

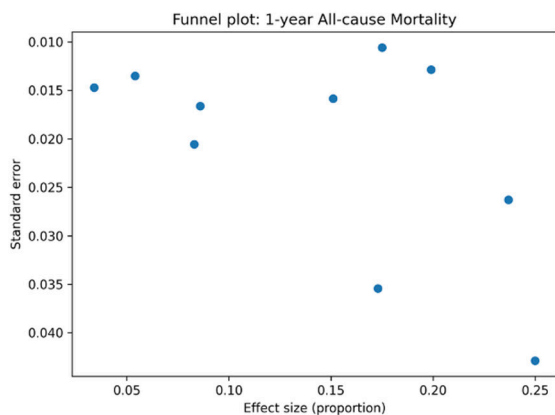
Figure S1 Meta-analysis flow-chart.

Table S1 Quality assessment of included observational studies using the Newcastle-Ottawa Scale

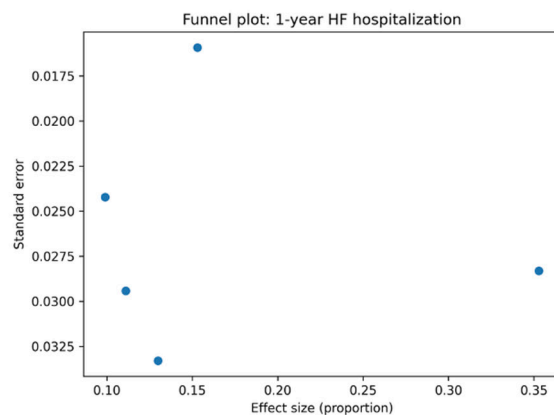
Author	Selection		Comparability		Outcome	
	Points (max 4)	Risk of bias	Points (max 2)	Risk of bias	Points (max 3)	Risk of bias
Gröger (9)	3★	moderate	1★	moderate	2★	moderate
Hanses (10)	3★	moderate	2★	low	2★	moderate
Echarte-Morales (14)	3★	moderate	2★	low	2★	moderate
Lurz (11)	4★	low	2★	low	3★	low
Stolz (16)	3★	moderate	2★	low	2★	moderate
Stolz (13)	3★	moderate	2★	low	2★	moderate
Vogelhuber (12)	3★	moderate	2★	low	2★	moderate
Sugiura (15)	3★	moderate moderate	2★	low	2★	moderate

Two independent reviewers undertook quality assessment and allocated stars/points for adherence to following criteria: (I) selection (adequate selection and definition of groups); (II) comparability (comparability of two groups for a selected variable and comparability for other variables); (III) outcome (modality of assessment, enough length of follow-up and adequacy of follow-up). Studies with 4 stars for selection, 2 for comparability, and 3 for outcome were defined at low risk of bias. Studies with 2 or 3 stars for selection, 1 for comparability, and 2 for outcome were defined at moderate risk. Any study with a score of 1 for selection or outcome ascertainment, or 0 for any of the three domains, was deemed at high risk of bias.

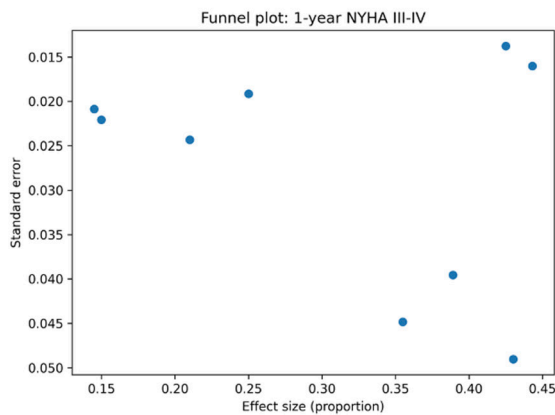
### A. 1-year All-cause Mortality



### B. 1-year HF Hospitalization



### C. 1-year NYHA Class III-IV



### D. Early Residual TR $\geq 3+$

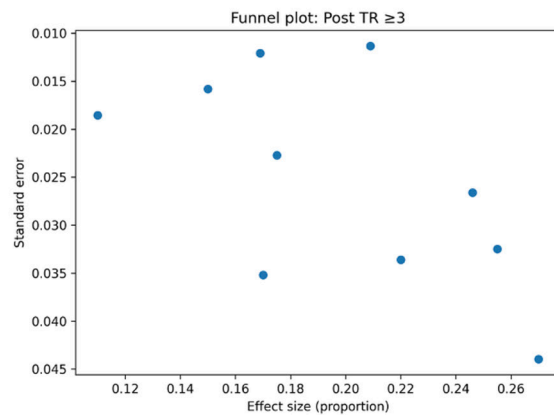


Figure S2 Funnel plot for the assessment of publication bias.

Table S2 Publication bias assessment			
Endpoint	n studies	Egger Intercept	P value
1-year All-cause Mortality	10	0.11	0.13
1-year HF Hospitalization	5	0.12	0.52
1-year NYHA Class III-IV	9	0.39	0.015
Early Residual TR $\geq 3+$	10	0.16	0.001

Egger's regression test was used to evaluate the presence of publication bias. A P value <0.05 was considered indicative of small-study effects. HF, heart failure; NYHA, New York Heart Association; TR, tricuspid regurgitation.

**Table S3** Clinical and imaging characteristics of the included studies

First author	Year	N	Center/registry/trial	Study design	Early Residual TR ≥3+ (%)	1-year Mortality (%)	1-year HF Hospitalization (%)	1-year NYHA Class III–IV (%)
Gröger (9)	2023	180	Ulm University Heart Center	Observational	Retrospective	26	8.3	N/A
Hanses (10)	2023	102	University of Lübeck	Observational	Prospective	27	25.0	13.0
Echarte-Morales (14)	2024	280	TRI-SPA Registry	Observational	Retrospective	18	5.4	N/A
Lurz (11)	2024	511	bRIGHT Study	Observational	Prospective	15	15.1	15.3
Stolz (16)	2024	1,286	EuroTR Registry	Observational	Retrospective	21	17.5	N/A
Stolz (13)	2024	962	Multicenter Registry	Observational	Retrospective	17	19.9	N/A
Vogelhuber (12)	2024	262	University Hospital Bonn	Observational	Retrospective	25	23.7	N/A
Donal (7)	2025	152	Tri.fr Trial	Randomized	Prospective	22	3.4	9.9
Sugiura (15)	2025	114	Primary TR Registry	Observational	Retrospective	17	17.3	11.1
Tang (6)	2025	285	TRILUMINATE Pivotal Trial	Randomized	Prospective	11	8.6	35.3

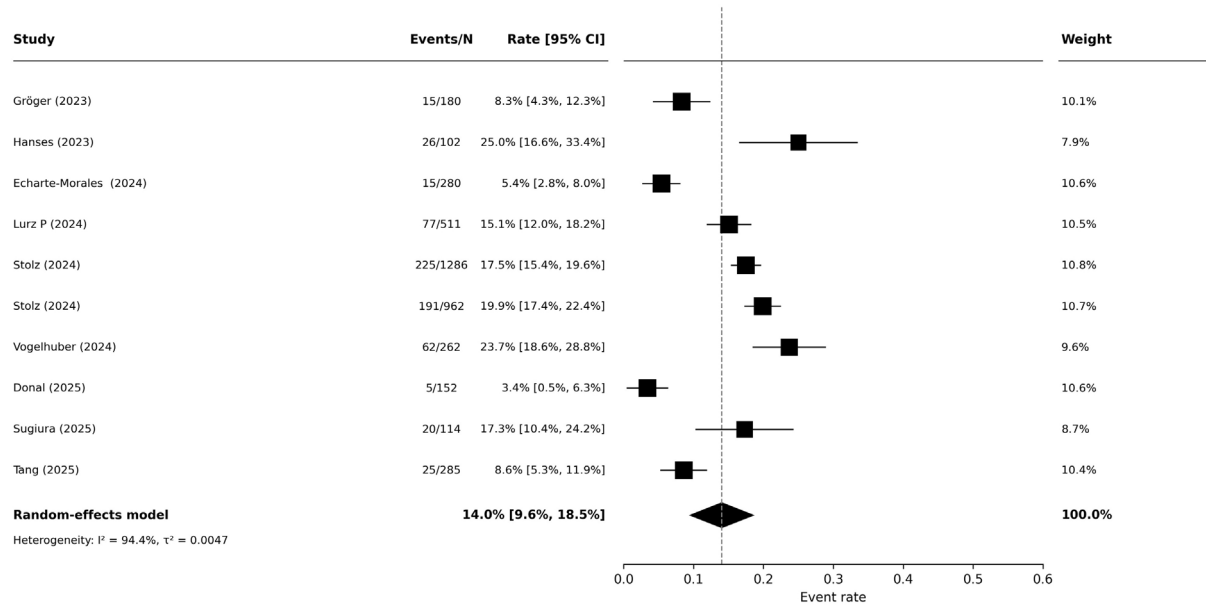
First author	Age (years)	BMI (kg/m <sup>2</sup> )	Sex (Male, %)	TRI-SCORE	Euro-SCORE II	Prior HF hosp (%)	DM (%)	HTN (%)	HLD (%)	AF (%)	COPD (%)	PM/ICD (%)	CKD (%)	NYHA III-IV (%)	CAD (%)	End-Stage Renal Disease (%)	Chronic liver disease (%)
Gröger (9)	80±7	25.9±4.8	51	6.0±2.2	6.4±4.7	N/A	N/A	N/A	N/A	88	11	6	24	79	51.7	1.7	18.9
Hanses (10)	81±6	N/A	49	N/A	N/A	N/A	22	72	N/A	83	13	10	N/A	96	44	3	N/A
Echarte-Morales (14)	77±7	26.5±4.3	30	4.5±2.0	3.8±3.0	N/A	19	68	47	91	16	10	41	70	N/A	N/A	N/A
Lurz (11)	79±7	N/A	44	N/A	7.6±8.0	40	N/A	N/A	N/A	N/A	N/A	23	40	80	N/A	N/A	N/A
Stolz (16)	78±9	26.1±4.9	46	N/A	6.5±5.8	30	26	80	48	90	18	28	N/A	84	39.5	N/A	N/A
Stolz (13)	78±7	26.0±5.0	50	N/A	6.2±6.0	64.8	26	85	46	88	20	29	76	89	45.9	N/A	N/A
Vogelhuber (12)	79±7	N/A	49	N/A	6.2±4.7	30	23	84	N/A	93	N/A	31	N/A	15	53.4	N/A	N/A
Donal (7)	78±6	25.2±4.7	35	N/A	N/A	36.1	15	70	44	94	6	14	9	39	19.7	N/A	0.6
Sugiura (15)	80±7	25.0±4.0	54	5.0±1.5	5.2±4.2	N/A	18	85	N/A	88	18	22	N/A	84	45	N/A	N/A
Tang (6)	78±8	26.8±5.8	41	N/A	6.4±4.7	24.9	17	81	63	83	13	17	32	56	N/A	N/A	7.0

First author	LVEF (%)	At least moderate MR (%)	TR secondary aetiology (%)	TA (mm)	RV EDD basal (mm)	RA area (cm <sup>2</sup> )	RA volume (ml)	PAPs (mmHg)	TAPSE (mm)	FAC (%)	Vena contracta (mm)	EROA (cm <sup>2</sup> )	TR Reg Vol (ml)
Gröger (9)	50±12	23.9	87	44±8	N/A	N/A	N/A	49±13	N/A	N/A	12±4	0.6±0.2	N/A
Hanses (10)	51±9	36	N/A	47±6	49±8	37±8	N/A	48±14	20.0±3.7	N/A	10±3	0.8±0.4	75±27
Echarte-Morales (14)	59±5	26	79	39±6	N/A	29±9	N/A	38±12	18.0±3.0	40±11	11±2	0.7±0.2	N/A
Lurz (11)	56±10	N/A	90	44±8	46±9	N/A	152±70	40±12	17.0±4.0	N/A	N/A	N/A	N/A
Stolz (16)	54±11	N/A	84	45±8	49±10	37±14	N/A	43±15	17.1±4.5	39±11	11±4	0.7±0.5	52±33
Stolz (13)	53±12	37.1	84	46±13	49±9	N/A	163±86	44±15	17.0±4.7	39±11	11±4	0.7±0.6	50±30
Vogelhuber (12)	55±10	N/A	95	N/A	N/A	N/A	N/A	48±15	18.0±4.9	43±10	N/A	N/A	N/A
Donal (7)	57±10	N/A	98	N/A	N/A	N/A	N/A	35±10	17.5±5.2	44±8	N/A	0.6±0.2	51±19
Sugiura (15)	56±10	N/A	0	44±7	37±8	31±12	N/A	43±14	17.8±6.0	44±10	11±4	0.7±0.4	61±28
Tang (6)	59±9	N/A	96	43±8	N/A	N/A	141±81	39±9	17.0±4.0	37±6	12±4	0.6±0.2	N/A

AF, atrial fibrillation; BMI, body mass index; CAD, coronary artery disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; EROA, effective regurgitant orifice area; FAC, fractional area change; HF, heart failure; HLD, hyperlipidemia; HTN, hypertension; ICD, implantable cardioverter-defibrillator; LVEF, left ventricular ejection fraction; MR, mitral regurgitation; N, number of patients; NYHA, New York Heart Association; PAPs, pulmonary artery systolic pressure; PM, pacemaker; RA, right atrium; Reg Vol, regurgitant volume; RV EDD, right ventricular end-diastolic diameter; TAPSE, tricuspid annular plane systolic excursion; TA, tricuspid annulus; TR, tricuspid regurgitation.

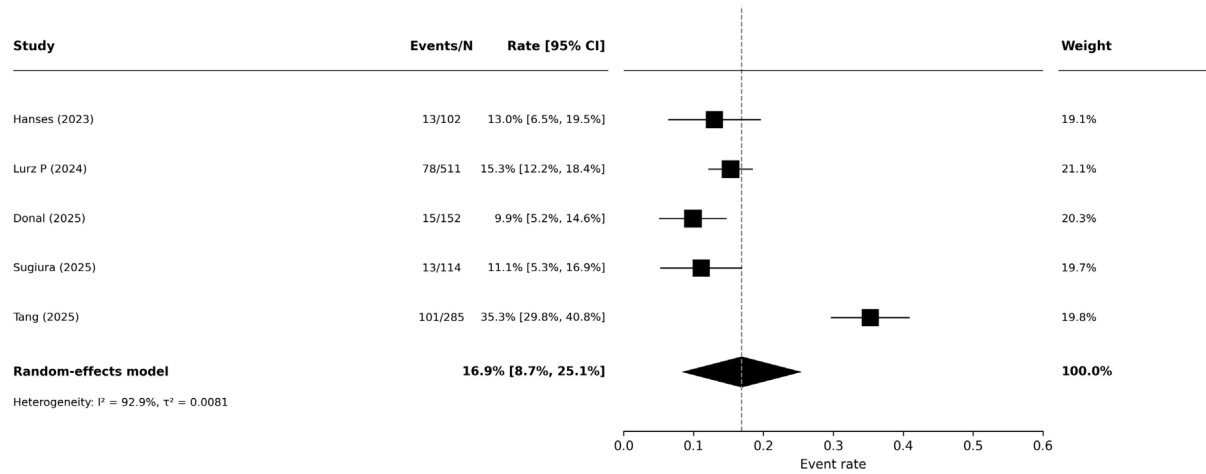
A

**1-year All-cause Mortality**



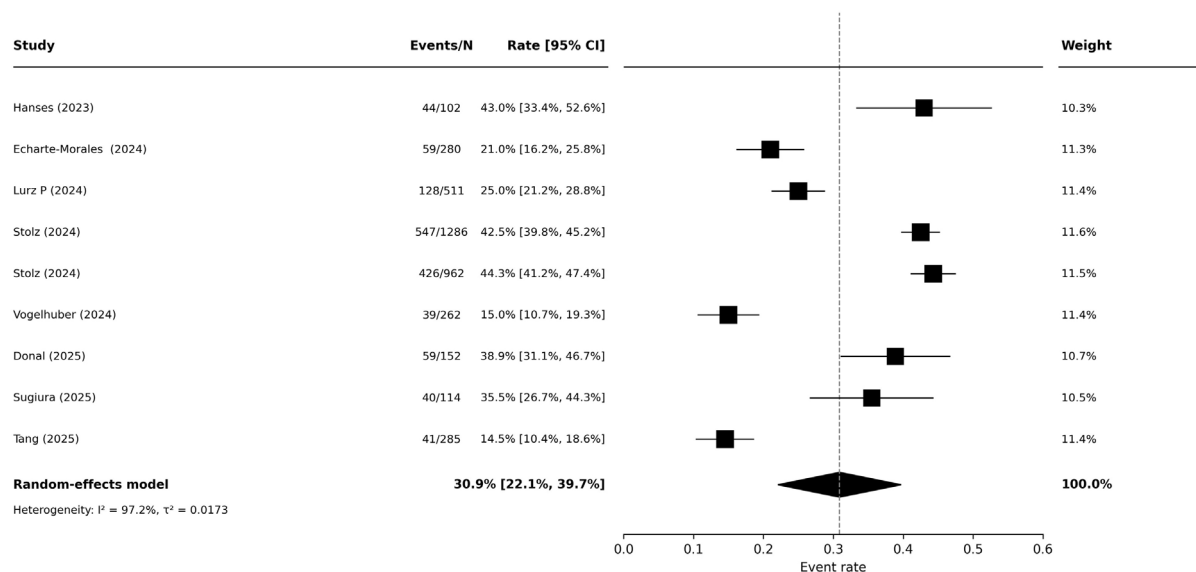
B

**1-year HF hospitalization**



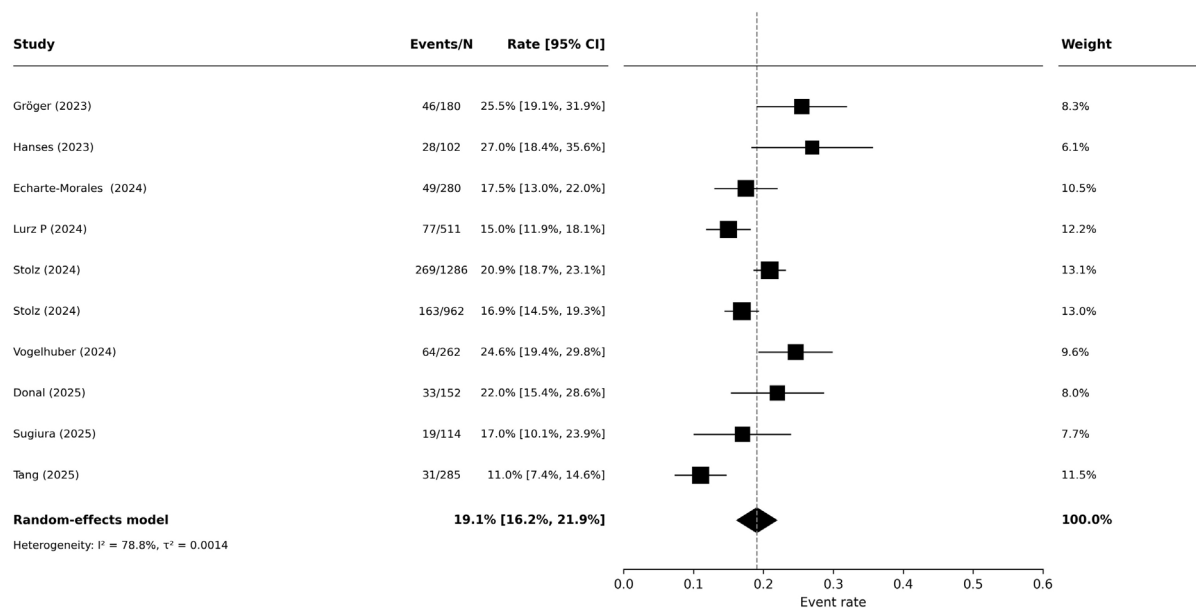
C

1-year NYHA III-IV



D

Post-procedural TR  $\geq 3$

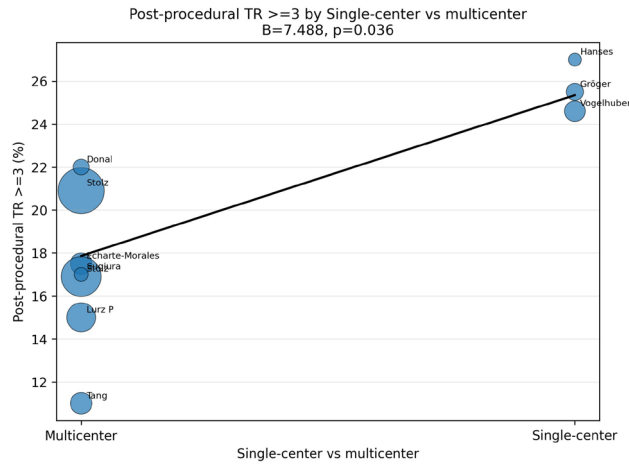


**Figure S3** Forest plots of clinical outcomes following T-TEER. Forest plots showing pooled estimates for (A) 1-year all-cause mortality, (B) 1-year HF hospitalization, (C) 1-year NYHA class III–IV, and (D) early residual TR  $\geq 3+$ . Squares represent study-specific effect estimates and horizontal lines indicate 95% confidence intervals. Diamonds represent pooled estimates. HF, heart failure; NYHA, New York Heart Association; TR, tricuspid regurgitation.

**Table S4** Sensitivity analyses excluding potentially overlapping datasets

Scenario	Outcome	N studies	Total N	Events	Pooled rate (95% CI)	I <sup>2</sup>	P heterogeneity
All eligible studies	1-year all-cause mortality	10	4,134	661	14.0% (9.6% to 18.5%)	94.4%	<0.001
	1-year HF hospitalization	5	1,164	220	16.9% (8.7% to 25.1%)	92.9%	<0.001
	1-year NYHA class III/IV	9	3,954	1,383	30.9% (22.1% to 39.7%)	97.2%	<0.001
	Early Residual TR ≥3+	10	4,134	779	19.1% (16.2% to 21.9%)	78.8%	<0.001
EuroTR included, Stolz TRILUMINATE eligibility excluded	1-year all-cause mortality	9	3,172	469	13.3% (8.7% to 18.0%)	93.7%	<0.001
	1-year HF hospitalization	5	1,164	220	16.9% (8.7% to 25.1%)	92.9%	<0.001
	1-year NYHA class III/IV	8	2,992	957	29.1% (19.9% to 38.4%)	96.8%	<0.001
	Early Residual TR ≥3+	9	3,172	616	19.5% (16.1% to 22.9%)	80.4%	<0.001
Stolz TRILUMINATE eligibility included, EuroTR excluded	1-year all-cause mortality	9	2,848	436	13.7% (8.7% to 18.7%)	94.2%	<0.001
	1-year HF hospitalization	5	1,164	220	16.9% (8.7% to 25.1%)	92.9%	<0.001
	1-year NYHA class III/IV	8	2,668	837	29.4% (20.0% to 38.8%)	96.7%	<0.001
	Early Residual TR ≥3+	9	2,848	510	18.8% (15.7% to 22.0%)	76.8%	<0.001

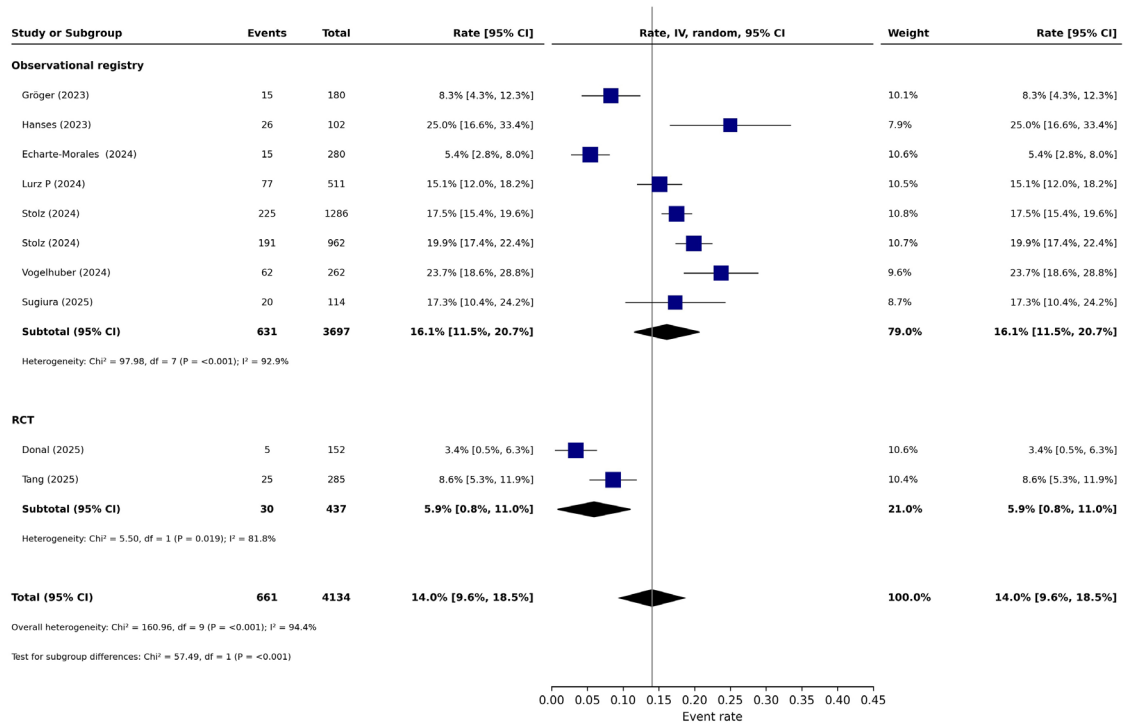
HF, heart failure; N, number; NYHA, New York Heart Association; TR, tricuspid regurgitation.



**Figure S4** Early residual TR by center design.

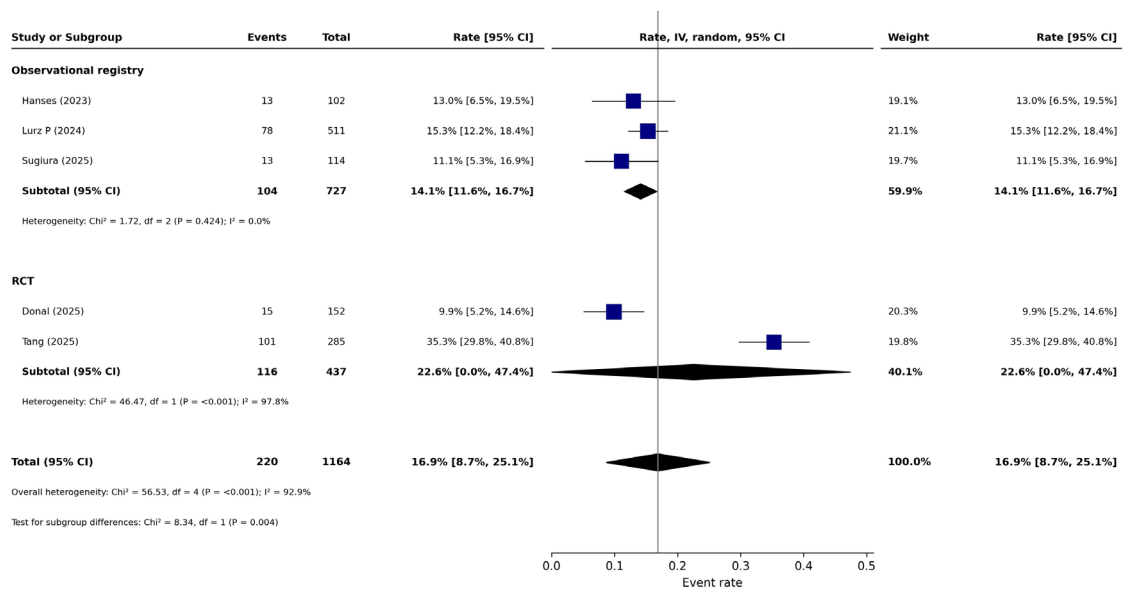
A

1-year all-cause mortality: subgroup analysis by RCT vs observational registries



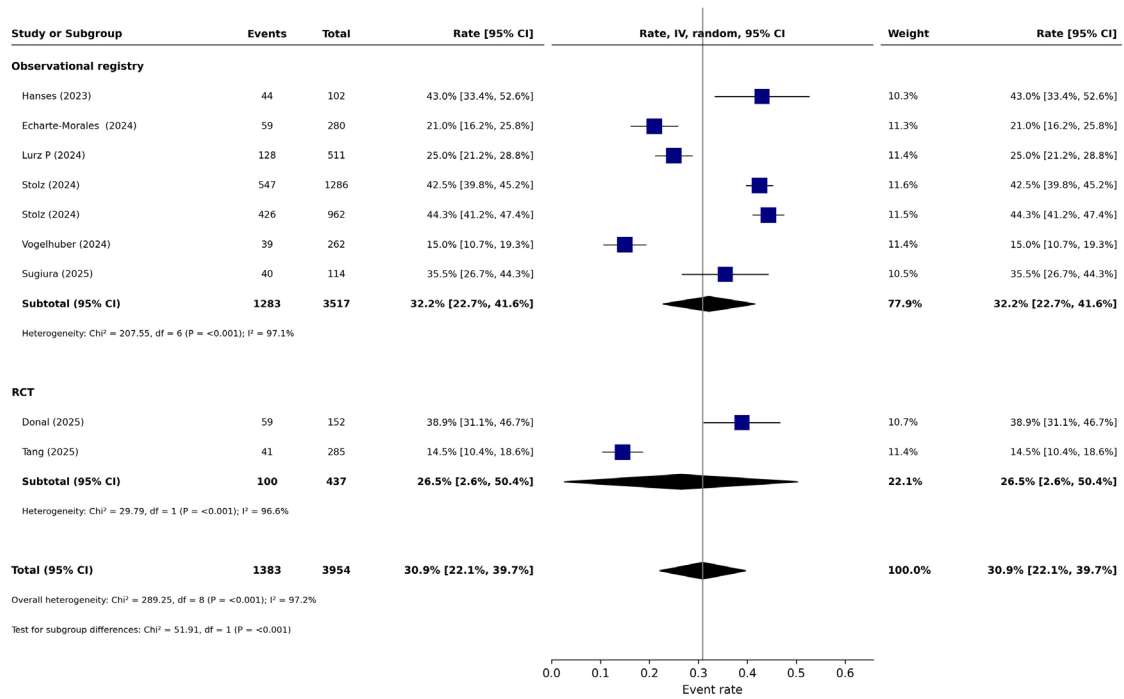
B

1-year HF hospitalization: subgroup analysis by RCT vs observational registries



C

1-year NYHA class III/IV: subgroup analysis by RCT vs observational registries



D

Post-procedural TR ≥3: subgroup analysis by RCT vs observational registries

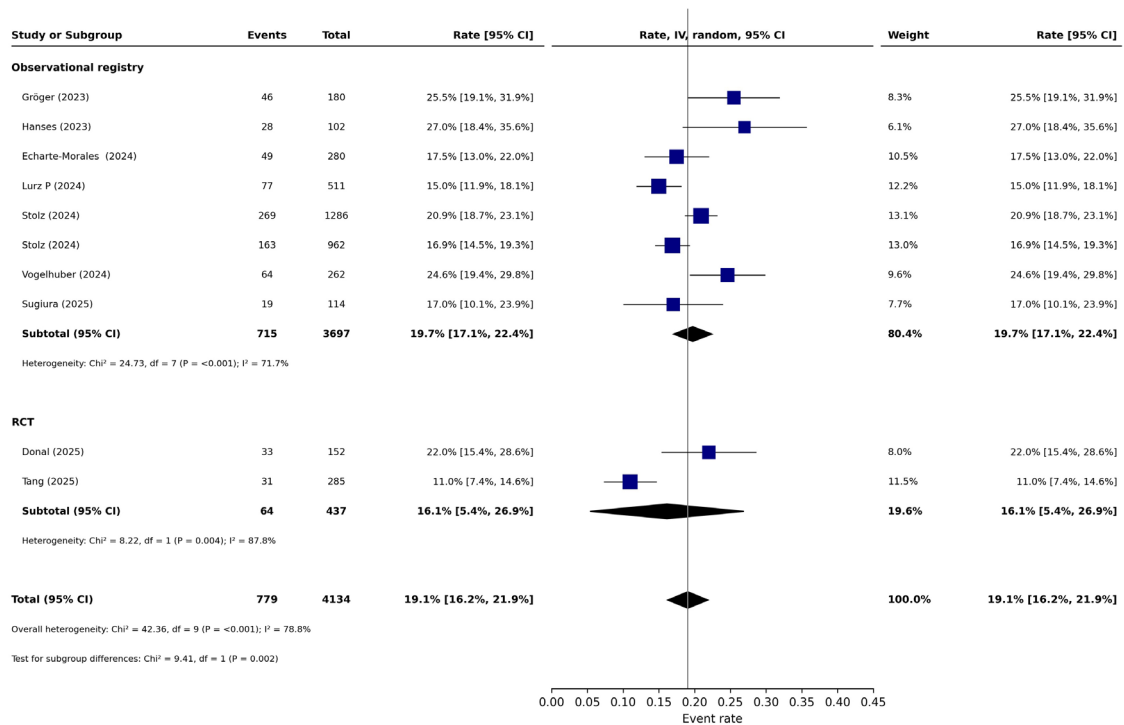


Figure S5 Subgroup forest plots for study design. (A) 1-year all-cause mortality. (B) 1-year HF Hospitalization. (C) 1-year NYHA class III-IV. (D) Early residual TR ≥3+.

**Table S5** Meta-regression analysis for Early Residual TR  $\geq 3+$ 

Covariate	Early Residual TR $\geq 3+$		
	$\beta$	95% CI	P value
<b>Study-level</b>			
Publication Year	-4.9	-10.6 to 0.8	0.09
Median recruitment year	-1.3	-4.0 to 1.4	0.30
Recruitment duration	0.8	-0.9 to 2.5	0.34
Single-center vs. multicenter	7.5	0.6 to 14.4	0.036
Log (sample size)	-0.4	-4.3 to 3.5	0.81
Device	2.6	-0.5 to 5.6	0.09
<b>Aggregate-level</b>			
Age (years)	1.5	-2.3 to 5.3	0.40
Sex (male, %)	0.2	-0.4 to 0.7	0.53
BMI (kg/m <sup>2</sup> )	-4.3	-13.3 to 4.7	0.28
DM (%)	0.3	-0.6 to 1.2	0.49
Hypertension (%)	-0.2	-0.8 to 0.5	0.60
AF (%)	0.7	-0.3 to 1.8	0.14
COPD (%)	-0.3	-1.3 to 0.8	0.56
PM/ICD (%)	-0.1	-0.4 to 0.4	0.96
CKD (%)	-0.1	-0.2 to 0.2	0.74
NYHA III-IV (%)	-0.1	-0.2 to 0.1	0.62
LVEF (%)	-1.0	-2.0 to 0.1	0.06
At least moderate MR (%)	-0.3	-2.0 to 1.5	0.54
RV EDD basal (mm)	0.4	-1.6 to 2.3	0.58
TA (mm)	0.6	-1.3 to 2.5	0.49
TAPSE (mm)	3.4	-1.4 to 8.3	0.14
FAC (%)	1.2	-0.5 to 2.8	0.14
PAPs (mmHg)	0.7	-0.1 to 1.5	0.06
Vena contracta (mm)	3.4	-5.0 to 11.8	0.33
EROA (cm <sup>2</sup> )	-21.6	-96.5 to 53.3	0.49
TR Reg Vol (ml)	0.3	-0.5 to 1.0	0.31

AF, atrial fibrillation; BMI, body mass index; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; EROA, effective regurgitant orifice area; FAC, fractional area change; ICD, implantable cardioverter-defibrillator; LVEF, left ventricular ejection fraction; MR, mitral regurgitation; NYHA, New York Heart Association; PAPs, pulmonary artery systolic pressure; PM, pacemaker; Reg Vol, regurgitant volume; RV EDD, right ventricular end-diastolic diameter; TAPSE, tricuspid annular plane systolic excursion; TA, tricuspid annulus.