

SUPPLEMENTAL MATERIAL

## Supplemental Tables

**Table 1.** Patient characteristics of those included and excluded from the study

Variable	Excluded from cohort	Included in cohort	p-value <sup>  </sup>
	N(%) or Mean (STD)	N(%) or Mean (STD)	
	or Median (p5,p95)	or Median (p5,p95)	
	(N=1819)	(N=2413)	
Age at first discharge diagnosis for HF*	77.6 (12.8)	73.3 (11.1)	<0.0001
Female sex	1063 (58.4%)	1210 (50.1%)	<0.0001
Race/ethnicity			
White	601 (33%)	1002 (41.5%)	<0.0001
Non-White or Hispanic	81 (4.5%)	247 (10.2%)	<0.0001
Unknown	1137 (62.5%)	1164 (48.2%)	<0.0001
Socio-economic status			
Above poverty	1210 (66.5%)	1818 (75.3%)	<0.0001
Below poverty	298 (16.4%)	463 (19.2%)	<0.0001
Unknown	311 (17.1%)	132 (5.5%)	<0.0001
Charlson comorbidity index <sup>†</sup>	2 (0,7)	2 (0,6)	<0.0001
Cerebrovascular disease	375 (20.6%)	555 (23%)	0.0636
Chronic pulmonary disease	1143 (62.8%)	1712 (70.9%)	<0.0001
Dementia	135 (7.4%)	76 (3.1%)	<0.0001
Diabetes	679 (37.3%)	1096 (45.4%)	<0.0001
Diabetes with chronic complications	391 (21.5%)	727 (30.1%)	<0.0001
Hemiplegia or paraplegia	44 (2.4%)	54 (2.2%)	0.6983
Hypertension	1568 (86.2%)	2111 (87.5%)	0.2201

Malignancy, including leukemia and lymphoma	282 (15.5%)	370 (15.3%)	0.8799
Metastatic solid tumor	89 (4.9%)	85 (3.5%)	0.0263
Mild liver disease	80 (4.4%)	119 (4.9%)	0.4169
Myocardial infarction	535 (29.4%)	872 (36.1%)	<0.0001
Peptic ulcer disease	103 (5.7%)	174 (7.2%)	0.0438
Peripheral vascular disorder	364 (20%)	630 (26.1%)	<0.0001
Renal disease	567 (31.2%)	817 (33.9%)	0.0651
Rheumatologic disease	111 (6.1%)	165 (6.8%)	0.3373
Valvular heart disease	665 (36.6%)	1247 (51.7%)	<0.0001
Median number of ambulatory encounters per patient	58 (10, 205)	100 (25, 289)	<0.0001
Median number of inpatient encounters per patient	5 (1, 20)	9 (2, 30)	<0.0001
LVEF <sup>#</sup>			0.6855
HFPEF <sup>‡</sup>	978/1477 (66.2%)	1613 (66.8%)	
HFRF <sup>§</sup>	499/1477 (33.8%)	800 (33.2%)	
No LVEF Measurements	342 (18.8%)	--	--
Mortality	1113 (61.2%)	1204 (49.9%)	<0.0001
Median time to death from first discharge diagnosis for HF	194 (5, 1831)	545 (12, 2076)	<0.0001

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\* Heart failure

† Modified CCI does not include CHF, hypertension, MI, renal disease, or valvular heart disease.

All other components of the modified CCI are listed, with the exception of AIDS and moderate/severe liver disease due to fewer than 5 patients having these conditions.

‡ Heart failure preserved ejection fraction

§ Heart failure reduced ejection fraction

| | T-test, Chi-square, Mantel-Haenszel Chi-Square, or Wilcoxon Rank Sum as appropriate.

# Left ventricular ejection fraction

**Table 2.** Parametric survival analyses parameter estimates, modeling transition from alive to death

	Exponential/MSM (95% CI)	Weibull (95% CI)	Gamma (95% CI)
-2LL	4714.88	4281.16	4267.96
AIC	4734.88	4303.16	4291.96
Gender (Male referent)	0.91 (0.81, 1.03)	0.94 (0.89, 1.01)	0.95 (0.89, 1.00)
Age	1.04 (1.03, 1.04)	1.02 (1.02, 1.03)	1.02 (1.02, 1.02)
Charlson comorbidity index	1.05 (1.02, 1.08)	1.03 (1.01, 1.05)	1.03 (1.02, 1.04)
Hypertension	1.39 (1.15, 1.67)	1.28 (1.16, 1.42)	1.26 (1.15, 1.39)
Myocardial infarction	0.93 (0.83, 1.05)	0.97 (0.91, 1.04)	0.97 (0.92, 1.03)
Renal disease	0.89 (0.79, 1.01)	0.95 (0.89, 1.02)	0.95 (0.90, 1.01)
Valvular heart disease	0.98 (0.87, 1.09)	0.99 (0.93, 1.06)	0.98 (0.93, 1.04)
SES <sup>†</sup> (Above poverty referent)			
Below poverty	0.88 (0.76, 1.03)	0.93 (0.85, 1.01)	0.94 (0.87, 1.02)
Unknown SES	0.80 (0.60, 1.07)	0.92 (0.78, 1.08)	0.92 (0.79, 1.08)

\* $\beta$ -blockers omitted from parametric survival analyses.

<sup>†</sup>Socioeconomic status - below poverty if patient resided in area with more than 20% of housing in poverty, or if less than 25% of residents had a high school education.

**Table 3.** Cox proportional hazards survival analysis vs. Multi-state Markov model (MSM), modeling the HFREF to death transition

	Cox PH HR (95% CI)	2 state MSM (95% CI)	Full MSM Model (95% CI)
Gender (Male referent)	0.93 (0.81, 1.07)	0.91 (0.75, 1.11)	1.01 (0.80, 1.26)
Age (per 10 year increase)	1.84 (1.69, 1.99)	1.63 (1.48, 1.79)	1.64 (1.46, 1.84)
Charlson comorbidity index	1.08 (1.05, 1.12)	1.09 (1.03, 1.14)	1.09 (1.03, 1.15)
Hypertension	1.03 (0.85, 1.25)	0.95 (0.73, 1.24)	0.99 (0.74, 1.33)
Myocardial infarction	1.00 (0.87, 1.14)	0.98 (0.81, 1.19)	0.96 (0.77, 1.20)
Renal disease	1.31 (1.14, 1.51)	1.20 (0.98, 1.47)	1.32 (1.06, 1.65)
Valvular heart Disease	1.00 (0.88, 1.14)	1.03 (0.86, 1.25)	1.04 (0.85, 1.28)
Past HF history (No HFREF referent)			
Has had HFREF in past	0.76 (0.64, 0.89)	1.16 (0.91, 1.47)	0.65 (0.44, 0.96)
Has not had any prior assessment	--	--	--
*SES (Above poverty referent)			
Below poverty	1.01 (0.85, 1.19)	0.91 (0.71, 1.16)	0.93 (0.72, 1.20)
Unknown	0.86 (0.61, 1.21)	0.83 (0.52, 1.33)	0.81 (0.48, 1.36)
Adherence (Not adherent, †PDC < 0.80 referent)			
Adherent (PDC ≥ 0.80)	0.94 (0.80, 1.11)	0.69 (0.54, 0.87)	0.68 (0.54, 0.85)

Not prescribed  $\beta$ -blocker    0.62 (0.51, 0.76)    1.09 (1.03, 1.14)    1.34 (1.01, 1.77)

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\*Socioeconomic status - below poverty if patient resided in area with more than 20% of housing in poverty, or if less than 25% of residents had a high school education.

†Percent days covered for  $\beta$ -blockers – adherent if PDC was  $\geq$  80%, and non-adherent if PDC < 80%.

## Figures

**Figure 1: Survival plots for transition from heart failure reduced ejection fraction (HFREF) to death:** Unadjusted Kaplan-Meier, Cox proportional hazards, and multi-state Markov model (MSM) adjusted for all covariates.

