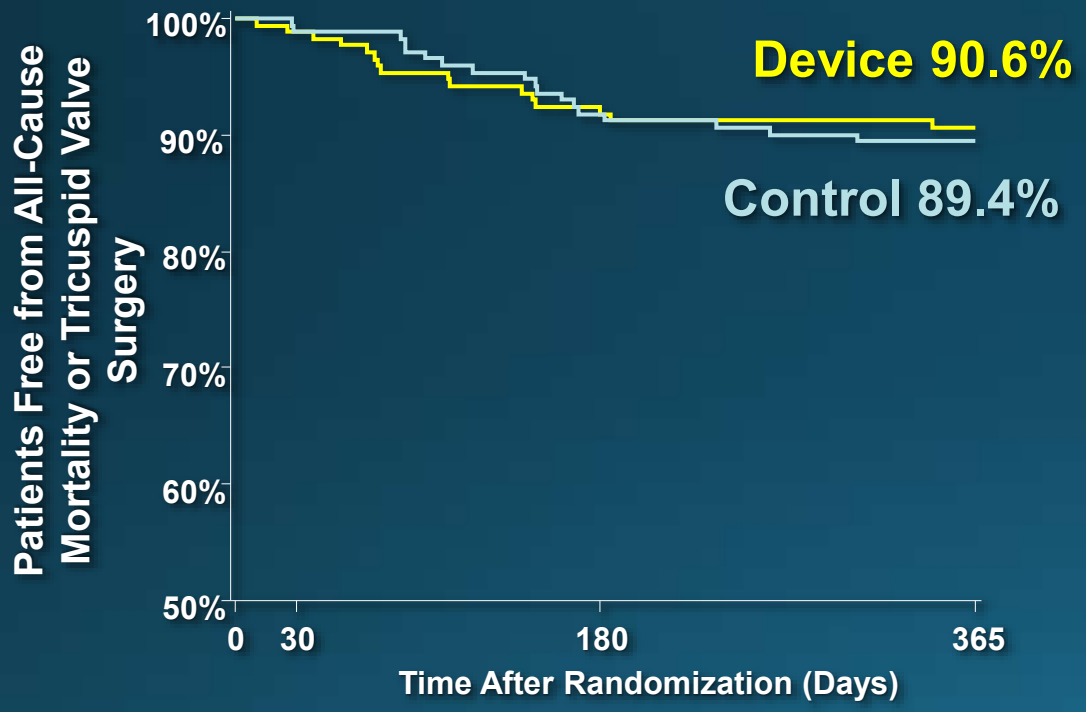


TRILUMINATE™ PIVOTAL TRIAL

Individual Component Analysis

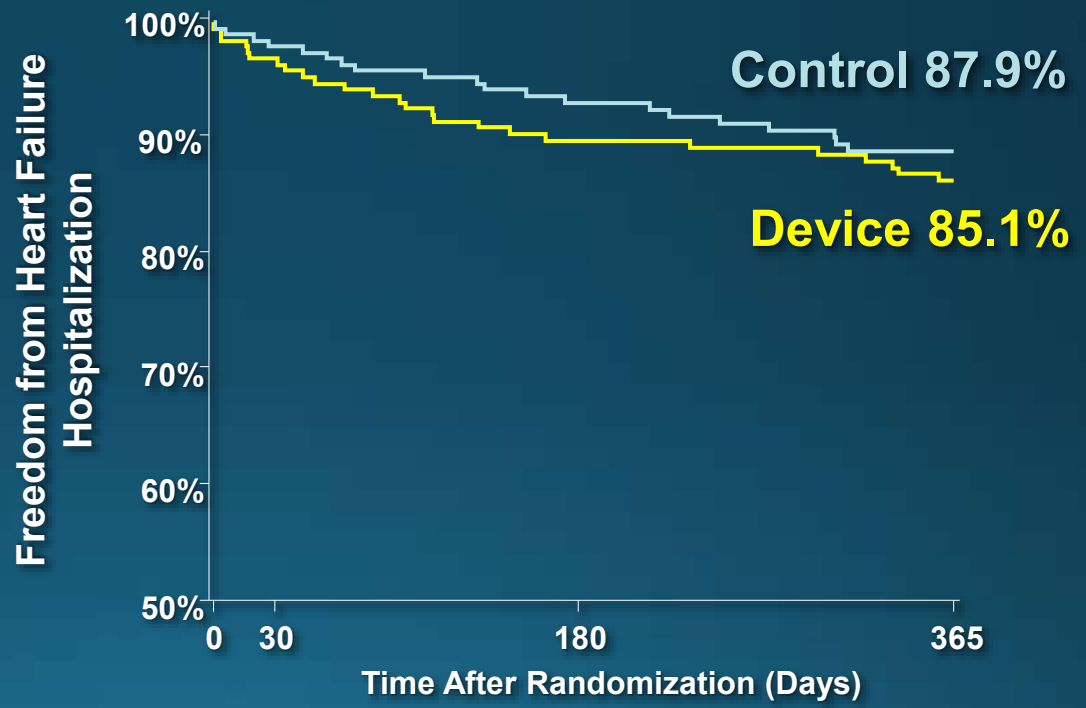
1st Component: Mortality or TV Surgery

p=0.75



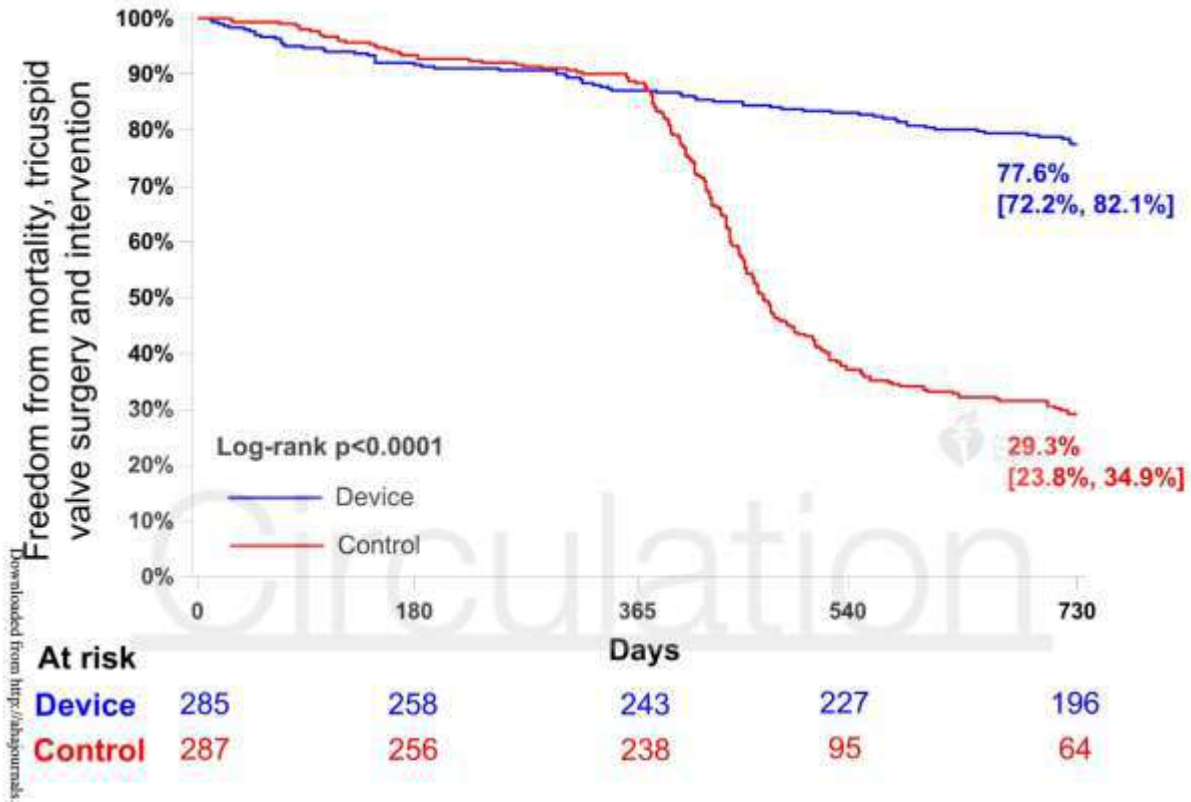
2nd Component: Heart Failure Hospitalization

p=0.41



TRILUMINATE™ PIVOTAL TRIAL

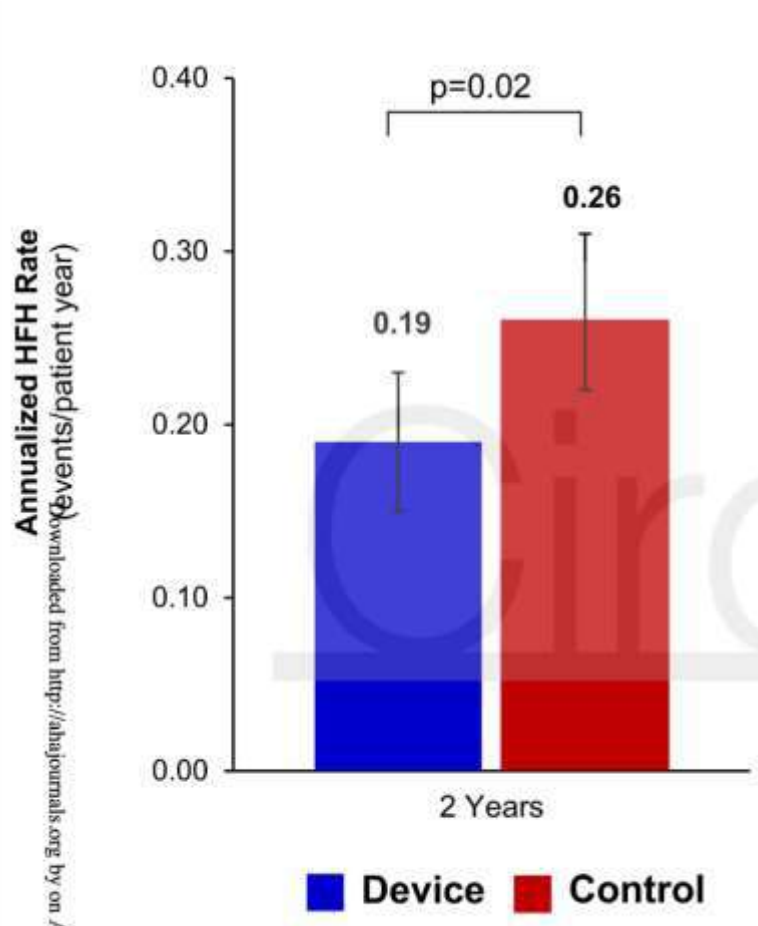
TRILUMINATE 2 Y: **Freedom from mortality, tricuspid valve surgery, and tricuspid valve intervention through 2 years.**

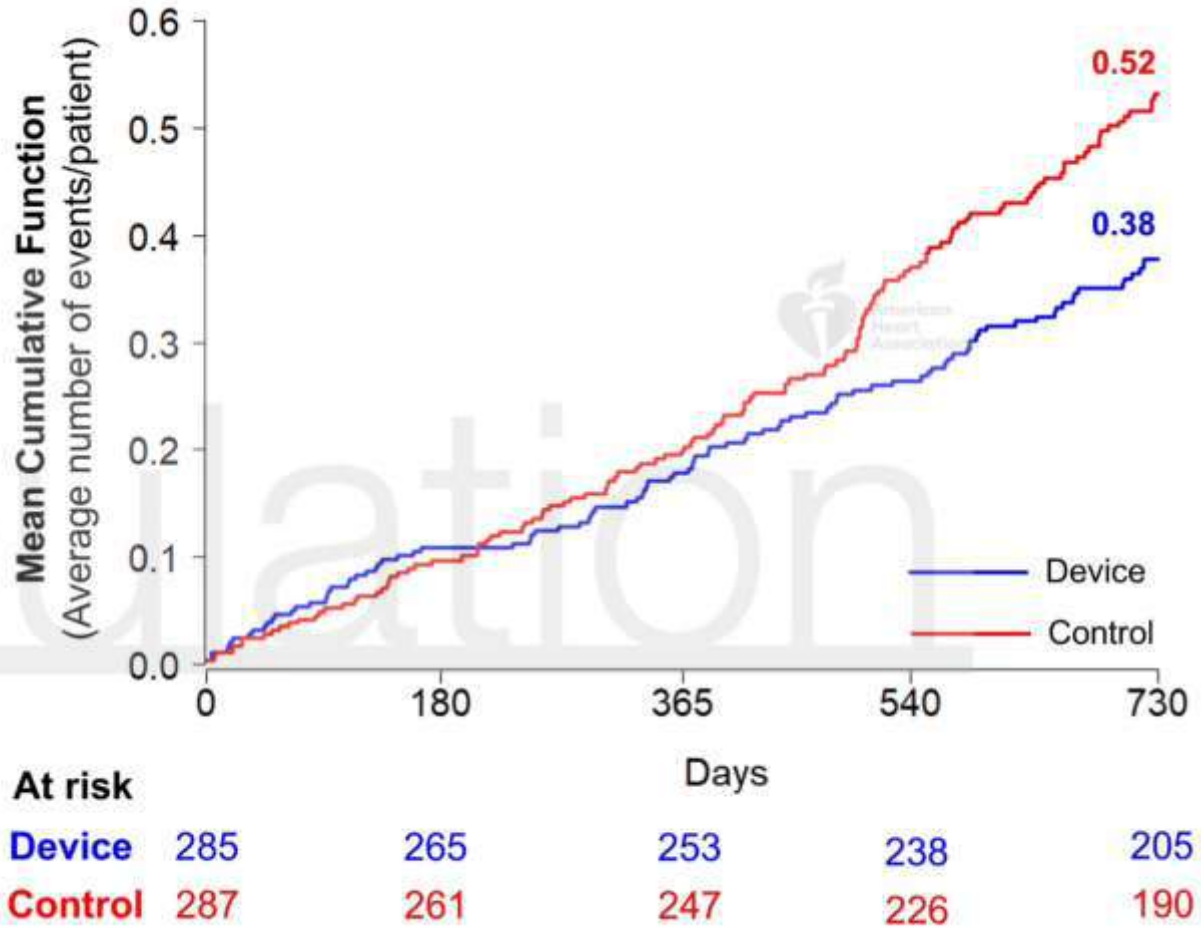


Component	Device N=285	Control N=287	p-value
Composite of mortality/TVS/TVI	**22.4% (62)**	**70.7% (185)**	**<0.0001**
All-cause mortality	17.9% (49)	17.1% (45)	
TVS	2.3% (6)	4.3% (11)	
TVI	3.8% (10)	61.5% (142)	

Kar S et al, . Circulation 2025

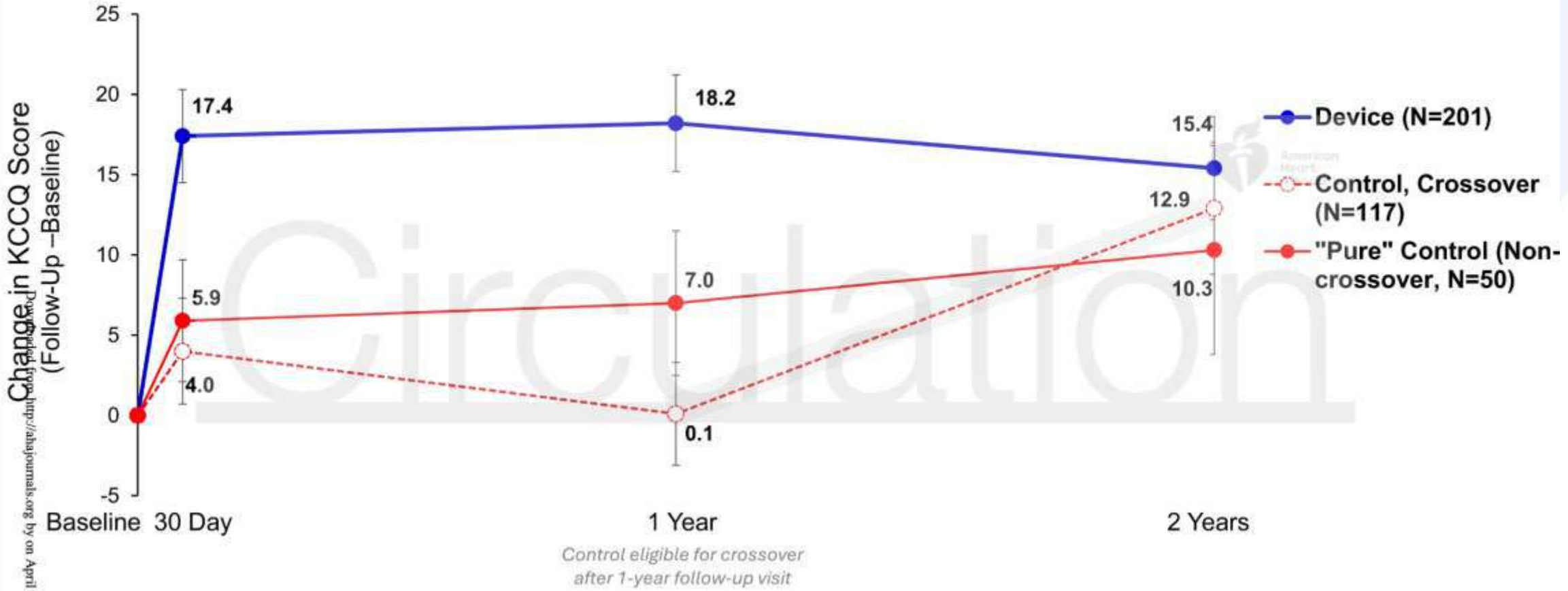
TRILUMINATE 2 Y: **Recurrent heart failure hospitalization (HFH) through 2 years.**





Kar S et al, . Circulation 2025

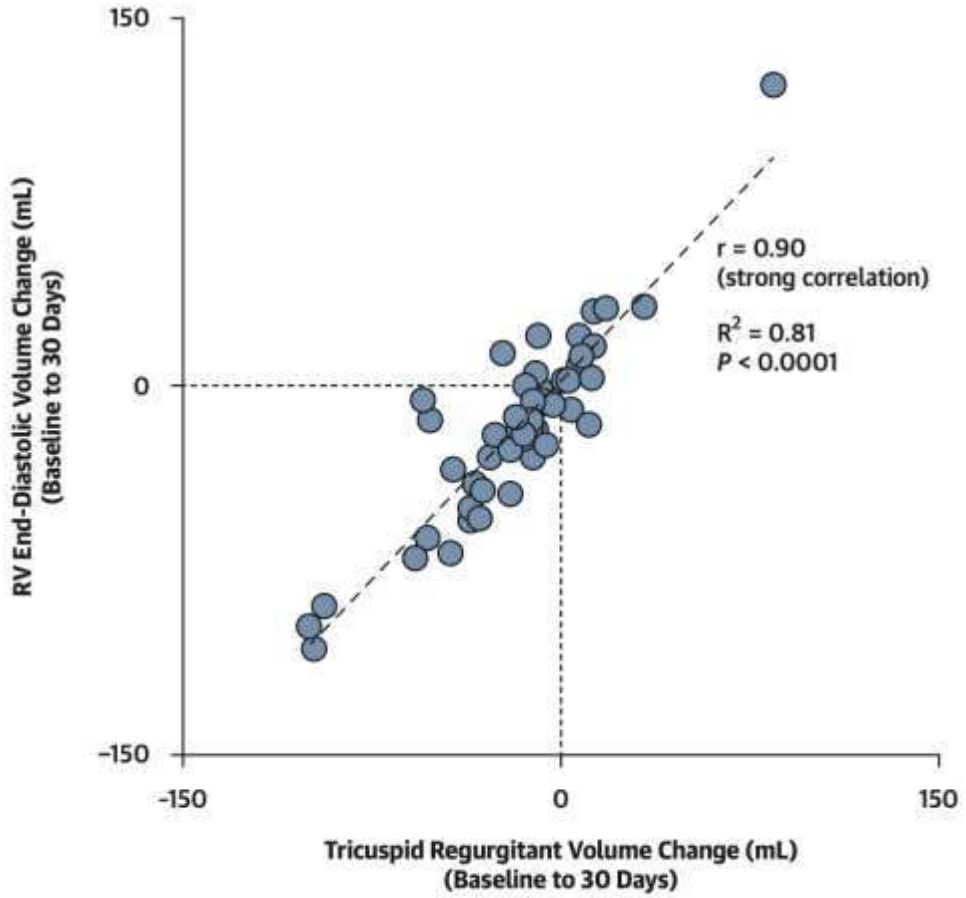
TRILUMINATE 2 Y: **Change in KCCQ score through 2 years.**



Kar S et al, . Circulation 2025

RV remodeling and TR redution a 1:1 relationship

Association Between the Change in Regurgitant Volume and the Change in RV End-Diastolic Volume (Cardiac Magnetic Resonance)



Cavalcante J et al, JACC. 2025;85:250–261

Mild to moderate post-operative TR is the ideal minimal target of therapy

ORIGINAL RESEARCH

STRUCTURAL

Prognostic Implications of Residual Tricuspid Regurgitation Grading After Transcatheter Tricuspid Valve Repair

Julien Dreyfus, MD, PhD,[a] Maurizio Taramasso, MD, PhD,[b] Karl-Patrik Kresoja, MD,[c] Hazem Omran, MD,[d] Christos Iliadis, MD,[e] Giulio Russo, MD,[f] Marcel Weber, MD,[g] Luis Nombela-Franco, MD, PhD,[h] Rodrigo Estevez Loureiro, MD, PhD,[i] Jörg Hausleiter, MD,[j] Azeem Latib, MD,[k] Lukas Stolz, MD,[l] Fabien Praz, MD,[l] Stephan Windecker, MD,[l] Jose Luis Zamorano, MD,[m] Ralph Stephan von Bardeleben, MD,[n] Gilbert H.L. Tang, MD, MSc, MBA,[o] Rebecca Hahn, MD,[p] Edith Lubos, MD,[q] John Webb, MD,[r] Joachim Schofer, MD,[s] Neil Fam, MD,[t] Alexander Lauten, MD,[u] Giovanni Pedrazzini, MD,[v] Josep Rodés-Cabau, MD, PhD,[w] Mohammed Nejjari, MD,[x] Luigi Badano, MD, PhD,[y] Hannes Alessandrini, MD,[z] Dominique Himbert, MD,[z] Horst Sievert, MD,[aa] Kerstin Piayda, MD, MSc,[aa,ab] Erwan Donal, MD, PhD,[ac] Thomas Modine, MD, PhD,[ad] Georg Nickenig, MD,[ae] Roman Pfister, MD,[af] Volker Rudolph, MD,[ag] Jordan Berrick, MSc,[ah] George A. Wells, MSc, PhD,[ah] Jeroen Bax, MD, PhD,[ai] Philipp Lurz, MD, PhD,[aj] Maurice Enrique Sarano, MD, PhD,[ak] Francesco Maisano, MD,[b] David Messika-Zeitoun, MD, PhD,[al] the TRIGISTRY Investigators

ABSTRACT

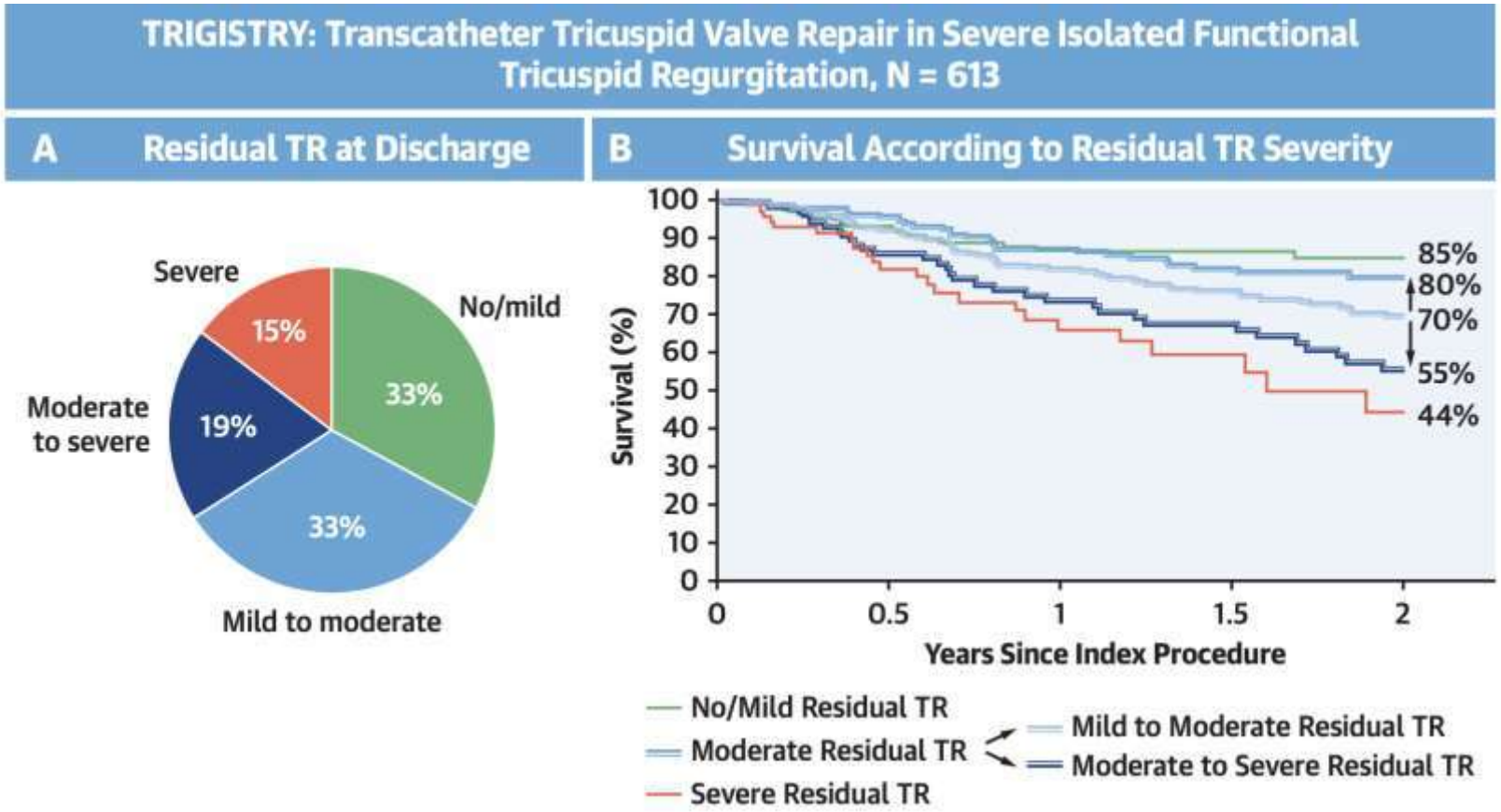
BACKGROUND The safety profile of transcatheter tricuspid valve (TTV) repair techniques is well established, but residual tricuspid regurgitation (TR) remains a concern.

OBJECTIVES The authors sought to assess the impact of residual TR severity post-TTV repair on survival.

METHODS We evaluated the survival rate at 2 years of 613 patients with severe isolated functional TR who underwent TTV repair in TRIGISTRY according to the severity of residual TR at discharge using a 3-grade (mild, moderate, and severe) or 4-grade scheme (mild, mild to moderate, moderate to severe, and severe).

RESULTS Residual TR was none/mild in 33%, moderate in 52%, and severe in 15%. The 2-year adjusted survival rates significantly differed between the 3 groups (85%, 70%, and 44%, respectively; restricted mean survival time [RMST], $P < 0.0001$). When the 319 patients with moderate residual TR were subdivided into mild to moderate (n = 201, 33%) and moderate to severe (n = 118, 19%), the adjusted survival rate was also significantly different between groups (85%, 80%, 55%, and 44%, respectively; RMST, $P < 0.001$). Survival was significantly lower in patients with moderate to severe residual TR compared to patients with mild to moderate residual TR ($P = 0.006$). No difference in survival rates was observed between patients with no/mild and mild to moderate residual TR ($P = 0.67$) or between patients with moderate to severe and severe residual TR ($P = 0.96$).

CONCLUSIONS The moderate residual TR group was heterogeneous and encompassed patients with markedly different clinical outcomes. Refining TR grade classification with a more granular 4-grade scheme improved outcome prediction. Our results highlight the importance of achieving a mild to moderate or lower residual TR grade during TTV repair, which could define a successful intervention. (J Am Coll Cardiol Intv 2024;17:1485–1496) © 2024 by the American College of Cardiology Foundation.



Heart Valve Center
Ospedale San Raffaele

When to act?????

suspicion

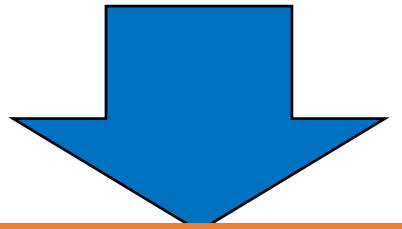
- Fatigue, weight loss, edema, abdominal pain

Diagnostic and profiling

- TTE-TEE
  - TR moderate to severe
  - Right atrial size
  - RV
  - etiology
- Biomarkers
- RH

timing

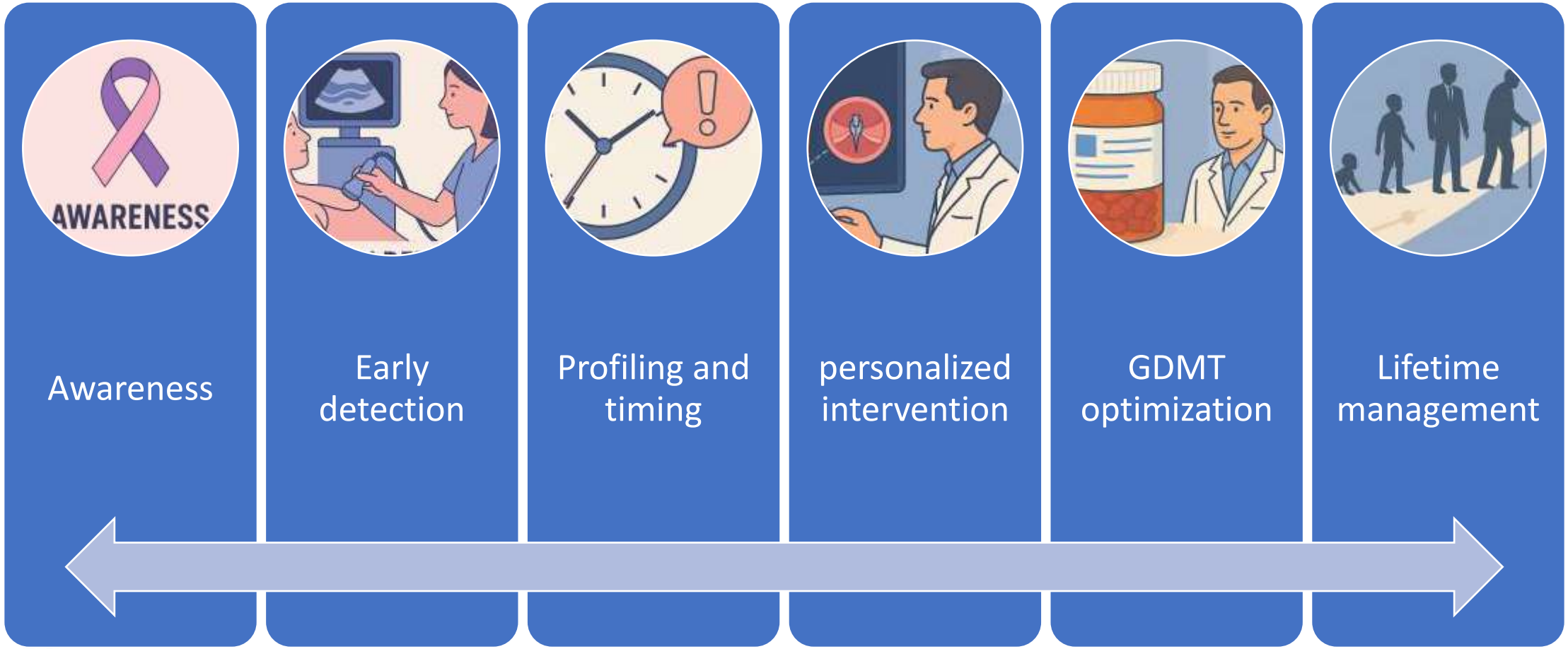
- **worsening heart failure**
  - **Lasix > 50 mg? >125 mg**
  - **Dose escalation**
- **Right chamber dilation**



- Intervention on predisposing causes(PH, Afib, LH disease, etc)
- Interventional or surgery

Heart Valve Center
Ospedale San Raffaele

A lifetime management approach.. A multi-disciplinary community approach to HF and valve disease



Heart Valve Center
Ospedale San Raffaele