

# **Supplemental Material**

**Table S1. Standardized differences of variables used in PS matching and IPW adjustment to adjust for baseline differences.**

	Beta-blocker at discharge			Renin angiotensin system blocker at discharge			Aldosterone antagonist at discharge		
	Standardized mean differences, %			Standardized mean differences, %			Standardized mean differences, %		
	Unadjusted	PS matched	IPW-adjusted	Unadjusted	PS matched	IPW-adjusted	Unadjusted	PS matched	IPW-adjusted
Age (yr)	8.7	6.0	0.1	-6.6	-1.8	-3.9	1.2	-1.2	-1.6
Male	0.5	-3.7	-2.2	-0.9	-0.7	-2.2	-20.8	1.1	-2.9
Body mass index (kg/m <sup>2</sup> )	-13.8	-2.2	2.8	-20.2	-4.3	-2.3	-4.0	-0.9	4.4
Current smoker	-10.6	-4.0	-0.2	9.9	-4.4	-1.9	-7.8	-0.8	1.8
Hypertension	-16.6	-4.3	0.7	-23.1	-4.0	-2.7	-11.0	-1.7	-5.1
Diabetes mellitus	-13.3	3.4	0.4	-7.9	-3.5	-1.9	-14.0	-4.7	0.8
Chronic kidney disease	-6.1	0.8	1.3	12.1	0.9	-3.0	-48.3	-3.1	-1.1
Previous myocardial infarction	-13.2	0.8	2.1	-10.2	-4.7	-3.5	-15.6	-2.4	-3.3
Previous cerebrovascular accident	-12.4	0	-0.8	-10.5	-8.0	0.2	-4.4	-0.8	-1.3
Previous heart failure admission	11.3	1.2	-0.2	-13.3	-1.6	0.2	14.4	3.1	-0.7
De novo acute heart failure	10.3	2.7	1.0	4.1	-3.3	-1.4	13.1	3.9	-0.6
NYHA	-13.0	6.3	0.9	-9.9	1.6	-1.7	19.6	1.1	1.8
Ischemic cardiomyopathy	-34.8	-7.2	0.5	-8.3	-2.0	-4.3	-32.7	-7.4	0.2
Dilated cardiomyopathy	3.8	-2.6	-2.1	-2.6	-1.7	3.3	15.9	9.0	0.4
Valvular heart disease	23.5	4.0	0.3	14.2	4.3	2.9	6.6	-5.3	1.2

Atrial fibrillation	19.0	0.6	-0.3	5.8	0.7	0.3	12.9	-0.6	2.1
Systolic blood pressure (mmHg)	-4.9	-0.6	-0.4	-33.5	1.6	-2.6	-9.3	-2.5	-2.6
Left ventricular ejection fraction (%)	-1.1	0.6	-2.0	-5.5	-5.7	-5.4	4.4	-1.3	4.3
WBC (/mm <sup>3</sup> )	-20.9	1.1	0.8	10.4	2.7	-0.4	-21.9	-1.2	-2.8
Creatinine (mg/dL)	-7.2	0.6	0.8	6.2	0.9	-4.8	-76.9	-8.2	1.8
Hemoglobin (g/dL)	-1.9	-6.2	-1.3	0.2	2.4	3.0	9.2	4.2	-5.7
IV diuretic	0.8	0	2.1	-4.9	5.8	0.9	30.1	-6.9	2.2
IV inotrope	15.5	5.4	0.8	46.3	6.1	-0.6	-14.8	-4.8	0.3
Mechanical ventilation	4.1	1.6	-0.7	17.5	3.6	-1.5	-5.5	0.9	-0.4
Transfusion	7.2	5.3	1.6	22.7	0.8	-2.2	-10.2	-1.5	1.1
ICU admission	-10.1	3.2	1.9	16.0	2.0	-2.5	-17.0	-8.9	2.2
Beta-blocker	NA	NA	NA	-47.1	-4.7	1.0	8.1	1.7	1.0
Renin angiotensin system blocker	-42.5	-6.4	-0.2	NA	NA	NA	13.1	4.2	0.3
Aldosterone antagonist	-10.1	-4.4	-0.7	-13.4	-4.9	2.7	NA	NA	NA

---

ICU = intensive care unit; IPW = inverse probability weighted; IV = intra-venous; NYHA = New York Heart Association; PS = propensity score; WBC = white blood cell

**Table S2. Comparison of KorHF and KorAHF populations.**

Variables	KorHF (N=301)	KorAHF (N=843)	P value
<i>Demographics</i>			
Age (yr)	69.8 ± 14.5	71.0 ± 12.9	0.233
Male	135 (44.9%)	397 (47.1%)	0.547
Body mass index (kg/m <sup>2</sup> )	22.9±3.6	23.4±3.7	0.051
<i>Cardiovascular risk factors</i>			
Current smoker	56 (18.6%)	111 (13.2%)	0.028
Hypertension	154 (51.2%)	538 (63.8%)	<0.001
Diabetes mellitus	100 (33.2%)	302 (35.8%)	0.458
Chronic kidney disease	34 (11.3%)	133 (15.8%)	0.073
Previous myocardial infarction	45 (15.0%)	145 (17.2%)	0.418
Previous cerebrovascular accident	30 (10.0%)	133 (15.8%)	0.017
Previous heart failure admission	6 (2.0%)	242 (28.7%)	<0.001
<i>Presentation and etiology of heart failure</i>			
De novo acute heart failure	87 (28.9%)	370 (43.9%)	<0.001
NYHA ≥3	196 (65.1%)	705 (83.6%)	<0.001
Ischemic cardiomyopathy	170 (56.5%)	374 (44.4%)	<0.001
Dilated cardiomyopathy	21 (7.0%)	33 (3.9%)	0.046
Valvular heart disease	40 (13.3%)	122 (14.5%)	0.682

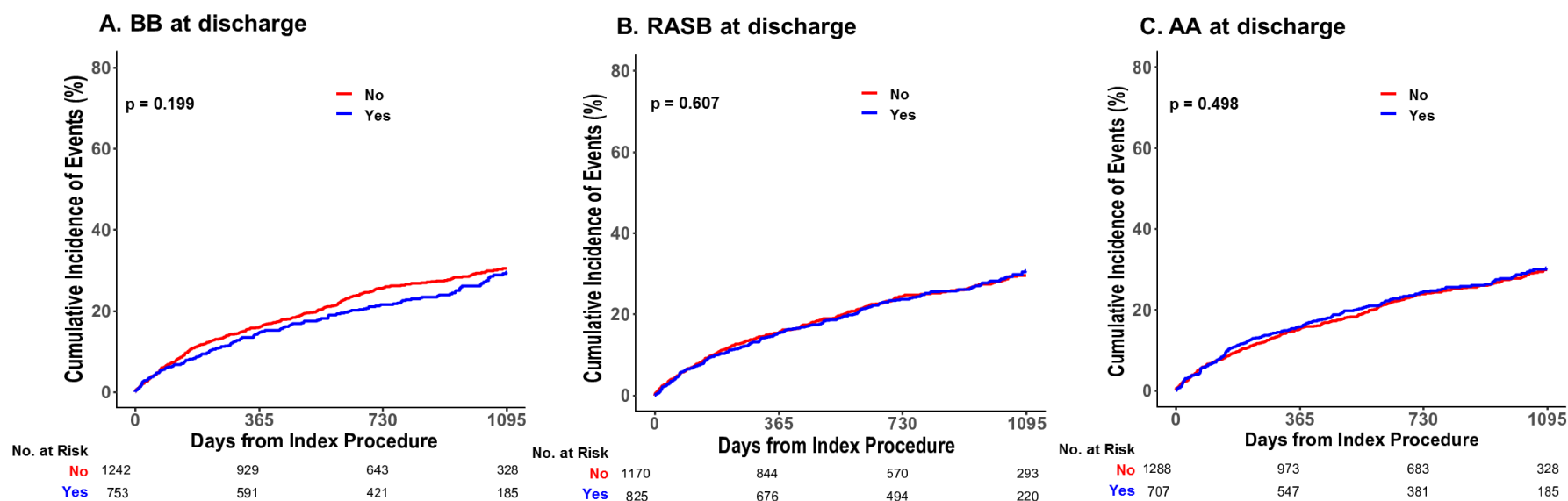
Arrhythmia	39 (13.0%)	294 (34.9%)	<0.001
Atrial fibrillation	32 (10.6%)	263 (31.2%)	<0.001
<i>Hemodynamic parameters at admission</i>			
Systolic blood pressure (mmHg)	134.8±32.1	137.7±31.9	0.180
Diastolic blood pressure (mmHg)	80.1±18.0	79.8±19.5	0.784
Pulse rate (beats/min)	91.2±28.0	92.3±26.6	0.527
Left ventricular ejection fraction (%)	44.1±2.9	44.2±2.8	0.359
<i>Laboratory data</i>			
WBC (/mm <sup>3</sup> )	9006.3±4557.1	8874.9±4187.0	0.654
Creatinine (mg/dL)	1.6±1.5	1.6±1.7	0.805
Hemoglobin (g/dL)	11.9±2.2	12.0±2.4	0.642
NT-proBNP (pg/mL)	9277.4±10566.6	9084.5±10293.1	0.822
<i>In-hospital management</i>			
IV diuretic	209 (69.4%)	618 (73.3%)	0.225
IV inotrope	70 (23.3%)	195 (23.1%)	>0.999
Mechanical ventilation	24 (8.0%)	101 (12.0%)	0.071
Transfusion	11 (3.7%)	187 (22.2%)	<0.001
ICU admission	112 (37.2%)	431 (51.1%)	<0.001
Length of stay (days)	9.0 (6.0–15.5)	9.0 (6.0–14.0)	0.523
<i>Medications at discharge</i>			

Beta-blocker	135 (44.9%)	485 (57.5%)	<0.001
Renin angiotensin system blocker	163 (54.2%)	574 (68.1%)	<0.001
Aldosterone antagonist	87 (28.9%)	346 (41.0%)	<0.001
Loop diuretic	158 (52.5%)	740 (87.8%)	<0.001
<i>Outcomes</i>			
All-cause mortality	81 (26.9%)	273 (32.4%)	0.091

Values are mean  $\pm$  SD, median (Q1-Q3), or n (%).

ICU = intensive care unit; IPW = inverse probability weighted; IV = intra-venous; NYHA = New York Heart Association; PS = propensity score; WBC = white blood cell

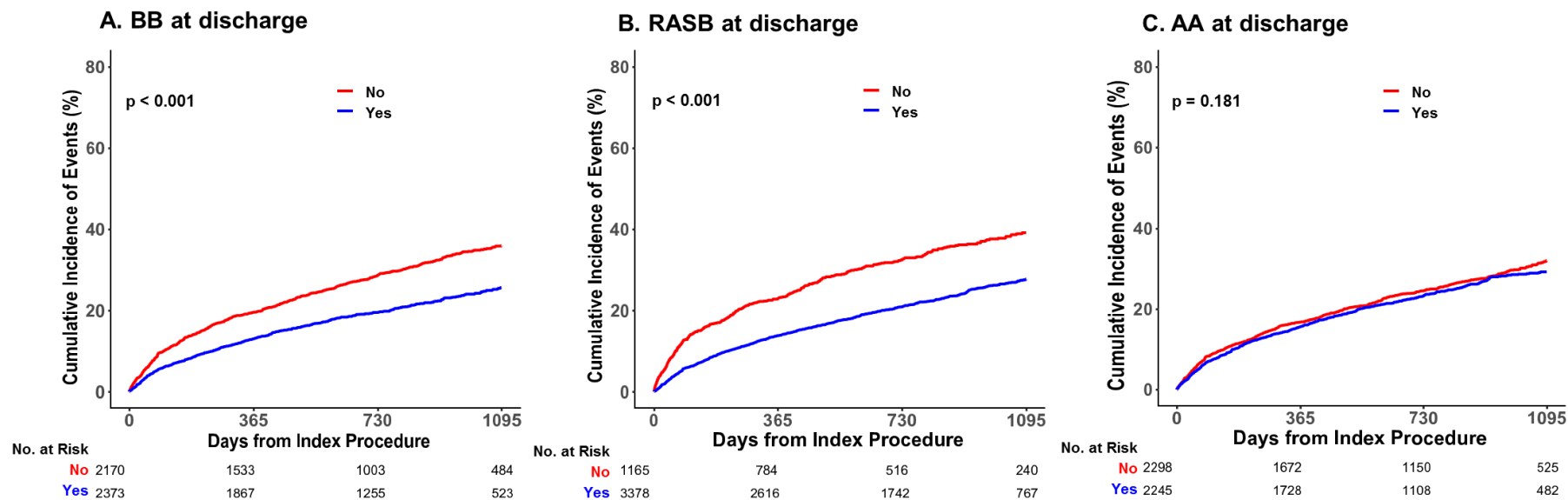
**Figure S1. Comparison of All-cause Mortality at 3 Years According to Use of Guideline Directed Medical Therapy Among Patients with Heart Failure with Preserved Ejection Fraction.**



Kaplan-Meier curves for all-cause mortality of AHF patients with HFpEF according to use of BB (blue line) or no BB (red line) (A), use of RASB (blue line) or no RASB (red line) (B), and use of AA (blue line) or no AA (red line) (C) are presented.

AA= aldosterone antagonist; BB= beta-blocker; HFpEF= heart failure with preserved ejection fraction; RASB= renin angiotensin system blocker

**Figure S2. Comparison of All-cause Mortality at 3 Years According to Use of Guideline Directed Medical Therapy Among Patients with Heart Failure with Reduced Ejection Fraction.**

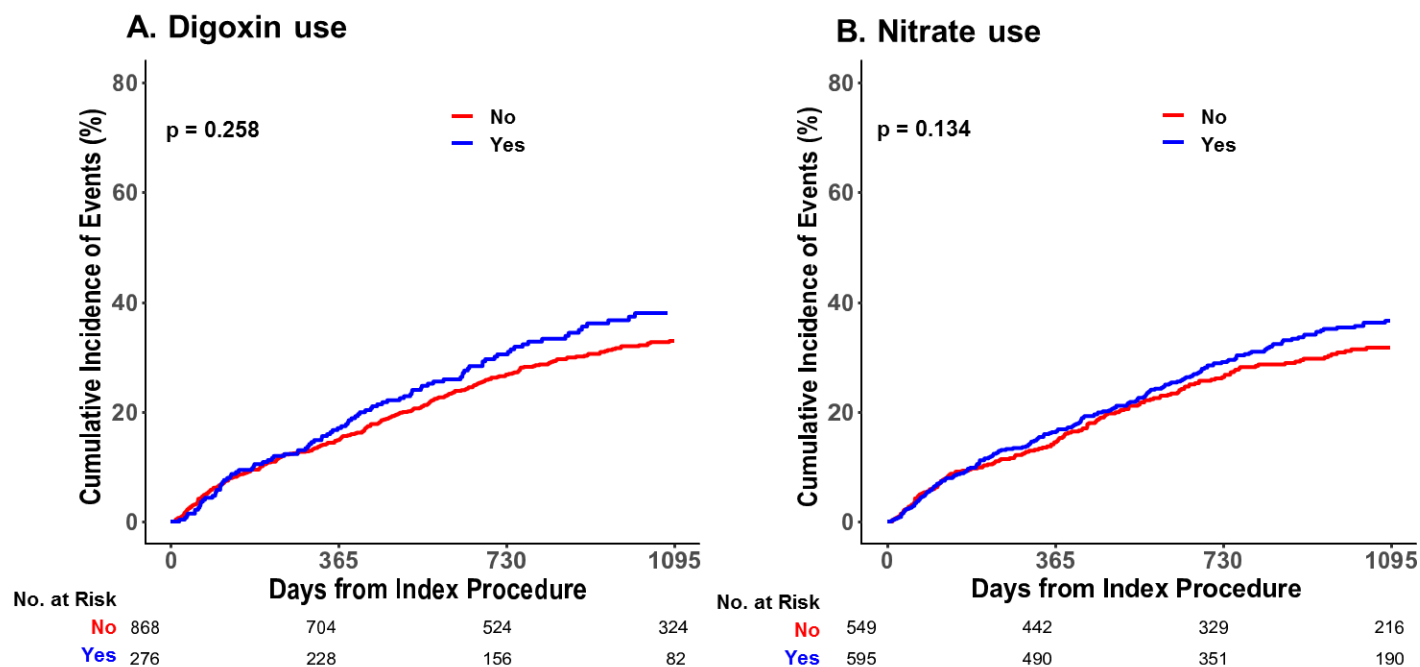


Kaplan-Meier curves for all-cause mortality of AHF patients with HFrEF according to use of BB (blue line) or no BB (red line) (A), use of RASB (blue line) or no RASB (red line) (B), and use of AA (blue line) or no AA (red line) (C) are presented.

AA= aldosterone antagonist; AHF = acute heart failure; BB= beta-blocker; HFrEF= heart failure with reduced ejection fraction; RASB= renin angiotensin system blocker



**Figure S3. Comparison of All-cause Mortality at 3 Years According to Use of Digoxin and Nitrate Among Patients with Heart Failure with Mid-Range Ejection Fraction.**



Kaplan-Meier curves for all-cause mortality of AHF patients with HFmrEF according to use of digoxin (blue line) or no digoxin (red line) (A), and use of nitrates (blue line) or no nitrates (red line) (B) are presented.

AA= aldosterone antagonist; AHF = acute heart failure; BB= beta-blocker; HFpEF= heart failure with preserved ejection fraction; RASB= renin angiotensin system blocker