



**Incidence and Clinical Significance of 30-Day and 90-Day
Rehospitalization for Heart Failure Among Patients
With Acute Decompensated Heart Failure in Japan**
— From the NARA-HF Study —

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Supplementary Table 1. Baseline Characteristics of the Patients Who Died Within 90 Days

	Without 90-day re-HHF or death (n=683)	With 90-day death (n=43)	<i>P</i>-value
Demographic			
Age (years)	72.8 ± 12.6	79.4 ± 9.2	0.001
Male (%)	53.7	67.4	0.076
BMI (kg/m ²)	23.6 ± 4.3	21.3 ± 3.1	0.001
NYHA class III or IV on admission (%)	89.2	95.3	0.156
NYHA class III or IV at discharge (%)			
Length of hospitalization (days)	19 [13-29]	24 [16-45]	0.051
Discharged home (%)	89.5	62.8	<0.001
Causes of HF, %			
Ischemic heart disease	36.5	34.9	0.835
Dilated cardiomyopathy	15.2	7.0	0.106
Hypertensive heart disease	7.9	2.3	0.123
Valvular heart disease	15.7	20.9	0.378
Medical history, %			
Diabetes mellitus	45.1	55.8	0.172
AF	31.2	41.9	0.154
Vital sign on admission			
Heart rate (beats/min)	97.9 ± 27.7	98.7 ± 28.0	0.862
SBP (mmHg)	149.6 ± 35.9	135.4 ± 35.9	0.013
Vital sign at discharge			
Heart rate (beats/min)	71.5 ± 11.1	77.3 ± 15.8	0.001
SBP (mmHg)	113.4 ± 17.9	108.8 ± 20.3	0.104
Echocardiographic parameters at discharge			
LVEF (%)	45.7 ± 16.5	45.5 ± 18.1	0.931

LVEF \geq 50% (%)	39.2	44.2	0.728
Laboratory data on admission			
BNP (pg/ml)	886 [451-1570]	1305 [557-1797]	0.309
Hemoglobin (g/dl)	11.6 \pm 2.4	10.7 \pm 1.8	0.015
eGFR (ml/min/1.73m ²)	47.1 \pm 27.6	39.0 \pm 23.5	0.061
BUN (mg/dl)	29.6 \pm 21.0	43.4 \pm 29.7	<0.001
CRP (mg/dl)	0.5 [0.2-2.0]	1.8 [0.5-4.9]	<0.001
Sodium (mEq/L)	138.7 \pm 4.1	137.4 \pm 4.7	0.052
Laboratory data at discharge			
BNP (pg/ml)	234 [129-464]	444 [273-857]	0.001
Hemoglobin (g/dl)	11.5 \pm 2.1	10.5 \pm 1.7	0.002
eGFR (ml/min/1.73m ²)	43.3 \pm 25.4	43.2 \pm 24.4	0.963
BUN (mg/dl)	31.1 \pm 17.7	41.4 \pm 23.6	<0.001
CRP (mg/dl)	0.3 [0.1-1.0]	0.9 [0.3-2.0]	<0.001
Sodium (mEq/L)	138.0 \pm 3.7	137.1 \pm 4.5	0.105
Medication at discharge			
β -blockers (%)	58.6	72.1	0.073
ACE-I/ARBs (%)	88.6	73.8	0.011
MRA (%)	34.9	32.6	0.759
Diuretics (%)	78.4	81.4	0.639
Loop diuretics (%)	77.0	81.4	0.490

Data are presented as the mean \pm SD for continuous normally distributed variables, the median (25th to 75th interquartile range [IQR]) for continuous non-normally distributed variables, or n (%).

re-HHF, rehospitalizations for heart failure; BMI, body mass index; NYHA, New York Heart Association; AF, atrial fibrillation; SBP, systolic blood pressure; LVEF, left ventricular ejection fraction; BNP, brain natriuretic peptide; eGFR, estimated glomerular filtration rate; BUN, blood urea nitrogen; CRP, C-reactive protein; ACE-I, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; MRA, mineralocorticoid receptor antagonist.

P-values are generated from the comparison of the patients without 90-day re-HHF or death vs. the patients with 90-day death.

Supplementary Table 2. Baseline Characteristics of Patients According to Sex (A) and Patients With Early (Within 30 Days) and Late (31–90 Days) Rehospitalization (B)

Supplementary Table 2A

	Male (n=432)	Female (n=351)	P-value
Demographic			
Age (years)	71.9 ± 12.2	75.0 ± 12.3	<0.001
BMI (kg/m ²)	23.8 ± 4.0	23.0 ± 4.4	0.019
NYHA class III or IV on admission (%)	90.3	89.2	0.613
NYHA class III or IV at discharge (%)	4.2	4.8	0.649
Length of hospitalization (days)	20 [14-29]	19 [13-29]	0.680
Days until re-HHF	245 [73-728]	336 [122-801]	0.052
Discharged home (%)	91.0	84.9	0.009
Causes of HF, %			
Ischemic heart disease	46.3	25.6	<0.001
Dilated cardiomyopathy	15.5	13.1	0.340
Hypertensive heart disease	6.7	8.8	0.269
Valvular heart disease	9.5	23.7	<0.001
Medical history, %			
Diabetes mellitus	51.9	39.3	<0.001
AF	31.3	33.1	0.592
Vital sign on admission			
Heart rate (beats/min)	98.3 ± 27.4	97.0 ± 28.0	0.502
SBP (mmHg)	149.1 ± 36.8	148.3 ± 34.7	0.749
Vital sign at discharge			
Heart rate (beats/min)	71.4 ± 11.2	72.0 ± 12.0	0.467
SBP (mmHg)	113.0 ± 18.6	113.9 ± 17.9	0.481

Echocardiographic parameters at discharge

LVEF (%)	43.1 ± 16.3	49.3 ± 16.3	<0.001
LVEF≥50% (%)	32.4	48.2	<0.001

Laboratory data on admission

BNP (pg/ml)	931 [500-1618]	806 [417-1555]	0.786
Hemoglobin (g/dl)	12.0 ± 2.6	10.9 ± 2.1	<0.001
eGFR (ml/min/1.73m ²)	44.8 ± 26.3	47.6 ± 28.4	0.154
BUN (mg/dl)	31.8 ± 22.4	29.1 ± 20.7	0.086
CRP (mg/dl)	0.8 [0.2-2.7]	0.5 [0.2-1.7]	0.045
Sodium (mEq/L)	138.7 ± 3.9	138.4 ± 4.5	0.373

Laboratory data at discharge

BNP (pg/ml)	279 [137-499]	234 [126-465]	0.094
Hemoglobin (g/dl)	11.8 ± 2.3	11.0 ± 1.7	<0.001
eGFR (ml/min/1.73m ²)	42.8 ± 24.0	42.8 ± 26.3	0.993
BUN (mg/dl)	32.4 ± 18.5	31.8 ± 18.5	0.692
CRP (mg/dl)	0.4 [0.1-1.2]	0.4 [0.1-0.9]	0.194
Sodium (mEq/L)	137.7 ± 3.6	138.2 ± 4.1	0.068

Medication at discharge

β-blockers (%)	64.1	53.6	0.003
ACE-I/ARBs (%)	90.0	84.8	0.029
MRA (%)	31.9	37.0	0.136
Diuretics (%)	78.4	79.1	0.807
Loop diuretics (%)	76.8	78.0	0.690

Supplementary Table 2B

	With early rehospitalization (n=26)	With late rehospitalization (n=37)	<i>P</i>-value
Demographic			
Age (years)	73.5 ± 10.7	76.0 ± 7.9	0.285
Male (%)	73.1	62.2	0.362
BMI (kg/m ²)	23.8 ± 3.4	22.7 ± 3.5	0.219
NYHA class III or IV (%)	88.5	97.3	0.157
Length of hospitalization (days)	22 [13-26]	21 [12-37]	0.256
Causes of HF, %			
Ischemic heart disease	42.3	46	0.775
Dilated cardiomyopathy	15.4	5.4	0.187
Hypertensive heart disease	0	13.5	0.018
Valvular heart disease	23.1	10.8	0.193
Medical history, %			
Diabetes mellitus	57.7	54.1	0.775
AF	42.3	32.4	0.424
Vital sign at discharge			
Heart rate (beats/min)	70.4 ± 8.1	70.3 ± 14.2	0.978
SBP (mmHg)	119.8 ± 15.3	114.6 ± 23.8	0.331
Echocardiographic parameters at discharge			
LVEF (%)	46.4 ± 15.0	48.5 ± 17.4	0.611
LVEF≥50% (%)	42.3	35.1	0.564
Laboratory data at discharge			
BNP (pg/ml)	281 [136-650]	331 [115-692]	0.755
Hemoglobin (g/dl)	11.7 ± 2.1	10.8 ± 1.7	0.061
eGFR (ml/min/1.73m ²)	40.9 ± 19.2	32.0 ± 20.0	0.081
BUN (mg/dl)	32.3 ± 13.9	42.1 ± 23.2	0.062

CRP (mg/dl)	0.5 [0.1-1.6]	0.6 [0.1-1.1]	0.473
Sodium (mEq/L)	138.6 ± 4.2	135.9 ± 5.0	0.029
Medication at discharge			
β-blockers (%)	57.7	62.2	0.721
ACE-I/ARBs (%)	84.6	88.6	0.652
MRA (%)	30.8	27.0	0.747
Diuretics (%)	84.6	81.1	0.715
Loop diuretics (%)	84.6	78.4	0.531

Data are presented as the mean ± SD for continuous normally distributed variables, the median (25th to 75th interquartile range [IQR]) for continuous non-normally distributed variables, or n (%).

re-HHF, rehospitalizations for heart failure; BMI, body mass index; NYHA, New York Heart Association; AF, atrial fibrillation; SBP, systolic blood pressure; LVEF, left ventricular ejection fraction; BNP, brain natriuretic peptide; eGFR, estimated glomerular filtration rate; BUN, blood urea nitrogen; CRP, C-reactive protein; ACE-I, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; MRA, mineralocorticoid receptor antagonist.

P-values are generated from the comparison of male patients vs. female patients (A).

P-values are generated from the comparison of the patients with early rehospitalization vs. the patients with late rehospitalization (B).

Supplementary Table 3. Predictors of the Composite Outcome Using 90-Day All-Cause Death and HF Rehospitalization

Covariate	Univariate			Multivariate		
	HR	95% CI	P-value	HR	95% CI	P-value
Age (per 1 year)	1.030	(1.012-1.050)	0.001	1.026	(1.004-1.048)	0.021
Male/Female	1.555	(1.038-2.369)	0.032	1.966	(1.242-3.179)	0.004
Length of hospitalization (days)	1.003	(0.994-1.009)	0.410			
Discharged home/Transfer	0.507	(0.317-0.850)	0.011	0.603	(0.353-1.084)	0.089
Diabetes mellitus	1.384	(0.934-2.057)	0.105			
AF	1.332	(0.882-1.984)	0.170			
Vital sign on admission						
Heart rate (per 1 bpm)	0.998	(0.991-1.005)	0.574			
SBP (per 10 mmHg)	0.953	(0.900-1.007)	0.090			
Vital sign at discharge						
Heart rate (per 1 bpm)	1.012	(0.996-1.029)	0.149			
SBP (per 10 mmHg)	0.999	(0.896-1.111)	0.983			
LVEF at discharge (per 1%)	1.001	(0.991-1.006)	0.775			
Laboratory data on admission						
BNP (per 100 pg/ml)	1.006	(0.987-1.022)	0.536			
Hemoglobin (per 1 g/dl)	0.906	(0.834-0.983)	0.017	0.972	(0.848-1.115)	0.690
BUN (per 1 mg/dl)	1.012	(1.005-1.019)	0.002	1.005	(0.992-1.018)	0.485
eGFR (per 1 ml/min/1.73 m ²)	0.990	(0.982-0.997)	0.008	1.004	(0.993-1.016)	0.475
Laboratory data at discharge						
BNP (per 100 pg/ml)	1.035	(1.004-1.058)	0.030	1.026	(0.996-1.057)	0.089
Hemoglobin (per 1 g/dl)	0.865	(0.780-0.956)	0.004	0.978	(0.828-1.154)	0.789
BUN (per 1 mg/dl)	1.017	(1.008-1.025)	<0.001	1.013	(1.001-1.025)	0.038
eGFR (per 1 ml/min/1.73 m ²)	0.994	(0.985-1.002)	0.115			

Medication at discharge

β-blockers (%)	1.283	(0.857-1.955)	0.229
ACE-I/ARBs (%)	0.598	(0.367-1.029)	0.062
MRA (%)	0.810	(0.521-1.230)	0.328
Loop diuretics (%)	1.193	(0.746-2.000)	0.473

HF, heart failure; HR, hazard ratio; CI, confidence interval, AF, atrial fibrillation; SBP, systolic blood pressure; LVEF, left ventricular ejection fraction; BNP, brain natriuretic peptide; BUN, blood urea nitrogen; eGFR, estimated glomerular filtration rate; ACE-I, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; MRA, mineralocorticoid receptor antagonist.