

SUPPLEMENTAL MATERIAL

Table S1. Summary of Balance of propensity score matching (PSM): no heart failure (HF) vs HF with mild reduced/reduced ejection fraction (HFmrEF/HFrEF) (top panel) and no HF versus HF with preserved ejection fraction (HFpEF) (bottom panel).

Summary of Balance for
All Data:

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max
distance	0.1962	0.121	0.5715	2.6886	0.1966	0.2991
Female	0.3531	0.4628	-0.2294	.	0.1097	0.1097
Age	76.3309	75.9391	0.0412	1.0199	0.0073	0.0377
BMI	27.1007	26.7942	0.0589	1.177	0.0118	0.0467
DOAC use	0.4835	0.5747	-0.1826	.	0.0912	0.0912
Hypertension	0.8507	0.7908	0.168	.	0.0599	0.0599
Diabetes	0.2913	0.1891	0.2249	.	0.1022	0.1022
CAD	0.3325	0.1372	0.4147	.	0.1953	0.1953
Anemia	0.3564	0.2333	0.2571	.	0.1231	0.1231
GFR	60.5512	67.5284	-0.2352	1.1503	0.0355	0.1433
Cancer	0.1295	0.1481	-0.0553	.	0.0186	0.0186
COPD/OSAS	0.1931	0.0858	0.2716	.	0.1072	0.1072
Cirrhosis with varices	0.0033	0.006	-0.0464	.	0.0027	0.0027
Smoking	0.1799	0.1188	0.1591	.	0.0611	0.0611
Dementia	0.0371	0.0273	0.0518	.	0.0098	0.0098

Summary of Balance for Matched
Data:

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max	Pair Dist.
distance	0.1899	0.1896	0.0023	1.0109	0.0002	0.0084	0.0029
Female	0.3576	0.34	0.0368	.	0.0176	0.0176	0.8464
Age	76.3635	76.062	0.0317	1.1011	0.01	0.0436	1.0576
BMI	27.08	27.0215	0.0112	1.2386	0.0102	0.0352	1.0255
DOAC use	0.4874	0.4816	0.0117	.	0.0059	0.0059	0.9603
Hypertension	0.8484	0.8484	0	.	0	0	0.2529
Diabetes	0.2839	0.2663	0.0387	.	0.0176	0.0176	0.7908

CAD	0.3224	0.325	-0.0053	.	0.0025	0.0025	0.5458
Anemia	0.3501	0.3777	-0.0577	.	0.0276	0.0276	0.8271
GFR	60.8878	61.9749	-0.0366	1.2824	0.015	0.0754	0.915
Cancer	0.1307	0.1323	-0.005	.	0.0017	0.0017	0.6684
COPD/OSAS	0.1851	0.1776	0.0191	.	0.0075	0.0075	0.626
Cirrhosis with varices	0.0034	0.0025	0.0146	.	0.0008	0.0008	0.1022
Smoking	0.1742	0.1817	-0.0196	.	0.0075	0.0075	0.7087
Dementia	0.036	0.0436	-0.0399	.	0.0075	0.0075	0.4119

Sample Sizes:

	Control	Treated
All	8049	1212
Matched	1194	1194
Unmatched	6855	18
Discarded	0	0

Summary of Balance for All Data:

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max
distance	0.1728	0.1122	0.5829	1.9922	0.1977	0.2942
Female	0.5311	0.4628	0.137	.	0.0683	0.0683
Age	79.4158	75.9391	0.4104	0.8097	0.0483	0.1584
BMI	27.0082	26.7942	0.0426	1.0938	0.0113	0.0452
DOAC use	0.5604	0.5747	-0.0288	.	0.0143	0.0143
Hypertension	0.8892	0.7908	0.3135	.	0.0984	0.0984
Diabetes	0.2454	0.1891	0.1309	.	0.0563	0.0563
CAD	0.2262	0.1372	0.2128	.	0.089	0.089
Anemia	0.3636	0.2333	0.2707	.	0.1302	0.1302
GFR	56.8562	67.5284	-0.4321	0.7972	0.0535	0.1879
Cancer	0.1538	0.1481	0.0159	.	0.0058	0.0058
COPD/OSAS	0.2271	0.0858	0.3372	.	0.1413	0.1413
Cirrhosis with varices	0.0082	0.006	0.0252	.	0.0023	0.0023
Smoking	0.1282	0.1188	0.0282	.	0.0094	0.0094
Dementia	0.054	0.0273	0.1181	.	0.0267	0.0267

Summary of Balance for Matched Data:

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max	Pair Dist.
distance	0.1714	0.1713	0.0007	1.0029	0.0001	0.0037	0.002
Female	0.5312	0.5239	0.0147	.	0.0074	0.0074	0.9762
Age	79.3833	79.114	0.0318	1.1492	0.01	0.0542	0.883
BMI	27.0062	27.1734	-0.0333	0.9303	0.0069	0.0294	1.0869
DOAC use	0.5616	0.5735	-0.0241	.	0.0119	0.0119	1.0166
Hypertension	0.8888	0.8879	0.0029	.	0.0009	0.0009	0.53
Diabetes	0.2436	0.2335	0.0235	.	0.0101	0.0101	0.7881
CAD	0.2243	0.2335	-0.022	.	0.0092	0.0092	0.725
Anemia	0.3612	0.3686	-0.0153	.	0.0074	0.0074	0.8254
GFR	56.9605	57.704	-0.0301	1.0949	0.0097	0.0597	0.8712
Cancer	0.1526	0.1636	-0.0306	.	0.011	0.011	0.7082
COPD/OSAS	0.2243	0.2298	-0.0132	.	0.0055	0.0055	0.4388
Cirrhosis with varices	0.0074	0.0046	0.0305	.	0.0028	0.0028	0.1322
Smoking	0.1278	0.1425	-0.044	.	0.0147	0.0147	0.6873
Dementia	0.0542	0.0551	-0.0041	.	0.0009	0.0009	0.4269

Sample Sizes:

	Control	Treated
All	8049	1092
Matched	1088	1088
Unmatched	6961	4
Discarded	0	0

Table S2. Characteristics of patients according to the vital status during follow-up.

	Alive (n=9642)	Dead (n=727)	p-value
Mean age (years)	75.9±9.4	81.9±7.3	<0.001
Age ≥75 years (%)	60.9	83.9	<0.001
HFrEF/HFmrEF (%)	11.3	17.1	<0.001
HFpEF (%)	10.1	17.2	<0.001
Women (%)	45.8	45.7	0.969
Paroxysmal atrial fibrillation (vs persistent/ permanent) (%)	38.4	25.9	<0.001
Arterial Hypertension (%)	80.6	83.8	0.041
Diabetes (%)	20.5	23.5	0.050
Obesity (BMI ≥30 kg/m²)	21.8	19.3	0.124
Previous cerebrovascular disease (%)	15.4	18.7	0.018
Previous cardiovascular disease (%)	16.4	24.2	<0.001
COPD/OSAS (%)	10.7	20.4	<0.001
Current Smoking (%)	4.8	2.9	<0.001
Former Smoking (%)	12.1	13.8	
Anemia (%)	25.1	40.7	<0.001
Creatinine clearance <30 ml/min (%)	4.3	14.6	<0.001
Peripheral artery disease (%)	5.5	10.3	<0.001
CHA₂DS₂-VAsC score	3.6±1.5	4.3±1.3	<0.001
DOACs (%)	58.2	31.2	<0.001
Lipid lowering drugs (%)	35.7	29.7	0.001
Antiplatelet (%)	11.8	13.6	0.153
Digoxin (%)	8.0	11.8	<0.001
Amiodarone (%)	12.4	12.4	0.995
Class 1C AAD (%)	9.1	2.9	<0.001
β-blockers (%)	46.8	52.4	0.004
RAASi (%)	56.9	49.1	<0.001
Calcium channel blockers (%)	21.9	24.1	0.163
Diuretics (%)	37.8	50.9	<0.001

AAD, antiarrhythmic drug; BMI, body mass index; COPD, chronic obstructive pulmonary disease; DOAC, direct oral anticoagulants; HFpEF, heart failure with preserved ejection fraction; HFrEF/HFmrEF, heart failure with reduced/mildly reduced ejection fraction; OSAS, obstructive sleep apnea syndrome; RAASi: renin angiotensin aldosterone system inhibitors.

Table S3. Multivariable Cox proportional hazards regression analysis of factors associated with all-cause mortality in the whole cohort.

	Hazard Ratio	95% Confidence Interval		p-value
		Low	High	
Women	0.855	0.730	1.003	0.054
Age ≥ 75 years	2.791	2.264	3.442	<0.001
COPD/OSAS	1.680	1.383	2.040	<0.001
Diabetes mellitus	1.181	0.983	1.418	0.075
Obesity (BMI ≥ 30 kg/m²)	1.077	0.887	1.310	0.453
Anemia	1.550	1.321	1.820	<0.001
Paroxysmal atrial fibrillation (vs persistent/permanent) (%)	0.789	0.663	0.939	0.007
Creatinine clearance <30 ml/min	2.184	1.734	2.750	<0.001
Peripheral artery disease	1.634	1.272	2.100	<0.001
Previous cerebrovascular disease	1.332	1.100	1.613	0.003
Previous cardiovascular disease	1.458	1.193	1.781	<0.001
Heart failure with reduced/mildly reduced ejection fraction*	1.269	1.081	1.680	0.036
Heart failure with preserved ejection fraction*	1.417	1.146	1.753	0.001
DOAC	0.515	0.436	0.608	<0.001
RAASi	0.736	0.631	0.858	<0.001
β-blockers	0.959	0.821	1.121	0.600
Diuretics	1.185	1.000	1.405	0.050
Proton pump inhibitor	1.078	0.918	1.266	0.357
Digoxin	1.100	0.862	1.404	0.442
Antiplatelet	0.915	0.725	1.155	0.456
Class 1C AAD	0.522	0.331	0.823	0.005
Amiodarone	0.871	0.692	1.097	0.240
Lipid lowering therapy	0.617	0.515	0.741	<0.001
Calcium channel blockers	0.955	0.800	1.139	0.605

AAAD, antiarrhythmic drug; BMI, body mass index; COPD, chronic obstructive pulmonary disease; DOAC, direct oral anticoagulants; HF, heart failure; OSAS, obstructive sleep apnea syndrome; RAASi: renin angiotensin aldosterone system inhibitors.

** global p value 0.003*

Table S4. Multivariable Cox proportional hazards regression analysis of factors associated with all-cause mortality in women (top panel) and men (bottom panel).

Men	Hazard Ratio	95% Confidence Interval		p-value
		Low	High	
Age ≥ 75 years	2.659	2.050	3.449	<0.001
COPD/OSAS	1.709	1.330	2.197	<0.001
Diabetes mellitus	1.105	0.863	1.414	0.430
Obesity (BMI ≥ 30 kg/m ²)	0.972	0.737	1.281	0.840
Anemia	1.790	1.441	2.224	<0.001
Paroxysmal atrial fibrillation (vs persistent/permanent) (%)	0.701	0.548	0.896	0.005
Creatinine clearance <30 ml/min	2.488	1.727	3.585	<0.001
Peripheral artery disease	1.734	1.288	2.334	<0.001
Previous cerebrovascular disease	1.509	1.176	1.936	0.001
Previous cardiovascular disease	1.618	1.260	2.076	<0.001
Heart failure with reduced ejection fraction	1.234	0.929	1.639	0.146
Heart failure with preserved ejection fraction	1.243	0.908	1.700	0.175
DOAC	0.634	0.506	0.795	<0.001
RAASi	0.696	0.564	0.859	0.001
β -blockers	0.902	0.730	1.115	0.342
Diuretics	1.277	1.009	1.616	0.042
Proton pump inhibitor	1.068	0.858	1.328	0.557
Digoxin	0.961	0.652	1.416	0.840
Antiplatelet	1.005	0.759	1.331	0.971
Class 1C AAD	0.491	0.250	0.963	0.038
Amiodarone	0.759	0.552	1.043	0.089
Lipid lowering therapy	0.609	0.477	0.776	<0.001
Calcium channel blockers	0.850	0.670	1.080	0.184
Women	Hazard Ratio	95% Confidence Interval		p-value
		Low	High	
Age ≥ 75 years	2.824	1.981	4.024	<0.001
COPD/OSAS	1.786	1.309	2.437	<0.001
Diabetes mellitus	1.306	0.991	1.722	0.056
Obesity (BMI ≥ 30 kg/m ²)	1.190	0.900	1.575	0.222
Anemia	1.243	0.972	1.590	0.084
Paroxysmal atrial fibrillation (vs persistent/permanent) (%)	0.902	0.704	1.155	0.413
Creatinine clearance <30 ml/min	2.126	1.572	2.876	<0.001
Peripheral artery disease	1.512	0.933	2.449	0.093
Previous cerebrovascular disease	1.126	0.831	1.524	0.444
Previous cardiovascular disease	1.135	0.794	1.622	0.487
Heart failure with reduced ejection fraction	1.282	0.882	1.863	0.192
Heart failure with preserved ejection fraction	1.654	1.233	2.219	0.001
DOAC	0.418	0.326	0.538	<0.001
RAASi	0.786	0.625	0.989	0.040
β -blockers	1.036	0.820	1.309	0.765

Diuretics	1.065	0.831	1.364	0.621
Proton pump inhibitor	1.101	0.867	1.398	0.430
Digoxin	1.211	0.880	1.667	0.239
Antiplatelet	0.756	0.488	1.171	0.211
Class 1C AAD	0.529	0.285	0.983	0.044
Amiodarone	1.017	0.723	1.430	0.925
Lipid lowering therapy	0.622	0.471	0.820	0.001
Calcium channel blockers	1.088	0.837	1.414	0.530

AAD, antiarrhythmic drug; BMI, body mass index; COPD, chronic obstructive pulmonary disease; DOAC, direct oral anticoagulants; HF, heart failure; OSAS, obstructive sleep apnea syndrome; RAASi: renin angiotensin aldosterone system inhibitors.

Table S5. Univariate and multivariate Fine-Gray model for cardiovascular (CV) mortality.

	Univariate			Multivariate		
	HR	95% CI	p-value	HR	95% CI	p-value
HFmrEF/HFrEF (<i>vs no HF</i>)	2.61	1.76-3.88	<0.001	2.03	1.30-3.16	0.002
HFpEF (<i>vs no HF</i>)	2.72	1.81-4.10	<0.001	1.85	1.19-2.87	0.006
Female	-	-	-	0.81	0.58-1.13	0.200
Age	-	-	-	1.10	1.07-1.13	<0.001
BMI	-	-	-	1.00	0.95-1.05	>0.900
DOAC use	-	-	-	0.49	0.34-0.71	<0.001
Hypertension	-	-	-	0.87	0.56-1.34	0.500
Diabetes	-	-	-	0.92	0.60-1.40	0.700
CAD	-	-	-	1.12	0.76-1.63	0.600
Anemia	-	-	-	1.40	1.00-1.95	0.051
GFR	-	-	-	1.00	0.99-1.01	0.500
Cancer	-	-	-	1.02	0.67-1.57	>0.900
COPD/OSAS	-	-	-	1.14	0.74-1.74	0.600
Cirrhosis	-	-	-	2.39	0.55-10.4	0.300
Smoking	-	-	-	1.59	1.01-2.51	0.045
Dementia	-	-	-	2.03	1.11-3.72	0.021

BMI, Body Mass Index; CAD, Coronary Artery Disease; CI, Confidence Interval; COPD, Chronic Obstructive Pulmonary Disease; DOAC, Direct Oral Anticoagulants; GFR, Glomerular Filtration Rate; HF, Heart Failure; HFmrEF/HFrEF: Heart Failure with mild reduced/reduced Ejection Fraction; HFpEF: Heart Failure with preserved Ejection Fraction; HR, Hazard Ratio; OSAS, Obstructive Sleep Apnea Syndrome.

Table S6. Propensity Score Matching (PSM) comparing patients with HF with mild reduced/reduced ejection fraction (HFmrEF/HFrEF) (top panel) and HF with preserved ejection fraction (HFpEF) (bottom panel) compared to those without.

Characteristic	All Patients			Matched patients		
	No HF N = 8,049 ¹	HFmrEF/HFrEF N = 1,212 ¹	p-value	No HF N = 1,194 ¹	HFmrEF/HFrEF N = 1,194 ¹	p-value
Female	3,725 (46%)	428 (35%)	<0.001	406 (34%)	427 (36%)	0.367
Age	75.94 ± 9.41	76.33 ± 9.51	0.181	76.06 ± 9.10	76.36 ± 9.54	0.429
BMI	26.79 ± 4.80	27.10 ± 5.21	0.054	27.02 ± 4.69	27.08 ± 5.22	0.773
DOAC use	4,626 (57%)	586 (48%)	<0.001	575 (48%)	582 (49%)	0.774
Hypertension	6,365 (79%)	1,031 (85%)	<0.001	1,013 (85%)	1,013 (85%)	>0.999
Diabetes	1,522 (19%)	353 (29%)	<0.001	318 (27%)	339 (28%)	0.336
CAD	1,104 (14%)	403 (33%)	<0.001	388 (32%)	385 (32%)	0.896
Anemia	1,878 (23%)	432 (36%)	<0.001	451 (38%)	418 (35%)	0.160
GFR	67.53 ± 27.66	60.55 ± 29.67	<0.001	61.97 ± 26.21	60.89 ± 29.68	0.343
Cancer	1,192 (15%)	157 (13%)	0.088	158 (13%)	156 (13%)	0.904
COPD/OSAS	691 (8.6%)	234 (19%)	<0.001	212 (18%)	221 (19%)	0.633
Cirrhosis	48 (0.6%)	4 (0.3%)	0.247	3 (0.3%)	4 (0.3%)	>0.999
Smoking	956 (12%)	218 (18%)	<0.001	217 (18%)	208 (17%)	0.630
Dementia	220 (2.7%)	45 (3.7%)	0.057	52 (4.4%)	43 (3.6%)	0.346

¹ n (%); Mean ± SD

BMI: body mass index, DOAC: direct oral anticoagulants, CAD: coronary artery disease, GFR: glomerular filtration rate, COPD/OSAS: chronic obstructive pulmonary disease/Obstructive sleep syndrome apnoea.

Characteristic	All Patients			Matched patients		
	No HF N = 8,049 ¹	HFpEF N = 1,092 ¹	p-value	No HF N = 1,088 ¹	HFpEF N = 1,088 ¹	p-value
Female	3,725 (46%)	580 (53%)	<0.001	570 (52%)	578 (53%)	0.731

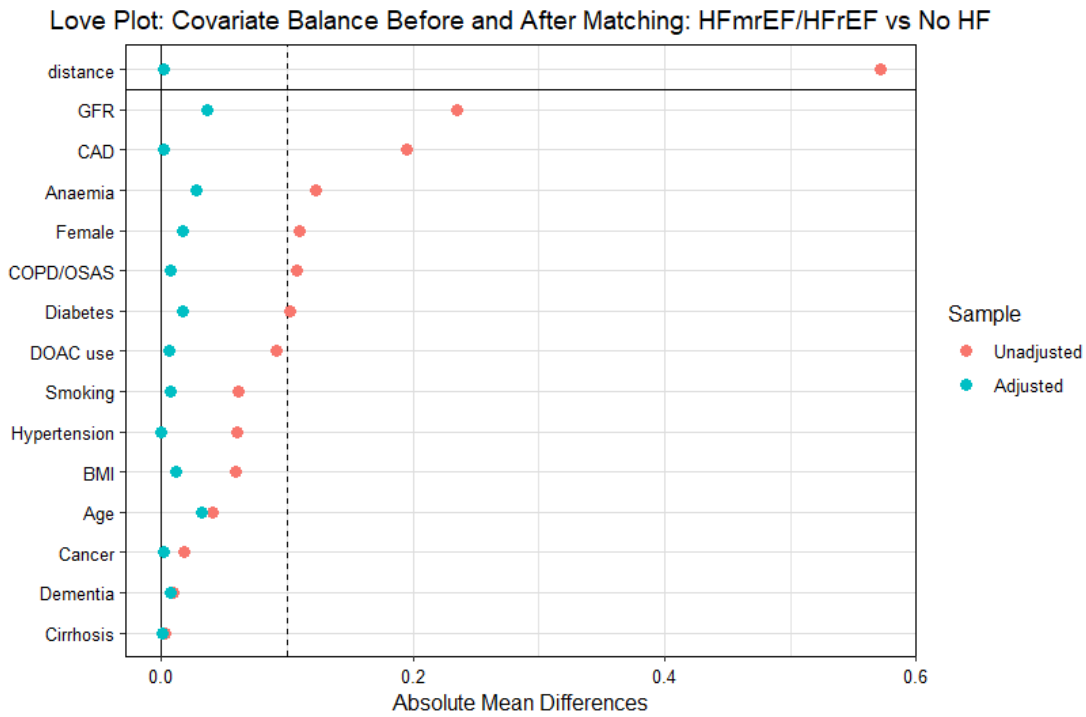
Characteristic	All Patients			Matched patients		
	No HF N = 8,049 ^l	HFpEF N = 1,092 ^l	p-value	No HF N = 1,088 ^l	HFpEF N = 1,088 ^l	p-value
Age	75.94 ± 9.41	79.42 ± 8.47	<0.001	79.11 ± 7.90	79.38 ± 8.47	0.443
BMI	26.79 ± 4.80	27.01 ± 5.02	0.184	27.17 ± 5.21	27.01 ± 5.02	0.446
DOAC use	4,626 (57%)	612 (56%)	0.370	624 (57%)	611 (56%)	0.574
Hypertension	6,365 (79%)	971 (89%)	<0.001	966 (89%)	967 (89%)	0.946
Diabetes	1,522 (19%)	268 (25%)	<0.001	254 (23%)	265 (24%)	0.580
CAD	1,104 (14%)	247 (23%)	<0.001	254 (23%)	244 (22%)	0.610
Anemia	1,878 (23%)	397 (36%)	<0.001	401 (37%)	393 (36%)	0.722
GFR	67.53 ± 27.66	56.86 ± 24.70	<0.001	57.70 ± 23.59	56.96 ± 24.68	0.473
Cancer	1,192 (15%)	168 (15%)	0.616	178 (16%)	166 (15%)	0.481
COPD/OSAS	691 (8.6%)	248 (23%)	<0.001	250 (23%)	244 (22%)	0.759
Cirrhosis	48 (0.6%)	9 (0.8%)	0.369	5 (0.5%)	8 (0.7%)	0.404
Smoking	956 (12%)	140 (13%)	0.368	155 (14%)	139 (13%)	0.316
Dementia	220 (2.7%)	59 (5.4%)	<0.001	60 (5.5%)	59 (5.4%)	0.925

^l n (%); Mean ± SD

BMI: body mass index, DOAC: direct oral anticoagulants, CAD: coronary artery disease, GFR: glomerular filtration rate, COPD/OSAS: chronic obstructive pulmonary disease/Obstructive sleep syndrome apnoea.

Figure S1. Balance diagnostics after PSM comparing patients with HF with mild reduced/reduced ejection fraction (HFmrEF/HFrEF) and those without. Panel A: Love plot; Panel B: Propensity score distributions.

Panel A



Panel B

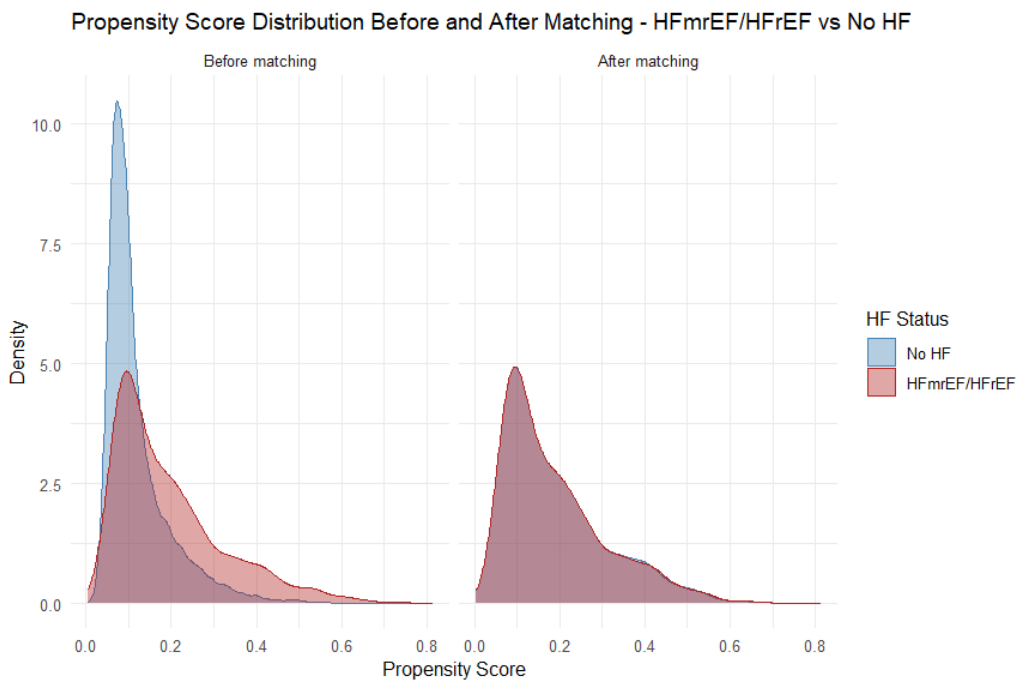
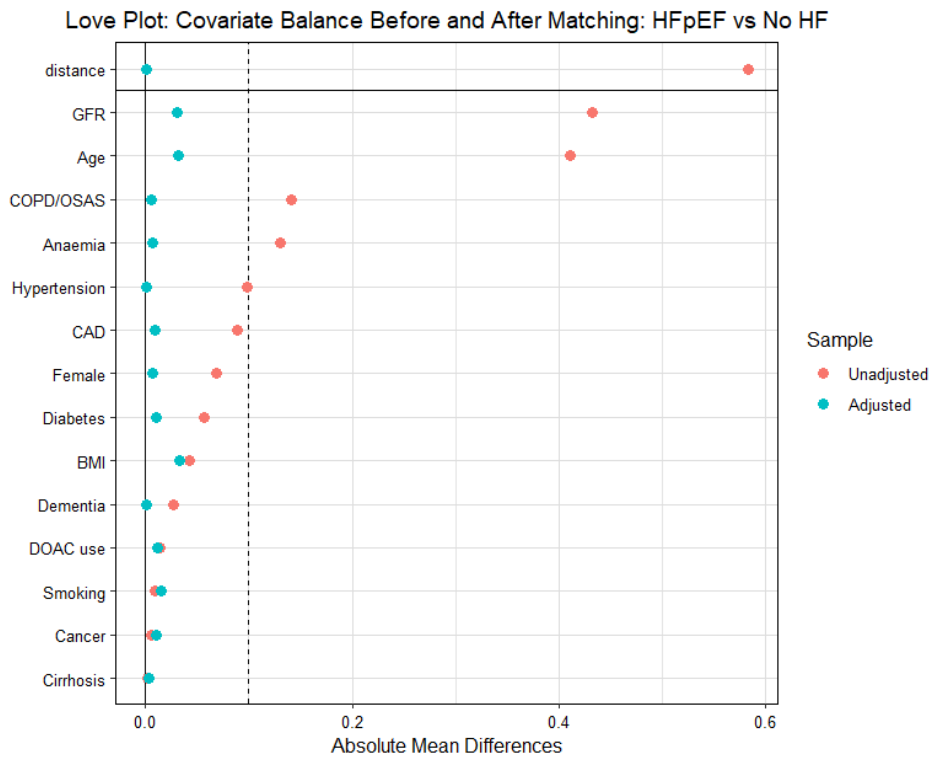


Figure S2. Balance diagnostics after PSM comparing patients with HF with mild preserved ejection fraction (HFpEF) and those without. Panel A: Love plot; Panel B: Propensity score distributions.

Panel A



Panel B

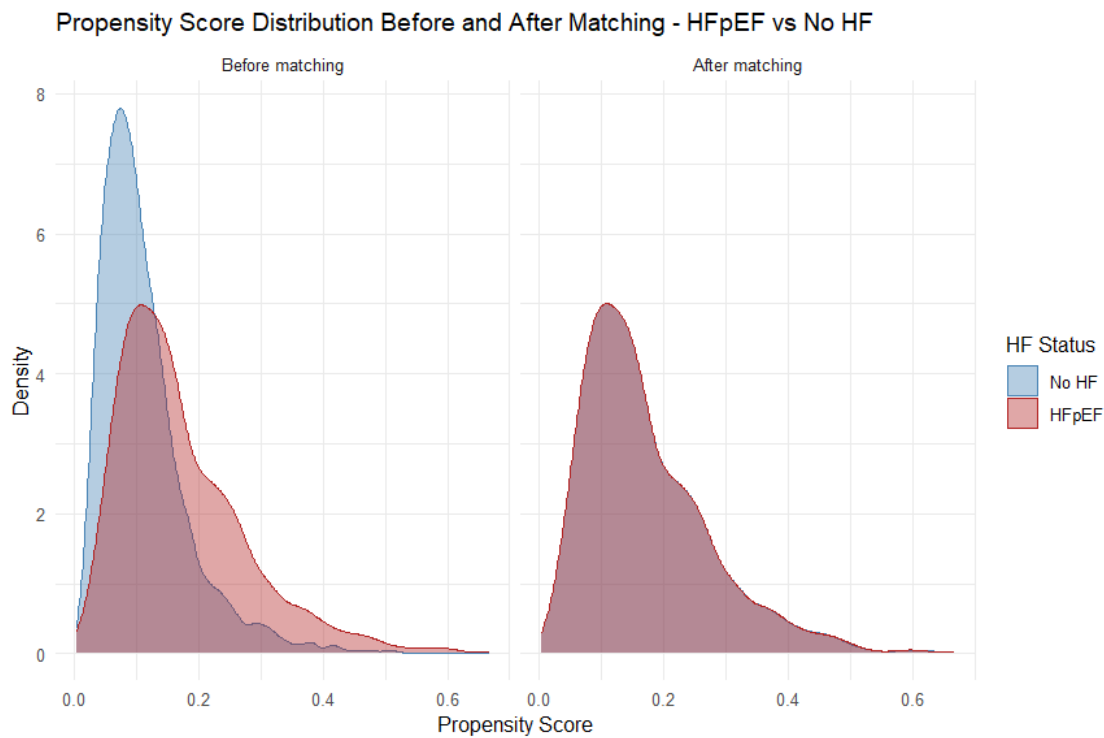
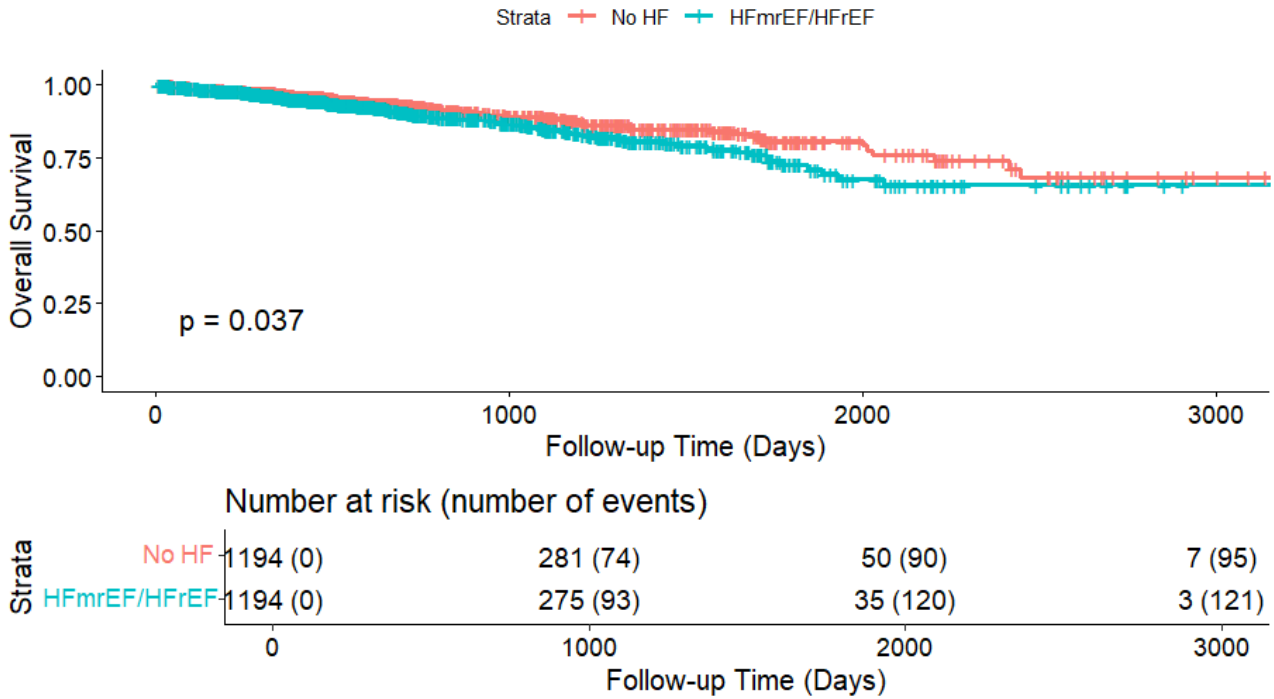


Figure S3. Kaplan-Meier survival curves for all-cause mortality of patients with heart failure with mild reduced/reduced ejection fraction (HFmrEF/HFrEF) (Panel A) and heart failure with preserved ejection fraction (HFpEF) (Panel B) compared to those without HF in the propensity score matching (PSM) cohort.

A



B

