# Early follow-up at outpatient care after discharge improves long-term heart failure readmission rate and prognosis

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### Abstract

**Aims** It has been reported that congestive heart failure (CHF) readmission has not decreased in the last decade. It is also reported that CHF readmission is likely to occur shortly after discharge. We investigated whether an early follow-up at outpatient care within 2 weeks after discharge affects the long-term readmission rate and prognosis.

**Methods and results** We reviewed consecutive 1002 patients admitted to our hospital due to CHF. Two-hundred and fifty-nine patients who died in-hospital or were transferred to another hospital or readmitted within 2 weeks were excluded and 743 of discharged patients were analysed. We extracted contributing variables associated with heart failure (HF) readmission and the composite adverse outcome (all cause death or HF readmissions) by univariate and multivariate analysis. Multivariate analysis showed that the early follow-up was independently associated with freedom from HF readmission and the composite outcome. We divided these patients into two groups, with/without early follow-up and performed a propensity score-matching analysis (n = 259 each). HF readmission during 2 year follow-up was significantly less in the early follow-up group [P = 0.02, hazard ratio (HR) = 0.647, 95% confidence interval (CI) = 0.447–0.935] as well as the composite outcome was less in the early follow-up group (P = 0.01, HR = 0.643, 95% CI = 0.456–0.908). Medication adjustments were done in only 33.2% of the patients. Rates of HF readmissions were comparable regardless of whether or not medication adjustment was done at the early follow-up (P = 0.505, HR = 1.208, 95% CI = 0.692–2.106).

**Conclusions** The present study demonstrates that an early follow-up approach after discharge in CHF patients may improve the long-term prognosis. These results may not depend on medication adjustment but rather on modifying patient factors early after discharge.

Keywords Heart failure; Early follow-up; Heart failure readmissions

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# Introduction

It is recognized that a heart failure (HF) pandemic is already in sight in Japan and worldwide. The majority of patients with HF are elderly with poor prognosis and requiring high economic burden.<sup>1,2</sup> The increasing of HF patients is a socio-economic problem and thus preventing HF readmission is an important medical and economic issue. Despite advances in treatment, the number of readmissions due to worsening HF has not decreased at all in the last decade.<sup>3</sup> Possible reasons for this

result are patient factors such as insufficient salt restrictions, overwork, and poor compliance to the lifestyle guidance and medications.<sup>4</sup> It is reported that guideline-based medical therapy (GBMT) is not necessarily effective in elderly HF patients.<sup>5</sup> Thus, multidisciplinary interventions as well as GBMTs are important to reduce HF readmissions.<sup>6–10</sup> However, the clinical significance of multidisciplinary interventions to reduce HF readmission is still controversial.<sup>11–13</sup>

It is known that HF readmissions are likely to occur early after discharge, especially within a month. $^{14}$  It may be due

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to changes in lifestyle, such as increasing salt intake and overwork early after hospital discharge. It is also reported that early follow-up at outpatient care 7 days after discharge reduce 30 days HF readmission.<sup>15,16</sup> Thus, early follow-up is thought to be effective in preventing HF readmissions; however, no reports have investigated its effect on the long-term outcomes. Thus, the aim of this study was to investigate the effects of early follow-up at outpatient care after initial hospital discharge on HF readmission and prognosis in a long-term.

# **Material and methods**

#### Study design and patients

This is a single-centre, retrospective cohort study. Study design and number of patients are presented in *Figure 1*. We reviewed 1002 consecutive in-hospitalized patients due to decompensated HF from April 2015 to March 2019. Congestive HF was diagnosed on the basis of Framingham HF criteria.<sup>17</sup> After excluding the 196 patients transferred to another hospital, 39 patients died in-hospital and 24 patients readmitted within 2 weeks after discharge, and 743 patients were retrospectively investigated. The patients were followed up for 1 to 2 years after the initial hospital discharge. The median length of follow-up was 730 days (range, 16 to 730). The primary outcome was a readmission due to worsening HF. The secondary outcome was a composite of death from any cause or a HF readmission. Survival after

Figure 1 Illustration of study design. CHF, congestive heart failure.

1002 CHF hospitalized patients from April 2015 to March 2019 196 transfer to another hospital exclude 39 in-hospital death 743 CHF hospitalized patients 24 readmitted within 2 weeks from April 2015 to March 2019 Early follow-up within 2 weeks by outpatient (-) Early follow-up within 2 weeks by outpatient (+) n=463 n=280 Propensity matching Early follow-up within 2 weeks by outpatient (-) Early follow-up within 2 weeks by outpatient (+) n=259n=259

discharge was confirmed from the follow-up records in our hospital or through direct telephone contact to each patient or their family members.

# Extraction of factors associated with heart failure readmission and death

We investigated the factors associated with HF readmission and death by univariate and multivariate analyses. Patient backgrounds, comorbidities, laboratory data at admission (Labo data), treatment details during hospitalization (in hospital use), and prescription at discharge (use at discharge) were the analysed variables. Follow-up details after discharge were also analysed including early follow-up, number of visits to our outpatient department after first visit per year, continuation of outpatient rehabilitation, and follow-up by general practitioner (GP) (after discharge). Abbreviations are listed at the beginning of the text.

# Association between early follow-up and long-term outcomes

We investigated the association between early follow-up and long-term clinical outcomes after propensity matching of patient characteristics. We defined early follow-up group as patients received a cardiologist and nurse-guided multidisciplinary follow-up at our outpatient department within 2 weeks after discharge. Non-early follow-up group was defined as patients other than the above mentioned. The early follow-up group includes patients who continue to be followed at our hospital with or without GP follow, and patients followed only by GPs after their first visit to our hospital. The non-early follow-up group includes patients followed in our hospital with or without GP follow and patients followed directly by GP after discharge. Whether to perform an early follow-up approach depended on the decision of each attending physician.

# Contents of intervention at early follow-up at outpatient care

It was up to the attending physician to decide what to do in the early follow-up visit.

Regardless of whether it is an early follow-up visit or not, outpatient care at first visit to our hospital after discharge included medical examinations, lifestyle guidance and an adjustment of drugs as needed. A systematic lifestyle guidance such as salt reduction guidance, daily check of body weight, and avoidance of physical overload was performed by a cardiologist and/or a nurse. These were performed at our outpatient department, and we did not provide a telephone support by nurse. Contents of interventions were investigated in the 280 patients with early follow-up at outpatient care after discharge. Then, we investigated whether or not medication adjustments at early follow-up affected the outcomes.

#### Statistical analyses

All statistical analyses were performed with EZR (Saitama Medical Center, Jichi Medical University, Saitama, Japan), which is a graphical user interface for R (The R Foundation for Statistical Computing, Vienna, Austria). More precisely, it is a modified version of R commander designed to add statistical functions frequently used in biostatistics.<sup>18</sup>

Continuous variables in the early follow-up group/nonearly follow-up group were compared using the unpaired ttest or Mann-Whitney test, as appropriate. Categorical variables among early follow-up group/non-early follow-up group were compared using the  $\chi^2$  test or Fisher's exact test, as appropriate. A univariate analysis about the factors associated with HF readmissions as well as the composite adverse outcome was performed using cox proportional hazards model. Then, a multivariate analysis using the cox proportional hazards model was performed. Independent variables used for multivariate analysis were selected with a P value < 0.05, and clinical variables likely to affect the outcomes were included. Then, we divided the patients into two groups: patients without early follow-up (n = 463) and patients with early follow-up (n = 280). There were many differences in the backgrounds between two groups. Thus, we performed

a propensity score matching analysis. A propensity score indicating the predicted probability of early follow-up that was conditional on the observed covariates was calculated from the logistic equation for each patient. The following variables were included in the logistic regression model to calculate the propensity score: age, male, ejection fraction (EF), ischemic heart disease (IHD), frequent flyer (patients hospitalized for congestive HF at least twice in the past year), hospital stay, body mass index (BMI), pneumonia, blood urea nitrogen, estimated glomerular filtration rate (eGFR), uric acid, haemoglobin (Hb), albumin (Alb), catecholamine use, cardiac resynchronization therapy/implantable cardioverter defibrillator, angiotensin-converting enzyme inhibitor (ACE)/angiotensin receptor blocker, beta-blocker, mineralocorticoid receptor agonist (MRA), phosphodiesterase III inhibitor, sodium glucose co-transporter2 inhibitor, no. visits per year, outpatient rehabilitation, and follow-up by GP. We performed rigorous adjustment for significant differences in the baseline characteristics of patients matched by propensity score (n = 259 each). Clinical outcomes in the matched population were analysed by Kaplan-Meier curve with the log-rank test. Because some variables associated with HF readmission and the composite outcome remained with a difference, multivariate analysis using cox proportional hazards regression was added. Independent variables used for this multivariate analysis were as follows: catecholamine use, hospital stay, follow-up by GP, and early follow-up. Then, we investigated the contents of early outpatient care. Freedom from HF readmissions between the patients with or without medication adjustment in the early follow-up group were analysed by Kaplan-Meier curve with the log-rank test. Subgroup analysis was performed using a cox proportional hazard model. Unless otherwise specified, all data are expressed as the mean ± standard deviation or median [95% confidence interval (CI)]. The probability was two-tailed, with P values of <0.05 being regarded as statistically significant.

#### **Ethical standards**

All human and animal studies were approved by the appropriate ethics committee and were therefore performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study was approved by the ethics committee of Fukuoka Red Cross Hospital and got informed consent by an opt-out method.

#### Results

#### **Studied patients**

All patients backgrounds, comorbidities, laboratory data at admission (Labo data); treatment details during

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hospitalization (in hospital use); prescription at discharge (use at discharge); and follow-up details after discharge (after discharge) are shown in *Table 1*.

# Factors associated with heart failure readmissions and death

Results of the univariate and multivariate cox proportional hazard analyses to identify the clinical factors associated with HF readmissions and the composite outcome of HF readmission or all-cause death are shown in Table 2. In the multivariate analysis, IHD and frequent flyer are independent positive predictive factors, whereas early follow-up was a negative independent predictive factor associated with HF readmissions. In terms of the composite outcome, IHD, frequent flyer, and chronic obstructive pulmonary disease were independent positive predictive factors, whereas early follow-up, higher Hb levels (>10.7 g/dL), and ACE inhibitor/angiotensin receptor blocker use were independent negative predictive factors. Early follow-up was a negative predictor for both HF readmission [P = 0.015], hazard ratio (HR) = 0.637, 95% CI = 0.443-0.916] and the composite outcome (P = 0.004, HR = 0.607, 95% CI = 0.431 - 0.856).

#### **Propensity matching**

The effect of early follow-up on HF readmissions and the composite outcome was further investigated. We divided 743 patients into two groups: early follow-up group and non-early follow-up group. The baseline characteristics of the two groups are presented in Table 3 (left panel). In clinical characteristics, age is younger, more male patients are included, EF is lower, more IHD patients are included, longer hospital stay, less followed by GP, and BMI is higher in the early follow-up group. In laboratory data, eGFR, uric acid levels, Hb levels, and Alb levels is higher in the early follow-up group. In hospital use, catecholamine use was more prevalent in the early follow-up group. In use at discharge, beta-blocker use, MRA use and sodium glucose cotransporter2 inhibitor use are more in the early follow-up group. Because there were significant differences in characteristics between the two groups, a propensity score matching analysis was performed to eliminate the effects of related clinical factors (n = 259 each, Table 3, right panel).

#### The effect of early follow-up

The log-lank test demonstrated that HF readmission during 2 year follow-up was significantly less in the early follow-up

group (P = 0.02, HR = 0.647, 95% CI = 0.447–0.935, Figure 2A) as well as the composite outcome was (P = 0.01, HR = 0.643, 95% CI = 0.456–0.908, Figure 2B). Readmission rate and readmission or death rate at 2 years follow-up were also lower in the early follow-up group compared with the non-early follow-up group (18.5 vs. 26.6%, 21.2 vs. 30.5%, P = 0.03). The total number of HF readmissions during the follow-up period were 1.44 ± 0.82 in the early follow-up group (P = 0.086) among patients who were readmitted at least once.

After matching, there were still some differences remained in the backgrounds. To reinforce the study results, we again performed multivariate cox proportional hazard analyses using the remained factors (catecholamine use, period of hospital stay, followed by GP, and early follow-up) in the matched groups. Longer hospital stay was an independent positive predictive factor, and early follow-up was an independent negative predictive factor associated with HF readmissions, showing the strongest significance and an HR of 0.586 for early follow-up. Catecholamine use and longer hospital stay were independent positive predictive factors, and early follow-up was an independent negative predictive factor associated with the composite outcome, showing the strongest significance and an HR of 0.577 for early followup. (Supporting Information, *Table S1*).

#### Subgroup analysis

We further performed subgroup analyses from the entire cohort to find out in which group of patient early follow-up approach is particularly effective. Early follow-up approach was more effective in younger than 75 years old, female, IHD, heart failure with reduced EF (HFrEF), non-invasive positive pressure ventilation use, shorter hospital stay (<19 days), de novo decompensated HF and followed by our own facility (*Figure 3*).

#### Intervention at early follow-up care

The first visit was at  $8.9 \pm 4.0$  days after discharge in the early follow-up group and  $56.2 \pm 68.1$  days in the non-early follow-up group. Contents of medication adjustment at early follow-up care are presented in *Table S2*. Lifestyle guidance was done in all patients. Medication adjustments were done in only 33.2% of the patients at the early follow-up visits. In the early follow group, HF readmissions were comparable between those with or without medication adjustments at the early follow-up visit (P = 0.505, HR = 1.208, 95% CI = 0.692–2.106, Figure 4).

#### Table 1 Characteristics of studied patients

Backgrounds	
Age Male (%) BNP NYHA3,4 (%) EF HFrEF (%) HFmrEF (%) HHD (%) Frequent flyer (%) Hospital stay sBP dBP HR BMI	$\begin{array}{c} 75.29 \pm 13.76 \\ 468 \ (63.0) \\ 916.6 \pm 896.8 \\ 567 \ (76.3) \\ 40.9 \pm 17.2 \\ 369 \ (49.7) \\ 117 \ (15.7) \\ 257 \ (34.6) \\ 262 \ (35.3) \\ 126 \ (17.0) \\ 19.9 \pm 15.6 \\ 142.0 \pm 35.5 \\ 82.0 \pm 23.6 \\ 90.3 \pm 27.1 \\ 23.1 \pm 4.9 \end{array}$
Comorbidity	
AF (%) DM (%) COPD (%) Dialysis (%) Pneumonia (%)	326 (43.9) 285 (38.4) 58 (7.8) 55 (7.4) 85 (11.4)
Labo data	
BUN Cr eGFR UA Na K Hb Alb	$\begin{array}{c} 29.9 \pm 16.8 \\ 1.91 \pm 2.00 \\ 43.2 \pm 23.5 \\ 6.69 \pm 2.08 \\ 139.6 \pm 4.0 \\ 4.40 \pm 0.66 \\ 11.9 \pm 2.48 \\ 3.64 \pm 0.51 \end{array}$
In hospital use	
Loop (%) TLV (%) Carperitide (%) Catecholamine (%) Vasodilator (%) NPPV (%) CRT/ICD (%)	507 (68.3) 219 (29.5) 123 (16.6) 112 (15.1) 130 (17.5) 95 (12.8) 27 (3.6)
Use at discharge	
ACEI/ARB (%) BB (%) MRA (%) Anticoagulant (%) Loop at discharge (%) Loop dose (mg) TLV continue (%) TLV dose (mg) PDE III i (%) SGLT2i (%)	$\begin{array}{c} 605 \ (81.6) \\ 567 \ (76.4) \\ 335 \ (44.1) \\ 322 \ (43.4) \\ 416 \ (56.0) \\ 13.8 \pm 16.6 \\ 219 \ (29.5) \\ 6.52 \pm 3.38 \\ 30 \ (4.0) \\ 27 \ (3.6) \end{array}$
After discharge	
Early follow (%) No. visits per year Outpatient rehabili (%) Followed by GP (%)	280 (37.7) 4.02 ± 4.12 66 (8.9) 457 (61.5)

Data are given as n (%) or the mean  $\pm$  SD.

ACEI/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; AF, atrial fibrillation; Alb, albumin; BB, beta-blocker; BMI, body mass index; BNP, brain natriuretic peptide; BUN, blood urea nitrogen; COPD, chronic obstructive pulmonary disease; Cr, creatinine; CRT/ICD, cardiac resynchronization therapy/implantable cardioverter defibrillator; dBP, diastolic blood pressure; DM, diabetes mellitus; EF, ejection fraction; eGFR, estimated glomerular filtration rate; Followed by GP, patients followed by general practitioner after first visit; Frequent flyer, patients hospitalized for decompensated HF at least twice in the past year; Hb, haemoglobin; HF, heart failure; HFmrEF, HF with mid-range EF; HFpEF, HF with preserved EF; HFrEF, heart failure with reduced EF; HR, heart rate; IHD, ischemic heart disease; Loop, loop diuretics; MRA, mineralocorticoid receptor agonistNo. visits per year, Number of visits to our outpatient department after first visit per year; NPPV, non-invasive positive pressure ventilation; NYHA, New York Heart Association classification; Outpatient rehabilit, patients performed outpatient rehabilitation; PDE III i, phosphodiesterase III inhibitor; sBP, systolic blood pressure; SGLT2i, sodium glucose cotransporter2 inhibitor; TLV, tolvaptan; UA, uric acid.

#### Table 2 Univariate and multivariate analyses associated with HF readmissions and with composite outcome

Hazard ratio         95% CI         P value         Hazard ratio         95% CI         P value           Analyses associated with HF readmissions Backgrounds         Backgrounds         0.014         1.002-1.026         0.021         1.005         0.990-1.021         0.499           Mas         (%)         1.279         0.939-1.758         0.130         1.122         0.896-1.422         0.382           BWP         1.000         0.999-1.000         0.808         0.999         0.999-1.000         0.235           NYHA3.4 (%)         1.189         0.826-1.710         0.351         1.114         0.740-1.675         0.604           HFeff (%)         1.080         0.720-1.619         0.775         1.016-2.211         0.017           HHortf (%)         1.080         0.720-1.619         0.707         1.161-2.646         0.007           HHortf (%)         1.080         0.991-1.000         0.001         1.753         1.066-2.211         0.013           BW         0.991         0.991-1.003         0.283         0.016         0.997         0.990-1.005         0.541           BR         0.991         0.001         0.263         0.77-1.421         0.955         0.224           Dialysis (%i)         0.499		Univariate analysis		Multivariate analysis			
Analyses associated with HF readmissions           Backgrounds         1.014         1.002-1.026         0.021         1.005         0.990-1.021         0.499           Age         1.010         0.992-1.728         0.130         1.122         0.866-1.452         0.382           BNP         1.000         0.999-1.000         0.808         0.999         0.999-1.000         0.235           BNP         0.000         0.997         0.987-1.010         0.355         0.995         0.982-1.008         0.478           HTFEF (%)         1.048         0.778-1.412         0.755         0.995         0.982-1.008         0.478           HTFEF (%)         1.014         0.023-1.018         0.057         1.096-2.211         0.013           Frequent flyer (%)         2.366         1.700-3.300         <0.001		Hazard ratio	95% Cl	P value	Hazard ratio	95% Cl	P value
Age         1.014         1.002-1.026         0.021         1.005         0.990-1.021         0.499           Male (%)         1.279         0.929-1.758         0.130         1.122         0.866-1.452         0.382           BNP         1.000         0.999-1.000         0.808         0.999         0.989-1.000         0.235           MTH21,4(%)         1.189         0.826-1.710         0.351         1.114         0.740-1.675         0.644           FF         0.997         0.989-1.006         0.585         0.995         0.982-1.008         0.478           HTFE (%)         1.040         0.665-1.251         0.570         0.962-211         0.013           Frequent flyer (%)         2.368         1.700-3.300         <0.001	Analyses associated with HF Backgrounds	readmissions					
Main (%)         1.779         0.529-1.758         0.130         1.122         0.866-1.452         0.382           BNP         1.000         0.899-1.006         0.808         0.999         0.999-1.000         0.235           NTHA3.4 (%)         1.189         0.826-1.710         0.351         1.114         0.740-1.675         0.604           FF         0.997         0.989-1.006         0.585         0.995         0.982-1.008         0.478           HFRF (%)         1.080         0.720-1.619         0.707         1.095-2.211         0.013           HFD (%)         0.391         0.365         0.507         1.095-2.211         0.013           SP         0.996         0.991-1.000         0.081         0.997-1.018         0.123           SP         0.991         0.985-0.998         0.016         0.997         0.990-1.005         0.541           HR         0.997         0.990-1.005         0.541         0.10         0.771-1.421         0.955           COPO (%)         1.148         0.881-1.601         0.277         0.390         0.816-2.367         0.224           COPO (%)         1.543         0.599         0.94-1.007         0.424         0.071         0.424         0.232-1	Age	1.014	1.002-1.026	0.021	1.005	0.990-1.021	0.499
BNP         1.000         0.999         0.999         0.999         0.000         0.235           HFHEF (%)         1.189         0.826-1.710         0.351         1.114         0.740-1.675         0.664           HFHEF (%)         1.048         0.778-1.412         0.755         0.882-1.008         0.478           HHFHEF (%)         1.048         0.726-1.51         0.570         0.775         0.999         0.999-1.000         0.992         0.992-1.008         0.478           HHFEF (%)         1.046         0.702         1.472-2.564         0.001         1.753         1.161-2.646         0.001           requent Hyer (%)         2.368         1.700-3.300         0.001         1.753         1.161-2.646         0.007           dtP         0.997         0.991-1.003         0.283         0.997         0.997-1.018         0.123           dtP         0.997         0.997         0.991-1.003         0.283         0.977         0.360           Comorbidity         1.255         0.929-1.696         0.138         0.101         0.717-1.421         0.955           DM (%)         1.255         0.929-1.696         0.138         0.995         0.984-1.007         0.791           Cord DW (%)	Male (%)	1.279	0.929-1.758	0.130	1.122	0.866-1.452	0.382
NYHA3,4 (%)         1.189         0.826-1.710         0.351         1.114         0.740-1.675         0.604           EF         0.997         0.988-1.006         0.585         0.995         0.982-1.008         0.478           HFmEF (%)         1.048         0.720-1.619         0.707         1.096-2.211         0.013           HFmEF (%)         2.360         1.122.564         <0.001         1.557         1.096-2.211         0.013           BM         0.9991         0.985-0.998         0.0161         0.080         0.997-1.018         0.123           BM         0.9991         0.985-0.998         0.016         0.997         0.990-1.005         0.541           BM         0.9997         0.991-1.003         0.233         0.016         0.997         0.990-1.005         0.541           BM         0.9997         0.991-1.003         0.238         0.016         0.997         0.990-1.005         0.541           BM         0.9997         0.991-1.032         0.238         0.017         0.472-1.421         0.995           Comorbidity	BNP	1.000	0.999-1.000	0.808	0.999	0.999-1.000	0.235
FF         0.997         0.989-1.006         0.585         0.995         0.982-1.008         0.478           HFmEF (%)         1.048         0.778-1.412         0.755	NYHA3,4 (%)	1.189	0.826-1.710	0.351	1.114	0.740-1.675	0.604
HFREF (%)         1.048         0.778-1.412         0.755           HFREF (%)         0.800         0.720-1.619         0.770           HFDEF (%)         0.912         0.665-1.251         0.570           HB0 (%)         1.902         1.412-2.564         <0.001	EF	0.997	0.989-1.006	0.585	0.995	0.982-1.008	0.478
HFmEE (%)         1.080         0.720-1.619         0.707           HPEF (%)         1.902         1.412-2.554         <0.570	HFrEF (%)	1.048	0.778-1.412	0.755			
HFDE (%)         0.912         0.665-1.251         0.570           HD (%)         1.902         1.412-2.564         <.0.001	HFmrEF (%)	1.080	0.720-1.619	0.707			
HD (%)         1.902         1.412-2.564         <0.001	HFpEF (%)	0.912	0.665-1.251	0.570			
Frequent flyer (%)         2.368         1.700-3.300         <0.001         1.753         1.161-2.646         0.007           Haspital stay         0.996         0.991-1.008         0.005         1.008         0.997-1.018         0.123           sBP         0.996         0.991-1.003         0.283         0.990-1.005         0.541           HR         0.997         0.985-0.986         0.016         0.997         0.990-1.005         0.541           PM         0.997         0.982-1.083         0.283         0.005         0.990-1.005         0.541           PM         0.997         0.982-1.066         0.138         1.010         0.717-1.421         0.955           COPD (%)         1.543         0.982-2.485         0.074         0.499         0.202-1.235         0.132           Paeumonia (%)         1.004         0.699-1.743         0.669         0.202-1.235         0.132           UAA         1.002         0.932-1.077         0.521         0.998         0.984-1.007         0.791           Cr         0.9979         0.966-1.058         0.5991         0.995         0.984-1.007         0.791           Cr         0.992         0.982-1.043         0.995         0.984-1.007         0.436	IHD (%)	1.902	1.412-2.564	< 0.001	1.557	1.096-2.211	0.013
Hospital stay         1.010         1.003-1.018         0.005         1.008         0.997-1.018         0.123           BP         0.991         0.985-0.998         0.016         0.997         0.990-1.005         0.541           HR         0.995         0.955-1.017         0.360         0.283           BM         0.995         0.955-1.017         0.360         0.717-1.421         0.955           Comorbidity	Frequent flyer (%)	2.368	1.700-3.300	< 0.001	1.753	1.161-2.646	0.007
sBP         0.996         0.991-1.000         0.081           dP         0.997         0.998         0.717-1.421         0.955           Comorbidity         7         7         0.522         0.132         0.997         0.202-1.235         0.132           Pneumonia (%)         1.104         0.699-1.074         0.669         0.998         0.984-1.007         0.791           Cr         0.979         0.906-1.058         0.599         0.984         0.992         0.384-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.984         0.996         0.436           UA         1.001         0.971-1.041         0.389         0.440-0.551         1.173         0.781         0.436           UA         1.002         0.921-1.071         0.521         0.577         0.101         1.072	Hospital stay	1.010	1.003-1.018	0.005	1.008	0.997-1.018	0.123
dBP         0.991         0.985-0.986         0.016         0.997         0.990-1.005         0.511           HR         0.995         0.955-1.017         0.360	sBP	0.996	0.991-1.000	0.081			
HR         0.997         0.991-1.003         0.283           BMI         0.985         0.955-1.017         0.360           Comorbidity	dBP	0.991	0.985-0.998	0.016	0.997	0.990-1.005	0.541
BMI         0.985         0.955-1.017         0.360           Comorbidity         AF (%)         1.188         0.881-1.601         0.257           DM (%)         1.255         0.929-1.696         0.138         1.010         0.717-1.421         0.955           COPD (%)         1.543         0.958-2.485         0.074         1.390         0.816-2.367         0.224           Dalayis (%)         0.499         0.234-1.064         0.071         0.499         0.202-1.235         0.132           Labo data         0.669         0.669         0.577         0.998         0.984-1.007         0.791           Cr         0.379         0.992         0.985-0.986         0.599         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.552         0.577         0.571         0.066         0.133           K         0.902         0.713-1.141         0.389         0.447-1.002         0.056           Alb         0.765         0.577-1.014         0.66         0.533         0.516         0.133         0.724-1.902         0.353           Catcholamine (%)         1.561         1.192-3.21         0.105         1.237         0.789-1.936         0.353	HR	0.997	0.991-1.003	0.283			
Comorbidity AF (%) 1.188 0.881-1.601 0.257 DM (%) 1.255 0.929-1.696 0.138 1.010 0.717-1.421 0.955 COPD (%) 1.543 0.958-2.485 0.074 1.390 0.816-2.367 0.224 Dialysis (%) 0.499 0.234-1.064 0.071 0.499 0.202-1.235 0.132 Pneumonia (%) 1.104 0.699-1.743 0.669 Hb 0.0992 0.985-0.998 0.018 0.995 0.984-1.007 0.791 Cr 0.979 0.906-1.058 0.599 eGFR 0.992 0.985-0.998 0.018 0.995 0.984-1.007 0.436 UA 1.002 0.932-1.077 0.552 Na 1.010 0.973-1.049 0.591 K 0.902 0.713-1.141 0.389 Hb 0.898 0.845-0.955 <0.001 0.921 0.847-1.002 0.056 Alb 0.765 0.577-1.014 0.066 Loop (%) 1.290 0.924-1.800 0.133 TUV (%) 1.940 1.433-2.625 <0.001 1.237 0.789-1.936 0.553 Carpentide (%) 0.784 0.516-1.192 0.255 Catecholamine (%) 1.615 1.119-2.331 0.010 1.167 0.712-1.912 0.539 Vasodilator (%) 0.867 0.578-1.300 0.49 TUV (%) 0.9723 0.438-1.194 0.205 CRK/ICD (%) 0.224 1.270-4.108 0.015 CRK/ICD (%) 0.077 0.496-1.007 0.054 0.777 0.522-1.157 0.214 BB (%) 1.151 0.221 0.578-1.300 0.49 Vasodilator (%) 1.615 0.1192-0.31 CATPC (%) 0.223 0.438-1.194 0.205 CRK/ICD (%) 1.220 0.738-1.304 0.41 ATU (%) 0.867 0.578-1.300 0.49 TUV (%) 0.867 0.578-1.300 0.49 TUV (%) 0.212 0.438-1.194 0.205 CRK/ICD (%) 0.967 0.578-1.300 0.49 APPV (%) 0.212 0.438-1.194 0.205 CRK/ICD (%) 0.967 0.578-1.300 0.49 TUV cost discharge ACEUARB (%) 0.707 0.496-1.007 0.054 0.777 0.522-1.157 0.214 BB (%) 1.151 0.021-8.20 0.048 1.274 0.935-1.755 0.516 Anticoagulant (%) 1.351 1.0022 0.758-1.379 0.884 1.120 0.759-1.575 0.516 Anticoagulant (%) 1.351 1.0022 0.758-1.379 0.884 1.120 0.759-1.575 0.516 Anticoagulant (%) 1.351 0.022 0.758-1.379 0.844 1.20 0.759-1.575 0.516 Anticoagulant (%) 0.597 0.487-0.934 0.439 TV vontinue (%) 0.597 0.487-0.934 0.439 TV vontinue (%) 0.591 0.321 0.996 0.996 0.996-1.007 0.498 TV vontinue (%) 0.591 0.321 0.991 0.990 0.9991 0.00 0.448 PDE III (%) 0.588-2.75 0.140 PDE III (%) 0.675 0.487-0.934 0.017 0.637 0.443-0.916 0.015 No. vists per yean 1.009 0.972-1.047 0.628 Outpatient rehabili (%) 1.208 0.732-1.994 0.459 TV vontinue (%) 0.667 0.661	BMI	0.985	0.955-1.017	0.360			
AF (%)       1.188       0.881-1.601       0.257         DM (%)       1.255       0.929-1.696       0.138       1.010       0.717-1.421       0.955         COPD (%)       1.543       0.958-2.485       0.074       1.390       0.816-2.367       0.224         Dalayis (%)       0.499       0.234-1.064       0.071       0.490       0.202-1.235       0.132         Lab data       0.669       0.077       0.998       0.984-1.007       0.791         CF       0.979       0.906-1.058       0.599       0.984       0.995       0.984-1.007       0.436         UA       1.002       0.932-1.077       0.952       0.995       0.984-1.002       0.436         UA       1.010       0.973-1.049       0.591       .       .       .       .         K       0.902       0.924-1.800       0.133       .       <	Comorbidity						
DM (%)         1.255         0.929-1.696         0.138         1.010         0.717-1.421         0.055           COPD (%)         1.543         0.958-2.485         0.074         1.390         0.816-2.367         0.224           Dialysis (%)         0.499         0.234-1.064         0.071         0.499         0.202-1.235         0.132           Pneumonia (%)         1.004         0.699-1.743         0.669         0.998         0.984-1.007         0.791           Edo dat         0.979         0.906-1.058         0.599         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.955         0.984-1.007         0.436           UA         1.002         0.932-1.074         0.591         0.591         0.584           K         0.902         0.713-1.141         0.389         0.591         0.567           Mb         0.888         0.845-0.955<<<0.001	AF (%)	1.188	0.881-1.601	0.257			
COPD (%)         1.543         0.958-2.485         0.074         1.390         0.816-2.367         0.224           Dialysis (%)         0.499         0.234-1.064         0.071         0.499         0.224         0.132           Pneumonia (%)         1.104         0.699-1.743         0.669         0.791         0.77         0.912         0.998         0.984-1.007         0.791           Cr         0.979         0.966-1.058         0.599         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.984-1.002         0.436           UA         1.002         0.713-1.141         0.389         0.847-1.002         0.056           Alb         0.765         0.577-1.014         0.06         0.133         0.789-1.936         0.353           Carpertide (%)         1.615         1.119-2.331         0.101         1.167         0.712-1.912         0.539           Vasodilator (%)         0.867         0.578-1.300         0.439         0.712-1.912         0.539           Vasodilator (%)         0.867         0.578-1.300         0.49         0.712-1.912         0.539           Vasodilator (%)         0.723         0.438-1.194         0.205         0.500	DM (%)	1.255	0.929-1.696	0.138	1.010	0.717-1.421	0.955
Dialpsis (%)         0.499         0.234-1.064         0.071         0.499         0.202-1.235         0.132           Labo data         1.009         1.001-1.017         0.027         0.998         0.984-1.007         0.791           BUN         1.009         1.001-1.017         0.027         0.998         0.984-1.007         0.791           eGFR         0.979         0.985-0.998         0.018         0.995         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.984         0.436         0.436           K         0.902         0.713-1.144         0.389         0.447-1.002         0.056           Alb         0.848         0.845-0.955         <0.001	COPD (%)	1.543	0.958-2.485	0.074	1.390	0.816-2.367	0.224
Pneumonia (%)         1.104         0.699-1.743         0.669           Labo data         0.979         0.906-1.058         0.599         0.984-1.007         0.791           Cr         0.992         0.985-0.988         0.018         0.995         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.951	Dialysis (%)	0.499	0.234-1.064	0.071	0.499	0.202-1.235	0.132
Labo data BUN 1.009 1.001-1.017 0.027 0.998 0.984-1.007 0.791 GFR 0.979 0.906-1.058 0.599 0.985 0.986 0.984-1.007 0.436 UA 1.002 0.932-1.077 0.952 Na 1.010 0.973-1.049 0.591 K 0.902 0.713-1.141 0.389 Hb 0.898 0.845-0.955 <0.001 0.921 0.847-1.002 0.056 Alb 0.765 0.577-1.014 0.06 In hospital use Loop (%) 1.290 0.924-1.800 0.133 Carpertide (%) 0.784 0.516-1.192 0.255 Catecholamine (%) 1.615 1.119-2.331 0.010 1.167 0.712-1.912 0.539 Vasodilator (%) 0.867 0.578-1.300 0.49 NPPV (%) 0.723 0.438-1.194 0.205 CRT/CD (%) 0.223 0.438-1.194 0.205 CRT/CD (%) 0.707 0.496-1.007 0.054 0.777 0.522-1.157 0.214 BB (%) 1.156 0.803-1.663 0.434 1.117 0.730-1.707 0.609 MRA (%) 1.022 0.758-1.379 0.884 1.120 0.795-1.575 0.516 Anticoagulant (%) 1.351 1.002-1.820 0.048 1.274 0.903-1.796 0.168 ACEVARB (%) 0.707 0.998-1.015 0.105 0.996 0.986-1.007 0.498 TLV dose (mg) 1.007 0.998-1.015 0.105 0.996 0.986-1.007 0.498 TLV dose (mg) 1.007 0.998-1.015 0.105 0.996 0.986-1.007 0.498 TLV dose (mg) 1.007 0.998-1.015 0.105 0.999 Loop dose (mg) 1.007 0.998-1.015 0.105 0.996 0.986-1.007 0.498 TLV contine (%) 1.210 0.909-1.055 0.199 TLV dose (mg) 1.007 0.998-1.015 0.105 0.996 0.986-1.007 0.498 TLV contine (%) 0.772 0.427 0.522 0.114 0.588 After discharge K Aralyse associated with composite outcome Backgrounds After discharge K Aralyse associated with composite outcome Backgrounds After discharge K Age 1.022 1.010-1.033 <0.001 1.014 0.999-1.030 0.062 Male (%) 1.060 0.860-1.306 0.582 1.113 0.893-1.387 0.340 BNP 1.000 0.992-1.000 0.734 0.999 0.999-1.000 0.412 BRA (%) 1.000 0.999-1.000 0.734 0.999 0.999-1.000 0.412 BF (%) 0.060 0.860-1.306 0.582 1.113 0.893-1.387 0.340 BNP 1.000 0.999-1.000 0.734 0.999 0.999-1.000 0.412 EF 1.000 0.999-1.000 0.734 0.999 0.999-1.000 0.412 BF (%) 0.996 0.757-1.010 0.977	Pneumonia (%)	1.104	0.699-1.743	0.669			
BUN         1.009         1.001-1.017         0.027         0.998         0.984-1.007         0.791           Cr         0.979         0.906-1.058         0.599         0.018         0.995         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.985-0.998         0.018         0.995         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.847-1.002         0.056           Na         1.010         0.973-1.141         0.389         0.847-1.002         0.056           Alb         0.765         0.577-1.014         0.06         0.577         0.789-1.936         0.353           Carperitide (%)         1.290         0.924-1.800         0.133         0.712-1.912         0.539           Carperitide (%)         0.616         1.192         0.255         0.001         1.167         0.712-1.912         0.539           Vasodilator (%)         0.867         0.578-1.300         0.49         0.996         0.617-2.684         0.500           Use at discharge         0.005         1.287         0.617-2.684         0.500           ACEVARB (%)         0.707         0.496-1.007         0.054         0.777	Labo data						
Cr         0.979         0.906-1.058         0.599           eGFR         0.992         0.885-0.988         0.018         0.995         0.984-1.007         0.436           UA         1.002         0.392-1.077         0.952         0.995         0.984-1.007         0.436           Na         1.010         0.973-1.049         0.591         0.995         0.847-1.002         0.564           K         0.902         0.713-1.141         0.389         0.845-0.955         <0.001	BUN	1.009	1.001-1.017	0.027	0.998	0.984-1.007	0.791
eGR         0.992         0.885-0.998         0.018         0.995         0.984-1.007         0.436           UA         1.002         0.932-1.077         0.952         0.591         0.591         0.591         0.591         0.591         0.591         0.601         0.845-0.955         <0.001	Cr	0.979	0.906-1.058	0.599			
UA         1.002         0.932-1.077         0.952           Na         1.010         0.973-1.049         0.591           K         0.902         0.713-1.141         0.389           Hb         0.898         0.845-0.955         <0.001	eGFR	0.992	0.985-0.998	0.018	0.995	0.984-1.007	0.436
Na         1.010         0.973-1.049         0.591           K         0.902         0.713-1.141         0.389           Hb         0.898         0.845-0.955         <0.001	UA	1.002	0.932-1.077	0.952			
K         0.902         0.713-1.141         0.389           Hb         0.898         0.845-0.955         <0.001	Na	1.010	0.973-1.049	0.591			
Hb         0.898         0.845-0.955         <0.001         0.921         0.847-1.002         0.056           In hospital use         Loop (%)         1.290         0.924-1.800         0.133	К	0.902	0.713-1.141	0.389			
Alb         0.765         0.577-1.014         0.06           In hospital use	Hb	0.898	0.845-0.955	< 0.001	0.921	0.847-1.002	0.056
$ \begin{array}{l ln hospital use \\ Loop (%) & 1.290 & 0.924-1.800 & 0.133 \\ TLV (%) & 1.940 & 1.433-2.625 & <0.001 & 1.237 & 0.789-1.936 & 0.353 \\ Carperitide (%) & 0.784 & 0.516-1.192 & 0.255 \\ Catecholamine (%) & 1.615 & 1.119-2.331 & 0.010 & 1.167 & 0.712-1.912 & 0.539 \\ Vasodilator (%) & 0.723 & 0.438-1.194 & 0.205 \\ CRT/LCD (%) & 2.284 & 1.270-4.108 & 0.005 & 1.287 & 0.617-2.684 & 0.500 \\ Use at discharge & & & & & & & & & & & & & & & & & & &$	Alb	0.765	0.577-1.014	0.06			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	In hospital use						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Loop (%)	1.290	0.924-1.800	0.133			
Carperitide (%)         0.784         0.516-1.192         0.255           Catecholamine (%)         1.615         1.119-2.331         0.010         1.167         0.712-1.912         0.539           Vasodilator (%)         0.867         0.578-1.300         0.49	TLV (%)	1.940	1.433-2.625	< 0.001	1.237	0.789-1.936	0.353
Catecholamine (%)         1.615         1.119–2.331         0.010         1.167         0.712–1.912         0.539           Vasodilator (%)         0.867         0.578–1.300         0.49         0.205         0.438         1.194         0.205           CRT/ICD (%)         2.284         1.270–4.108         0.005         1.287         0.617–2.684         0.500           Use at discharge	Carperitide (%)	0.784	0.516-1.192	0.255			
Vasodilator (%)         0.867         0.578-1.300         0.49           NPPV (%)         0.723         0.438-1.194         0.205           CRT/ICD (%)         2.284         1.270-4.108         0.005         1.287         0.617-2.684         0.500           Use at discharge	Catecholamine (%)	1.615	1.119–2.331	0.010	1.167	0.712-1.912	0.539
NPV (%)         0.723         0.438-1.194         0.205           CRT/ICD (%)         2.284         1.270-4.108         0.005         1.287         0.617-2.684         0.500           Use at discharge         ACEI/ARB (%)         0.707         0.496-1.007         0.054         0.777         0.522-1.157         0.214           BB (%)         1.156         0.803-1.663         0.434         1.117         0.730-1.707         0.609           MRA (%)         1.022         0.758-1.379         0.884         1.120         0.795-1.575         0.516           Anticoagulant (%)         1.351         1.002-1.820         0.048         1.274         0.903-1.796         0.168           Loop at discharge (%)         1.221         0.900-1.655         0.199	Vasodilator (%)	0.867	0.578-1.300	0.49			
CRT/ICD (%)         2.284         1.270-4.108         0.005         1.287         0.617-2.684         0.500           Use at discharge         ACEI/ARB (%)         0.707         0.496-1.007         0.054         0.777         0.522-1.157         0.214           BB (%)         1.156         0.803-1.663         0.434         1.117         0.730-1.707         0.609           MRA (%)         1.022         0.758-1.379         0.884         1.220         0.795-1.575         0.516           Anticoagulant (%)         1.351         1.002-1.820         0.048         1.274         0.903-1.796         0.168           Loop at discharge (%)         1.221         0.900-1.655         0.199         0.107         0.498         1.274         0.936-1.007         0.498           TLV continue (%)         2.190         1.558-3.078         <0.001	NPPV (%)	0.723	0.438-1.194	0.205			
Use at discharge ACE/ARB (%) 0.707 0.496-1.007 0.054 0.777 0.522-1.157 0.214 BB (%) 1.156 0.803-1.663 0.434 1.117 0.730-1.707 0.609 MRA (%) 1.022 0.758-1.379 0.884 1.120 0.795-1.575 0.516 Anticoagulant (%) 1.351 1.002-1.820 0.048 1.274 0.903-1.796 0.168 Loop at discharge (%) 1.221 0.900-1.655 0.199 Loop dose (mg) 1.007 0.998-1.015 0.105 0.996 0.986-1.007 0.498 TLV continue (%) 2.190 1.558-3.078 <0.001 1.018 0.586-1.767 0.949 TLV dose (mg) 0.926 0.836-1.025 0.140 PDE III i (%) 1.203 0.591-2.446 0.609 SGLT2i (%) 0.782 0.321-1.904 0.588 After discharge Early follow (%) 0.675 0.487-0.934 0.017 0.637 0.443-0.916 0.015 No. visits per year 1.009 0.972-1.047 0.628 Outpatient rehabili (%) 1.208 0.732-1.994 0.459 Followed by GP (%) 0.916 0.675-1.242 0.572 Analyses associated with composite outcome Backgrounds Age 1.022 1.010-1.033 <0.001 1.014 0.999-1.030 0.062 Male (%) 1.060 0.860-1.306 0.582 1.113 0.893-1.387 0.340 BNP 1.000 0.999-1.000 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.010 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.010 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.010 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.010 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.010 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.010 0.734 0.999 0.999-1.000 0.412 NYHA3,4 (%) 1.415 0.998-2.006 0.051 1.279 0.864-1.891 0.218 EF 1.000 0.992-1.008 0.940 0.997 0.984-1.009 0.644	CRT/ICD (%)	2.284	1.270-4.108	0.005	1.287	0.617-2.684	0.500
ACEV/ARB (%)         0.707         0.496-1.007         0.054         0.777         0.522-1.157         0.214           BB (%)         1.156         0.803-1.663         0.434         1.117         0.730-1.707         0.609           MRA (%)         1.022         0.758-1.379         0.884         1.120         0.795-1.575         0.516           Anticoagulant (%)         1.351         1.002-1.820         0.048         1.274         0.903-1.796         0.168           Loop dose (mg)         1.007         0.998-1.015         0.105         0.996         0.986-1.007         0.498           TLV continue (%)         2.190         1.558-3.078         <0.001	Use at discharge						
BB (%)         1.156         0.803-1.663         0.434         1.117         0.730-1.707         0.609           MRA (%)         1.022         0.758-1.379         0.884         1.120         0.795-1.575         0.516           Anticoagulant (%)         1.351         1.002-1.820         0.048         1.274         0.903-1.796         0.168           Loop at discharge (%)         1.221         0.900-1.655         0.199         0.936-1.007         0.498           Loop dose (mg)         1.007         0.998-1.015         0.105         0.996         0.986-1.007         0.498           TLV continue (%)         2.190         1.558-3.078         <0.001	ACEI/ARB (%)	0.707	0.496-1.007	0.054	0.777	0.522-1.157	0.214
MRA (%)         1.022         0.758-1.379         0.884         1.120         0.795-1.575         0.516           Anticoagulant (%)         1.351         1.002-1.820         0.048         1.274         0.903-1.796         0.168           Loop at discharge (%)         1.221         0.900-1.655         0.199         0.996         0.986-1.007         0.498           Loop dose (mg)         1.007         0.998-1.015         0.105         0.996         0.986-1.007         0.498           TLV continue (%)         2.190         1.588-3.078         <0.001	BB (%)	1.156	0.803-1.663	0.434	1.117	0.730-1.707	0.609
Anticoagulant (%)       1.351       1.002–1.820       0.048       1.274       0.903–1.796       0.168         Loop dose (mg)       1.007       0.998–1.015       0.105       0.996       0.986–1.007       0.498         TLV continue (%)       2.190       1.558–3.078       <0.001	MRA (%)	1.022	0.758-1.379	0.884	1.120	0.795-1.575	0.516
Loop at discharge (%)         1.221         0.900-1.655         0.199           Loop dose (mg)         1.007         0.998-1.015         0.105         0.996         0.986-1.007         0.498           TLV continue (%)         2.190         1.558-3.078         <0.001	Anticoagulant (%)	1.351	1.002-1.820	0.048	1.274	0.903-1.796	0.168
Loop dose (mg)         1.007         0.998-1.015         0.105         0.996         0.986-1.007         0.498           TLV continue (%)         2.190         1.558-3.078         <0.001	Loop at discharge (%)	1.221	0.900-1.655	0.199			
TLV continue (%)       2.190       1.558–3.078       <0.001	Loop dose (mg)	1.007	0.998-1.015	0.105	0.996	0.986-1.007	0.498
TLV dose (mg)       0.926       0.836-1.025       0.140         PDE III i (%)       1.203       0.591-2.446       0.609         SGLT2i (%)       0.782       0.321-1.904       0.588         After discharge	TLV continue (%)	2.190	1.558-3.078	< 0.001	1.018	0.586-1.767	0.949
PDE III i (%)       1.203       0.591–2.446       0.609         SGLT2i (%)       0.782       0.321–1.904       0.588         After discharge       Early follow (%)       0.675       0.487–0.934       0.017       0.637       0.443–0.916       0.015         No. visits per year       1.009       0.972–1.047       0.628       0.459       0.459       0.572         Analyses associated with composite outcome       Backgrounds       0.422       1.010–1.033       <0.001	TLV dose (ma)	0.926	0.836-1.025	0.140			
SGLT2i (%)       0.782       0.321–1.904       0.588         After discharge       Early follow (%)       0.675       0.487–0.934       0.017       0.637       0.443–0.916       0.015         No. visits per year       1.009       0.972–1.047       0.628       0.459       0.017       0.637       0.443–0.916       0.015         Outpatient rehabili (%)       1.208       0.732–1.994       0.459       0.572       0.572       0.572         Analyses associated with composite outcome       Backgrounds       0.860–1.306       0.582       1.113       0.893–1.387       0.340         BNP       1.000       0.999–1.000       0.734       0.999       0.999–1.000       0.412         NYHA3,4 (%)       1.415       0.998–2.006       0.051       1.279       0.864–1.891       0.218         EF       1.000       0.992–1.008       0.940       0.997       0.984–1.009       0.644	PDE III i (%)	1.203	0.591-2.446	0.609			
After discharge       Early follow (%)       0.675       0.487–0.934       0.017       0.637       0.443–0.916       0.015         No. visits per year       1.009       0.972–1.047       0.628       0       0.015       0.015         Outpatient rehabili (%)       1.208       0.732–1.994       0.459       0.459       0.572         Analyses associated with composite outcome       Backgrounds       0.001       1.014       0.999–1.030       0.062         Male (%)       1.060       0.860–1.306       0.582       1.113       0.893–1.387       0.340         BNP       1.000       0.999–1.000       0.734       0.999       0.999–1.000       0.412         NYHA3,4 (%)       1.415       0.998–2.006       0.051       1.279       0.864–1.891       0.218         EF       1.000       0.992–1.008       0.940       0.997       0.984–1.009       0.644         HFrEF (%)       0.996       0.757–1.3101       0.977       0.577       0.572	SGLT2i (%)	0.782	0.321-1.904	0.588			
Early follow (%)       0.675       0.487–0.934       0.017       0.637       0.443–0.916       0.015         No. visits per year       1.009       0.972–1.047       0.628       0       0       0.015         Outpatient rehabili (%)       1.208       0.732–1.994       0.459       0.572       0.443–0.916       0.015         Analyses associated with composite outcome Backgrounds       0.010       1.014       0.999–1.030       0.062         Male (%)       1.060       0.860–1.306       0.582       1.113       0.893–1.387       0.340         BNP       1.000       0.999–1.000       0.734       0.999       0.999–1.000       0.412         NYHA3,4 (%)       1.415       0.998–2.006       0.051       1.279       0.864–1.891       0.218         EF       1.000       0.992–1.008       0.940       0.997       0.984–1.009       0.644         HFrEF (%)       0.996       0.757–1.3101       0.977       0.977       0.544       0.997	After discharge						
No. visits per year       1.009       0.972–1.047       0.628         Outpatient rehabili (%)       1.208       0.732–1.994       0.459         Followed by GP (%)       0.916       0.675–1.242       0.572         Analyses associated with composite outcome Backgrounds       4       0.999–1.030       0.062         Male (%)       1.060       0.860–1.306       0.582       1.113       0.893–1.387       0.340         BNP       1.000       0.998–1.000       0.734       0.999       0.999–1.000       0.412         NYHA3,4 (%)       1.415       0.998–2.006       0.051       1.279       0.864–1.891       0.218         EF       1.000       0.992–1.008       0.940       0.997       0.984–1.009       0.644	Early follow (%)	0.675	0.487-0.934	0.017	0.637	0.443-0.916	0.015
Outpatient rehabili (%)       1.208       0.732–1.994       0.459         Followed by GP (%)       0.916       0.675–1.242       0.572         Analyses associated with composite outcome       Backgrounds       0.001       1.014       0.999–1.030       0.062         Male (%)       1.060       0.860–1.306       0.582       1.113       0.893–1.387       0.340         BNP       1.000       0.999–1.000       0.734       0.999       0.999–1.000       0.412         NYHA3,4 (%)       1.415       0.998–2.006       0.051       1.279       0.864–1.891       0.218         EF       1.000       0.992–1.008       0.940       0.997       0.984–1.009       0.644	No. visits per vear	1.009	0.972-1.047	0.628			
Followed by GP (%)       0.916       0.675–1.242       0.572         Analyses associated with composite outcome Backgrounds	Outpatient rehabili (%)	1,208	0.732-1.994	0.459			
Analyses associated with composite outcome         Backgrounds         Age       1.022       1.010–1.033       <0.001	Followed by GP (%)	0.916	0.675-1.242	0.572			
Backgrounds           Age         1.022         1.010–1.033         <0.001	Analyses associated with con	nposite outcome					
Age1.0221.010–1.033<0.0011.0140.999–1.0300.062Male (%)1.0600.860–1.3060.5821.1130.893–1.3870.340BNP1.0000.999–1.0000.7340.9990.999–1.0000.412NYHA3,4 (%)1.4150.998–2.0060.0511.2790.864–1.8910.218EF1.0000.992–1.0080.9400.9970.984–1.0090.644HFrEF (%)0.9960.757–1.31010.9770.9770.984–1.0090.644	Backgrounds						
Male (%)         1.060         0.860-1.306         0.582         1.113         0.893-1.387         0.340           BNP         1.000         0.999-1.000         0.734         0.999         0.999-1.000         0.412           NYHA3,4 (%)         1.415         0.998-2.006         0.051         1.279         0.864-1.891         0.218           EF         1.000         0.992-1.008         0.940         0.997         0.984-1.009         0.644           HFrEF (%)         0.996         0.757-1.3101         0.977         0.977         0.864         0.996	Age	1.022	1.010-1.033	<0.001	1.014	0.999-1.030	0.062
BNP         1.000         0.999–1.000         0.734         0.999         0.999–1.000         0.412           NYHA3,4 (%)         1.415         0.998–2.006         0.051         1.279         0.864–1.891         0.218           EF         1.000         0.992–1.008         0.940         0.997         0.984–1.009         0.644           HFrEF (%)         0.996         0.757–1.3101         0.977         0.997         0.984–1.009         0.644	Male (%)	1.060	0.860-1.306	0.582	1,113	0.893-1.387	0.340
NYHA3,4 (%)         1.415         0.998-2.006         0.051         1.279         0.864-1.891         0.218           EF         1.000         0.992-1.008         0.940         0.997         0.984-1.009         0.644           HFrEF (%)         0.996         0.757-1.3101         0.977         0.977	BNP	1.000	0.999–1.000	0.734	0,999	0.999–1 000	0 412
EF         1.000         0.992-1.008         0.940         0.997         0.984-1.009         0.644           HFrEF (%)         0.996         0.757-1.3101         0.977	NYHA3 4 (%)	1 415	0.998_2.006	0.051	1 279	0.864-1.891	0.718
HFreF (%) 0.996 0.757–1.3101 0.977	FF	1,000	0.992-1.008	0.940	0 997	0 984-1 009	0.644
	 HFrEF (%)	0.996	0.757-1.3101	0,977	0.001	0.501 1.005	0.044

(Continues)

Tab	le 2	(continued)
	_	(,

	Univariate analysis			Multivariate analysis			
	Hazard ratio	95% Cl	P value	Hazard ratio	95% CI	P value	
HFmrEF (%)	1.084	0.746–1.573	0.672				
HFpEF (%)	0.989	0.742-1.318	0.939				
IHD (%)	1.911	1.453–2.514	< 0.001	1.632	1.177-2.262	0.003	
Frequent flyer (%)	2.365	1.740-3.213	< 0.001	1.644	1.116-2.422	0.011	
Hospital stay	1.011	1.005-1.018	< 0.001	1.009	1.000-1.018	0.051	
sBP	0.995	0.991-0.999	0.030	0.999	0.992-1.006	0.805	
dBP	0.990	0.984-0.997	0.003	0.998	0.987-1.009	0.721	
HR	0.996	0.991-1.001	0.153				
BMI	0.964	0.936-0.994	0.020	1.008	0.969-1.047	0.697	
Comorbidity							
AF (%)	1.181	0.897-1.554	0.234				
DM (%)	1.345	1.021-1.772	0.035	1.126	0.822-1.543	0.458	
COPD (%)	1.603	1.039-2.474	0.032	1.826	1.125-2.964	0.014	
Dialysis (%)	0.670	0.365-1.231	0.197				
Pneumonia (%)	1.111	0.731-1.689	0.621				
Labo data							
BUN	1.008	1.001-1.016	0.027	0.991	0.978-1.004	0.180	
Cr	0.986	0.920-1.057	0.696				
eGFR	0.991	0.985-0.997	0.003	0.996	0.986-1.006	0.468	
UA	0.970	0.907-1.038	0.387	0.000	0.000 1.000	000	
Na	1.013	0.978-1.049	0.476				
K	0.908	0.731-1.129	0.387				
Hb (>10.7 a/dl)	0.870	0.822-0.920	< 0.001	0 886	0 817-0 962	0.003	
Alb	0.668	0.519-0.861	0.001	0.983	0.713-1.356	0.919	
In hospital use	0.000		0.001	0.000		0.0.0	
	1,170	0.867-1.579	0.303				
TLV (%)	1 940	1 469-2 562	< 0.001				
Carperitide (%)	0.900	0.623-1.303	0 579				
Catecholamine (%)	1 714	1 228-2 392	0.001	1 564	0 992–2 467	0 054	
Vasodilator (%)	0.842	0 578-1 229	0 374	1.501	0.552 2.107	0.051	
NPPV (%)	0.631	0 389-1 024	0.062	0.626	0 372–1 054	0 077	
CRT/ICD (%)	2 258	1 312-3 886	0.002	1 383	0 701-2 728	0 349	
Use at discharge	2.250	1.512 5.000	0.005	1.505	0.701 2.720	0.5 15	
ACEI/ARB (%)	0.635	0 462–0 874	0.005	0 691	0 481_0 994	0.046	
BB (%)	1 013	0 733-1 399	0.937	1 041	0 707-1 531	0.839	
MBA (%)	1.015	0 760-1 317	0.995	1 1 2 6	0.818-1.551	0.465	
Anticoagulant (%)	1 340	1 019–1 762	0.036	1 197	0.869–1.648	0.769	
Loop at discharge (%)	1 230	0.930-1.627	0.050	1.157	0.005 1.040	0.205	
Loop dose (ma)	1.008	0.999_1.016	0.145	0 998	0 988_1 008	0 753	
TLV continue (%)	2 363	1 733_3 222	<0.052	1 277	0.768_2 122	0.755	
TLV dose (ma)	0 972	0.890_1.061	0.531	1.277	0.700 2.122	0.545	
	1 868	1 065-3 277	0.029	0.963	0 /87_1 90/	0 915	
SGIT2i (%)	0.935	0 //0_1 989	0.862	0.505	0.407 1.504	0.515	
After discharge	0.955	0.440-1.909	0.002				
Farly follow (%)	0 620	<u>በ //58_ በ                                   </u>	0.001	0 607	<u>በ / 310 ዩ</u> ፍራ	0.004	
No of visits por year	0.020	0.450-0.050	0.001	0.007	0.451-0.650	0.004	
Outpatient rehabili (%)	1 1 2 5	0.955-1.021	0.447				
Followed by GP (%)	0.966	0.701-1.004	0.020				
	0.900	0.725-1.201	0.015				

Univariate and multivariate analyses using cox proportional hazard model was performed.

ACEI/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; AF, atrial fibrillation; Alb, albumin; BB, beta-blocker; BMI, body mass index; BNP, brain natriuretic peptide; BUN, blood urea nitrogen; COPD, chronic obstructive pulmonary disease; Cr, creatinine; CRT/ICD, cardiac resynchronization therapy/implantable cardioverter defibrillator; dBP, diastolic blood pressure; DM, diabetes mellitus; EF, ejection fraction; eGFR, estimated glomerular filtration rate; Followed by GP, patients followed by general practitioner after first visit; Frequent flyer, patients hospitalized for decompensated HF at least twice in the past year; Hb, haemoglobin; HF, heart failure; HFmFF, HF with mid-range EF; HFpEF, HF with preserved EF; HFrEF, heart failure with reduced EF; HR, heart rate; IHD, ischemic heart disease; Loop, loop diuretics; MRA, mineralocorticoid receptor agonistNo. visits per year, Number of visits to our outpatient department after first visit per year; NPPV, non-invasive positive pressure ventilation; NYHA, New York Heart Association classification; Outpatient rehabilit, patients performed outpatient rehabilitation; PDE III i, phosphodiesterase III inhibitor; sBP, systolic blood pressure; SGLT2i, sodium glucose cotransporter2 inhibitor; TLV, tolvaptan; UA, uric acid.

Table 3	Characteristics	before and	after pro	pensity n	natching
				pensie,	

$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		Before pr	opensity matching		After propensity matching		
n         463         280         P value         259         259         P value           Backgrounds         79.0 [29.0, 106.0]         76.0 [31.0, 100.0] $\sim 0.001$ 77.4 f ± 13.3         72.4 ± 14.8         0.069           Male (%)         259 (58.1)         199 (71.1) $\sim 0.001$ 173 (66.8)         183 (70.7)         0.334           BNP         643.7 [23.3, 7712.9]         653.0 [58, 532.0.9]         0.582         52.04 [23.3, 512.1.0]         655.1 [58, 532.0.9]         0.681           FF         42.9 ± 16.7         37.5 ± 17.4 $\sim 0.001$ 39.9 ± 16.7         37.5 ± 17.5         0.110           HFFEF (%)         75 (15.2)         42 (15.0)         0.679         37 (14.3)         37 (14.3)         1.000           HD (%)         181 (39.1)         81 (28.9)         0.006         91 (35.1)         73 (28.2)         0.294           HD (%)         181 (39.3)         181 (28.9)         0.001         17.0 (1.0, 120.0]         19.0 [2.0, 195.0]         0.007           SBP         143.3 ± 36.1         13.99 ± 34.5         0.299         14.4 ± 3.93.3         141.3 ± 34.6         0.356           GER         143.9 ± 35.1         13.99 ± 45.7         0.901         123.0 [14.6, 48.0]         23.3 [10.0,	- Characteristic	Early follow (–)	Early follow (+)		Early follow (–)	Early follow (+)	
Backgrounds Age 79.0 [29.0, 106.0] 76.0 [31.0, 100.0] <0.001 74.6 $\pm$ 13.3 72.4 $\pm$ 14.8 0.069 Male (%) 269 (58.1) 199 (71.1) <0.001 173 (66.8) 183 (70.7) 0.394 BNP 643.7 (23.3, 771.2) 653.0 [15.8 (32.0.9] 0.589 NYHA3.4 (%) 352 (76.0) 215 (76.8) 0.859 194 (74.9) 199 (76.8) 0.689 NYHA3.4 (%) 352 (76.0) 215 (76.8) 0.859 194 (74.9) 199 (76.8) 0.689 HFF 42.9 $\pm$ 16.7 37.5 $\pm$ 17.4 <0.001 39.9 $\pm$ 16.7 37.5 $\pm$ 17.5 0.110 HFFE (%) 209 (45.1) 160 (57.1) 0.002 139 (53.7) 149 (57.5) 0.426 HmrtE (%) 75 (16.2) 42 (15.0) 0.679 37 (14.3) 37 (14.3) 1.000 HFpE (%) 179 (38.7) 78 (27.9) 0.003 85 (32.8) 73 (28.2) 0.108 Frequent flyer (%) 72 (15.6) 54 (19.3) 0.131 43 (16.6) 43 (16.5) 1.000 Hospital stay 16.0 (0.00, 12.0) 19.0 [2.0, 19.50] <0.001 17.0 (11.0.200 [19.0 [2.0, 19.50] 0.007 SdP 143.3 $\pm$ 36.1 139.9 $\pm$ 34.5 0.299 144.3 $\pm$ 39.3 $\pm$ 141.3 $\pm$ 34.6 0.356 HR 89.5 $\pm$ 26.9 $\pm$ 39.17 $\pm$ 27.4 0.298 9.7 $\pm$ 28.7 0.836 $\pm$ 24.6 0.705 HR 89.5 $\pm$ 26.9 $\pm$ 31.6 182.9 1.21 (43.2) 0.009 12.0 (11.6, 46.40 [2.3, 11.0.4, 47.3] 0.304 Controlidity 22.1 [13.2, 48.0] 21.1 (14.2.2) 0.819 112 (43.8) 111 (42.9) 1.000 COPD (%) 132 (39.3) 103 (36.8) 0.534 96 (37.8) 91.7 (37.5) 1.000 COPD (%) 137 (8.0) 22.1 (7.5) 0.888 26 (10.0) 18 (6.9) 0.270. HG (7 1.300 (37.1.405) 1.11 [0.43.8] 111 (42.9) 0.005 COPD (%) 139 (8.4) 1.11 (45.10, 15.0) 1.30 (14.5 ± 1.93 1.68 ± 1.73 0.293 eGFR 41.3 $\pm$ 23.6 46.3 $\pm$ 22.9 $\pm$ 16.7 47.3 $\pm$ 22.0 $\pm$ 16.0 47.3 $\pm$ 22.0 $\pm$ 16.0 47.3 $\pm$ 22.3 Na 139.6 $\pm$ 4.0 139.5 $\pm$ 4.0 0.596 17 (6.6) 44.5 $\pm$ 2.1 0.233 Na 139.6 $\pm$ 4.0 139.5 $\pm$ 4.0 0.596 17 (6.6) 44.5 $\pm$ 2.1 0.23 Na 139.6 $\pm$ 4.0 139.5 $\pm$ 4.0 0.596 17 (6.6) 44.5 $\pm$ 2.4 1 0.492 EGFR 41.3 $\pm$ 23.6 46.3 $\pm$ 22.9 $\pm$ 16.7 47.3 $\pm$ 22.7 0.167 Hb 1.1.6 $\pm$ 2.3 12.4 $\pm$ 2.6 $-$ 0.001 13.2 $\pm$ 2.4 $\pm$ 4.7.3 $\pm$ 2.2.7 0.167 Hb 1.1.6 $\pm$ 2.3 12.4 $\pm$ 2.6 $-$ 0.001 3.90 E4.7 3.32 (0.5) 0.398 EV (%) 39 (6.6.7) 98 (7.1.0) 0.254 176 (6.3.8) 139.5 (4.3.0) 0.596 HWP (%) 50 (10.8) 62 (22.2) $-$ 0.001 3.5 (13.5) 114.2 0.592 HA 6.59 $\pm$ 2.2.1 0.	n	463	280	P value	259	259	P value
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Backgrounds						
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Age	79.0 [29.0, 106.0]	76.0 [31.0, 100.0]	< 0.001	74.6 ± 13.3	$72.4 \pm 14.8$	0.069
$\begin{array}{l c c c c c c c c c c c c c c c c c c c$	Male (%)	269 (58.1)	199 (71.1)	< 0.001	173 (66.8)	183 (70.7)	0.394
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	BNP	643.7 [23.3, 7712.9]	663.0 [5.8, 5320.9]	0.582	620.4 [23.3, 5121.0]	659.1 [5.8, 5320.9]	0.889
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	NYHA3,4 (%)	352 (76.0)	215 (76.8)	0.859	194 (74.9)	199 (76.8)	0.681
$\begin{array}{c} \mbox{hrmer}(v_0) & 209 (45.1) & 160 (37.1) & 0.002 & 159 (53.7) & 149 (57.3) & 0.426 \\ \mbox{hrmer}(v_0) & 179 (38.7) & 78 (27.9) & 0.033 & 85 (22.8) & 73 (14.3) & 1.000 \\ \mbox{hrmer}(v_0) & 179 (38.7) & 78 (27.9) & 0.033 & 85 (32.8) & 73 (28.2) & 0.294 \\ \mbox{hrmer}(v_0) & 72 (15.6) & 54 (19.3) & 0.191 & 43 (16.6) & 43 (16.6) & 1.000 \\ \mbox{hospital stay} & 16.0 (0.0, 120.0) & 150 (2.0, 195.0) & 0.001 & 71.0 (1.0, 120.0) & 100 (2.0, 195.0) & 0.007 \\ \mbox{sBP} & 143.3 \pm 36.1 & 139.9 \pm 34.5 & 0.209 & 144.3 \pm 39.3 & 141.3 \pm 34.6 & 0.356 \\ \mbox{HR} & 89.5 \pm 26.9 & 91.7 \pm 27.4 & 0.298 & 93.7 \pm 28.7 & 92.0 \pm 28.0 & 0.513 \\ \mbox{BM} & 22.2 (132., 48.0) & 23.3 (10.0, 47.3) & 0.001 & 23.0 (14.6, 48.0) & 23.3 (10.0, 47.3) & 0.300 \\ \mbox{Comorbidity} & 22.2 (132., 48.0) & 23.3 (10.0, 47.3) & 0.001 & 23.0 (14.6, 48.0) & 23.3 (10.0, 47.3) & 0.300 \\ \mbox{CMP} (\psi_0) & 182 (39.3) & 103 (36.8) & 0.534 & 98 (37.8) & 97 (37.5) & 1.000 \\ \mbox{COPD} (\psi_0) & 37 (8.0) & 21 (7.5) & 0.099 & 27 (10.4) & 20 (7.7) & 0.359 \\ \mbox{BN} & 30.4 \pm 16.2 & 29.1 \pm 17.7 & 0.294 & 29.0 \pm 16.0 & 27.8 \pm 16.4 & 0.409 \\ \mbox{BN} & 30.4 \pm 16.2 & 29.1 \pm 17.7 & 0.294 & 29.0 \pm 16.0 & 27.8 \pm 16.4 & 0.409 \\ \mbox{BN} & 30.4 \pm 16.2 & 29.1 \pm 17.7 & 0.294 & 29.0 \pm 16.0 & 27.8 \pm 16.4 & 0.409 \\ \mbox{BN} & 30.4 \pm 16.2 & 29.1 \pm 17.7 & 0.294 & 29.0 \pm 16.0 & 27.8 \pm 16.4 & 0.409 \\ \mbox{BN} & 39.6 \pm 4.0 & 139.5 \pm 4.0 & 0.566 & 139.7 \pm 4.3 & 139.6 \pm 3.0 & 0.690 \\ \mbox{K} & 4.39 \pm 0.66 & 4.43 \pm 0.67 & 0.445 \pm 2.10 & 0.68 \pm 2.12 & 0.23 \\ \mbox{NPV} (\psi_0) & 309 (66.7) & 198 (71.0) & 0.254 & 176 (63.8) & 186 (71.8) & 0.389 \\ \mbox{TU} (\psi_0) & 134 (28.9) & 85 (30.5) & 0.678 & 83 (32.0) & 77 (29.7) & 0.635 \\ \mbox{CHrACP} & 3.09 (66.7) & 198 (71.0) & 0.254 & 176 (63.8) & 186 (71.8) & 0.389 \\ \mbox{TU} (\psi_0) & 309 (66.7) & 198 (71.0) & 0.254 & 176 (63.8) & 186 (71.8) & 0.389 \\ \mbox{TU} (\psi_0) & 57 (12.3) & 38 (13.6) & 0.659 & 37 (14.3) & 32 (12.4) & 0.665 \\ \mbox{TV} (\psi_0) & 57 (12.3) & 38 (13.6) & 0.659 & 37 (14.3) & 32 (12.4) & 0.655 \\ \mbox{TUV} (\psi_0) $		$42.9 \pm 10.7$	$37.5 \pm 17.4$	< 0.001	$39.9 \pm 10.7$	$3/.5 \pm 1/.5$	0.110
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	HFIEF(%)	209 (45.1) 75 (16.2)	100 (57.1)	0.002	139 (33.7)	149 (57.5)	0.420
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	HFIIIEF (70)	170 (10.2)	42 (15.0) 79 (27 0)	0.079	27 (14.2) 95 (22.9)	57 (14.5) 75 (29.2)	0.204
The quent flyer (%) (%) (%) (%) (%) (%) (%) (%) (%) (%)		181 (30.1)	81 (28 9)	0.005	05 (52.0) 01 (35.1)	73 (28.2)	0.2.94
$\begin{array}{c} \mbox{Hospital sys}{(\%)} & 16.0 \ [0.00, 120.0] & 19.0 \ [2.0, 195.0] & -0.001 \ 17.0 \ [1.0, 120.0] & 19.0 \ [2.0, 195.0] & -0.007 \ 3BP \\ \mbox{Hash}{(Mathematical system)} & 14.3 \ \pm 34.6 & 0.356 \ 0.007 \ 3BP & 82.9 \ \pm 36.6 \ 82.9 \ \pm 24.1 \ 0.996 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.4 \ \pm 25.0 \ 33.6 \ 44.6 \ 42.8 \ 33.6 \ \pm 24.6 \ 0.705 \ 84.6 \ 42.8 \ 53.6 \ 44.6 \ 42.8 \ 43.8 \ 44.6 \ 44.8 $	Frequent flyer (%)	72 (15.6)	54 (19 3)	0.000	43 (16.6)	43 (16 6)	1 000
$ \begin{array}{c} {} {} {} {} {} {} {} {} {} {} {} {} {}$	Hospital stay		190[20 1950]	< 0.001		190[20 1950]	0.007
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	sBP	143.3 + 36.1	139.9 + 34.5	0.209	144.3 + 39.3	141.3 + 34.6	0.356
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	dBP	82.9 ± 36.6	$82.9 \pm 24.1$	0.996	84.4 ± 25.0	83.6 ± 24.6	0.705
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	HR	$89.5 \pm 26.9$	$91.7 \pm 27.4$	0.298	$93.7 \pm 28.7$	$92.0 \pm 28.0$	0.513
	BMI	22.2 [13.2, 48.0]	23.3 [10.0, 47.3]	0.001	23.0 [14.6, 48.0]	23.3 [10.0, 47.3]	0.304
$ \begin{array}{c} \operatorname{AF}(\%) & 205 (44.3) & 121 (43.2) & 0.819 & 112 (43.8) & 111 (42.9) & 1.000 \\ \operatorname{DM}(\%) & 182 (39.3) & 103 (36.8) & 0.534 & 98 (37.8) & 97 (37.5) & 1.000 \\ \operatorname{COPD}(\%) & 37 (8.0) & 21 (7.5) & 0.888 & 26 (10.0) & 18 (6.9) & 0.270 \\ \operatorname{Dialysis}(\%) & 39 (8.4) & 16 (5.7) & 0.195 & 17 (6.6) & 14 (5.4) & 0.712 \\ \operatorname{Pneumonia}(\%) & 64 (13.8) & 21 (7.5) & 0.009 & 27 (10.4) & 20 (7.7) & 0.359 \\ \operatorname{Labo} \ data & & & & & & & & & & & & & & & & & & $	Comorbidity	- , -	. , ,		- / -		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	AF (%)	205 (44.3)	121 (43.2)	0.819	112 (43.8)	111 (42.9)	1.000
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	DM (%)	182 (39.3)	103 (36.8)	0.534	98 (37.8)	97 (37.5)	1.000
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	COPD (%)	37 (8.0)	21 (7.5)	0.888	26 (10.0)	18 (6.9)	0.270
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Dialysis (%)	39 (8.4)	16 (5.7)	0.195	17 (6.6)	14 (5.4)	0.712
Labo data BUN 30.4 ± 16.2 29.1 ± 17.7 0.294 29.0 ± 16.0 27.8 ± 16.4 0.409 Cr 1.20 [0.37, 14.05] 1.11 [0.45, 10.56] 0.136 1.85 ± 1.93 1.68 ± 1.73 0.293 eGFR 41.3 ± 23.6 46.3 ± 22.9 0.005 44.5 ± 24.1 47.3 ± 22.7 0.167 UA 6.5 ± 2.0 6.8 ± 2.1 0.04 6.66 ± 2.1 0.689 ± 2.1 2 0.23 Na 139.6 ± 4.0 139.5 ± 4.0 0.596 139.7 ± 4.3 139.6 ± 3.0 0.690 K 4.39 ± 0.66 4.43 ± 0.67 0.462 4.38 ± 0.68 4.39 ± 0.61 0.767 Hb 11.6 ± 2.3 12.4 ± 2.6 <0.001 12.2 ± 2.4 12.5 ± 2.64 0.209 Alb 3.58 ± 0.49 3.73 ± 0.52 <0.001 3.69 ± 0.47 3.73 ± 0.51 0.359 In hospital use Loop (%) 309 (66.7) 198 (71.0) 0.254 176 (63.8) 186 (71.8) 0.389 TLV (%) 81 (17.5) 42 (15.1) 0.416 47 (18.1) 42 (16.2) 0.641 Catecholamine (%) 50 (10.8) 62 (22.2) <0.001 35 (13.5) 53 (20.5) 0.046 Vasodilator (%) 82 (17.7) 48 (17.5) 0.921 50 (19.4) 44 (17.0) 0.496 NPPV (%) 57 (12.3) 38 (13.6) 0.673 97 (14.3) 32 (12.4) 0.605 CRT/CD (%) 12 (2.6) 15 (5.4) 0.067 9 (3.5) 11 (4.2) 0.820 Use at discharge MRA (%) 194 (41.9) 141 (50.5) 0.023 117 (45.2) 134 (51.7) 0.159 Anticoagulant (%) 199 (43.0) 123 (84.2) 0.171 217 (83.8) 220 (84.9) 0.809 BB (%) 336 (72.6) 231 (82.8) 0.002 207 (79.9) 214 (82.6) 0.499 MRA (%) 194 (41.9) 141 (50.5) 10.23 117 (45.2) 134 (51.7) 0.159 Anticoagulant (%) 199 (43.0) 123 (44.1) 0.819 113 (43.6) 111 (42.9) 9.929 Loop at discharge (%) 260 (56.2) 156 (55.7) 0.939 145 (56.0) 143 (55.2) 0.930 Loop dos (mg) 13.6 ± 16.0 14.2 ± 17.5 0.659 10.0 [0.0, 80.0] 10.0 [0.0, 120.0] 0.956 TLV continue (%) 71 (15.3) 49 (17.5) 0.472 43 (16.6) 43 (16.6) 1.000 TLV dose (mg) 64 ± 3.3 6.6 ± 3.4 0.836 6.35 ± 3.24 6.22 ± 3.10 0.850 TLV continue (%) 71 (15.3) 49 (17.5) 0.472 43 (16.6) 43 (16.6) 1.000 TLV dose (mg) 64 ± 3.3 6.6 ± 3.4 0.836 6.35 ± 3.24 6.22 ± 3.10 0.850 TLV continue (%) 14 (3.0) 16 (5.7) 0.083 11 (4.2) 11 (4.2) 1.000 SGLT2 (%) 10 (2.2) 17 (6.1) 0.083 11 (4.2) 11 (4.2) 1.000 SGLT2 (%) 10 (2.2) 17 (6.1) 0.083 11 (4.2) 11 (4.2) 1.000 SGLT2 (%) 10 (2.2) 17 (6.1) 0.083 11 (4.2) 11 (4.2) 1.000 SGLT2 (%) 10 (2.2) 17 (6.1) 0.083 11 (4.2) 11 (4.2) 1.000 SGLT2 (%) 32 (69.5) 135 (48.2	Pneumonia (%)	64 (13.8)	21 (7.5)	0.009	27 (10.4)	20 (7.7)	0.359
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Labo data						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	BUN	$30.4 \pm 16.2$	$29.1 \pm 17.7$	0.294	$29.0 \pm 16.0$	$27.8 \pm 16.4$	0.409
eGrR41.3 ± 23.646.3 ± 22.90.00544.5 ± 24.147.3 ± 22.70.167UA6.5 ± 2.06.8 ± 2.10.046.66 ± 2.106.89 ± 2.120.23Na139.6 ± 4.0139.5 ± 4.00.596139.7 ± 4.3139.6 ± 3.00.690K4.39 ± 0.664.43 ± 0.670.4624.38 ± 0.684.39 ± 0.610.767Hb11.6 ± 2.312.4 ± 2.6<0.001	Cr	1.20 [0.37, 14.05]	1.11 [0.45, 10.56]	0.136	$1.85 \pm 1.93$	$1.68 \pm 1.73$	0.293
DA $6.5 \pm 2.10$ $6.8 \pm 2.1$ $0.04$ $6.66 \pm 2.10$ $6.89 \pm 2.12$ $0.23$ Na $139.6 \pm 4.0$ $139.5 \pm 4.0$ $0.596$ $139.7 \pm 4.3$ $139.6 \pm 3.0$ $0.690$ K $4.39 \pm 0.66$ $4.43 \pm 0.67$ $0.462$ $4.38 \pm 0.68$ $4.39 \pm 0.61$ $0.767$ Hb $11.6 \pm 2.3$ $12.4 \pm 2.6$ $<0.001$ $12.2 \pm 2.4$ $12.5 \pm 2.64$ $0.209$ Alb $3.58 \pm 0.49$ $3.73 \pm 0.52$ $<0.001$ $3.69 \pm 0.47$ $3.73 \pm 0.51$ $0.359$ In hospital useCarpertide (%) $314$ (28.9) $85$ (30.5) $0.678$ $83$ (32.0) $77$ (29.7) $0.635$ Carpertide (%) $81$ (17.5) $42$ (15.1) $0.416$ $47$ (18.1) $42$ (16.2) $0.641$ Catcholamine (%) $50$ (10.8) $62$ (22.2) $<0.001$ $35$ (13.5) $53$ (20.5) $0.046$ Vasodilator (%) $82$ (17.7) $48$ (17.5) $0.921$ $50$ (19.4) $44$ (17.0) $0.496$ NPPV (%) $57$ (12.3) $38$ (13.6) $0.650$ $37$ (14.3) $32$ (12.4) $0.605$ CRT/LCD (%) $12$ (2.6) $15$ (5.4) $0.067$ $9$ (3.5) $11$ (4.2) $0.809$ BB (%) $336$ (72.6) $231$ (82.8) $0.002$ $207$ (79.9) $214$ (82.6) $0.499$ MRA (%) $199$ (43.0) $123$ (44.1) $0.819$ $113$ (43.6) $111$ (42.9) $9.929$ Lop at discharge (%) $260$ (56.2) $156$	eGFR	$41.3 \pm 23.6$	$46.3 \pm 22.9$	0.005	$44.5 \pm 24.1$	$4/.3 \pm 22.7$	0.167
Na139.6 $\pm$ 4.0139.5 $\pm$ 4.00.396139.7 $\pm$ 4.3139.6 $\pm$ 3.00.690K4.39 $\pm$ 0.664.43 $\pm$ 0.670.4624.38 $\pm$ 0.684.39 $\pm$ 0.610.767Hb11.6 $\pm$ 2.312.4 $\pm$ 2.6<0.001	UA	$6.5 \pm 2.0$	$6.8 \pm 2.1$	0.04	$6.66 \pm 2.10$	$6.89 \pm 2.12$	0.23
N4.35 $\pm$ 0.004.43 $\pm$ 0.010.4024.35 $\pm$ 0.064.35 $\pm$ 0.010.701Hb11.6 $\pm$ 2.312.4 $\pm$ 2.6<0.001	Na V	$139.0 \pm 4.0$	$139.5 \pm 4.0$	0.590	$139.7 \pm 4.3$	$139.0 \pm 3.0$	0.090
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ЧЬ	$4.39 \pm 0.00$ 11 6 + 2 3	$4.43 \pm 0.07$ 12 4 + 2 6	0.402 <0.001	$4.30 \pm 0.00$ 122 + 24	$4.39 \pm 0.01$ 125 + 264	0.707
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Alb	$358 \pm 0.49$	$12.4 \pm 2.0$ 3 73 + 0 52	< 0.001	$369 \pm 0.47$	$12.3 \pm 2.04$ 3 73 + 0 51	0.209
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	In hospital use	5.50 2 0.45	5.75 ± 0.52	0.001	5.05 2 0.47	5.75 - 0.51	0.555
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Loop (%)	309 (66.7)	198 (71.0)	0.254	176 (63.8)	186 (71.8)	0.389
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	TLV (%)	134 (28.9)	85 (30.5)	0.678	83 (32.0)	77 (29.7)	0.635
$\begin{array}{c} \mbox{Catcholamine}(\%) & 50 (10.8) & 62 (22.2) & <0.001 & 35 (13.5) & 53 (20.5) & 0.046 \\ \mbox{Vasodilator}(\%) & 82 (17.7) & 48 (17.5) & 0.921 & 50 (19.4) & 44 (17.0) & 0.496 \\ \mbox{NPPV}(\%) & 57 (12.3) & 38 (13.6) & 0.650 & 37 (14.3) & 32 (12.4) & 0.605 \\ \mbox{CRT/ICD}(\%) & 12 (2.6) & 15 (5.4) & 0.067 & 9 (3.5) & 11 (4.2) & 0.820 \\ \mbox{Use at discharge} & & & & & & & & & & & & & & & & & & &$	Carperitide (%)	81 (17.5)	42 (15.1)	0.416	47 (18.1)	42 (16.2)	0.641
Vasodilator (%)82 (17.7)48 (17.5)0.92150 (19.4)44 (17.0)0.496NPPV (%)57 (12.3)38 (13.6)0.65037 (14.3)32 (12.4)0.605CRT/ICD (%)12 (2.6)15 (5.4)0.0679 (3.5)11 (4.2)0.820Use at discharge	Catecholamine (%)	50 (10.8)	62 (22.2)	< 0.001	35 (13.5)	53 (20.5)	0.046
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Vasodilator (%)	82 (17.7)	48 (17.5)	0.921	50 (19.4)	44 (17.0)	0.496
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	NPPV (%)	57 (12.3)	38 (13.6)	0.650	37 (14.3)	32 (12.4)	0.605
Use at dischargeACEI/ARB (%) $370$ (79.9) $235$ (84.2) $0.171$ $217$ (83,8) $220$ (84.9) $0.809$ BB (%) $336$ (72.6) $231$ (82.8) $0.002$ $207$ (79.9) $214$ (82.6) $0.499$ MRA (%) $194$ (41.9) $141$ (50.5) $0.023$ $117$ (45.2) $134$ (51.7) $0.159$ Anticoagulant (%) $199$ (43.0) $123$ (44.1) $0.819$ $113$ (43.6) $111$ (42.9) $9.929$ Loop at discharge (%) $260$ (56.2) $156$ (55.7) $0.939$ $145$ (56.0) $143$ (55.2) $0.930$ Loop dose (mg) $13.6 \pm 16.0$ $14.2 \pm 17.5$ $0.659$ $10.0$ [ $0.0, 80.0$ ] $10.0$ [ $0.0, 120.0$ ] $0.956$ TLV continue (%) $71$ (15.3) $49$ (17.5) $0.472$ $43$ (16.6) $43$ (16.6) $1.000$ TLV dose (mg) $6.4 \pm 3.3$ $6.6 \pm 3.4$ $0.836$ $6.35 \pm 3.24$ $6.22 \pm 3.10$ $0.850$ PDE III i (%) $14$ (3.0) $16$ (5.7) $0.083$ $11$ ( $4.2$ ) $1.000$ SGLT2i (%) $10$ ( $2.2$ ) $17$ ( $6.1$ ) $0.008$ $7$ ( $2.7$ ) $16$ ( $6.2$ ) $0.086$ After discharge $No. visits per year$ $3.8 \pm 4.3$ $4.3 \pm 3.7$ $0.137$ $4.2 \pm 4.3$ $4.5 \pm 3.7$ $0.391$ Outpatient rehabili (%) $36$ ( $7.8$ ) $30$ ( $10.7$ ) $0.185$ $19$ ( $7.3$ ) $27$ ( $10.4$ ) $0.280$ Followed by GP (%) $322$ ( $69.5$ ) $135$ ( $48.2$ ) $<0.001$ $155$ ( $59.8$ ) $131$ ( $50.6$ ) $0.042$	CRT/ICD (%)	12 (2.6)	15 (5.4)	0.067	9 (3.5)	11 (4.2)	0.820
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Use at discharge						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ACEI/ARB (%)	370 (79.9)	235 (84.2)	0.171	217 (83,8)	220 (84.9)	0.809
MRA (%)194 (41.9)141 (50.5) $0.023$ $117 (45.2)$ $134 (51.7)$ $0.159$ Anticoagulant (%)199 (43.0)123 (44.1) $0.819$ $113 (43.6)$ $111 (42.9)$ $9.929$ Loop at discharge (%)260 (56.2)156 (55.7) $0.939$ $145 (56.0)$ $143 (55.2)$ $0.930$ Loop dose (mg)13.6 ± 16.0 $14.2 \pm 17.5$ $0.659$ $10.0 [0.0, 80.0]$ $10.0 [0.0, 120.0]$ $0.956$ TLV continue (%)71 (15.3)49 (17.5) $0.472$ 43 (16.6)43 (16.6) $1.000$ TLV dose (mg) $6.4 \pm 3.3$ $6.6 \pm 3.4$ $0.836$ $6.35 \pm 3.24$ $6.22 \pm 3.10$ $0.850$ PDE III i (%)14 (3.0)16 (5.7) $0.083$ 11 (4.2) $1.000$ SGLT2i (%)10 (2.2)17 (6.1) $0.008$ 7 (2.7)16 (6.2) $0.866$ After dischargeNo. visits per year $3.8 \pm 4.3$ $4.3 \pm 3.7$ $0.137$ $4.2 \pm 4.3$ $4.5 \pm 3.7$ $0.391$ Outpatient rehabili (%) $36 (7.8)$ $30 (10.7)$ $0.185$ $19 (7.3)$ $27 (10.4)$ $0.280$ Followed by GP (%) $322 (69.5)$ $135 (48.2)$ $<0.001$ $155 (59.8)$ $131 (50.6)$ $0.042$	BB (%)	336 (72.6)	231 (82.8)	0.002	207 (79.9)	214 (82.6)	0.499
Anticoagulant (%)199 (43.0)123 (44.1) $0.819$ 113 (43.6)111 (42.9)9.929Loop at discharge (%)260 (56.2)156 (55.7) $0.939$ 145 (56.0)143 (55.2) $0.930$ Loop dose (mg)13.6 ± 16.014.2 ± 17.5 $0.659$ 10.0 [0.0, 80.0]10.0 [0.0, 120.0] $0.956$ TLV continue (%)71 (15.3)49 (17.5) $0.472$ 43 (16.6)43 (16.6)1.000TLV dose (mg) $6.4 \pm 3.3$ $6.6 \pm 3.4$ $0.836$ $6.35 \pm 3.24$ $6.22 \pm 3.10$ $0.850$ PDE III i (%)14 (3.0)16 (5.7) $0.083$ 11 (4.2)1.000SGLT2i (%)10 (2.2)17 (6.1) $0.008$ 7 (2.7)16 (6.2) $0.866$ After dischargeNo. visits per year $3.8 \pm 4.3$ $4.3 \pm 3.7$ $0.137$ $4.2 \pm 4.3$ $4.5 \pm 3.7$ $0.391$ Outpatient rehabili (%)36 (7.8)30 (10.7) $0.185$ 19 (7.3)27 (10.4) $0.280$ Followed by GP (%)322 (69.5)135 (48.2)<0.001	MRA (%)	194 (41.9)	141 (50.5)	0.023	117 (45.2)	134 (51.7)	0.159
Loop at discharge (%)260 (56.2)156 (55.7) $0.939$ 145 (56.0)143 (55.2) $0.930$ Loop dose (mg)13.6 ± 16.014.2 ± 17.50.65910.0 [0.0, 80.0]10.0 [0.0, 120.0]0.956TLV continue (%)71 (15.3)49 (17.5) $0.472$ 43 (16.6)43 (16.6)1.000TLV dose (mg) $6.4 \pm 3.3$ $6.6 \pm 3.4$ $0.836$ $6.35 \pm 3.24$ $6.22 \pm 3.10$ $0.850$ PDE III i (%)14 (3.0)16 (5.7) $0.083$ 11 (4.2)1.000SGLT2i (%)10 (2.2)17 (6.1) $0.008$ 7 (2.7)16 (6.2) $0.086$ After dischargeNo. visits per year $3.8 \pm 4.3$ $4.3 \pm 3.7$ $0.137$ $4.2 \pm 4.3$ $4.5 \pm 3.7$ $0.391$ Outpatient rehabili (%)36 (7.8)30 (10.7) $0.185$ 19 (7.3)27 (10.4) $0.280$ Followed by GP (%)322 (69.5)135 (48.2)<0.001	Anticoagulant (%)	199 (43.0)	123 (44.1)	0.819	113 (43.6)	111 (42.9)	9.929
Loop dose (mg)13.6 $\pm$ 16.014.2 $\pm$ 17.50.65910.0 [0.0, 80.0]10.0 [0.0, 120.0]0.956TLV continue (%)71 (15.3)49 (17.5)0.47243 (16.6)43 (16.6)1.000TLV dose (mg)6.4 $\pm$ 3.36.6 $\pm$ 3.40.8366.35 $\pm$ 3.246.22 $\pm$ 3.100.850PDE III i (%)14 (3.0)16 (5.7)0.08311 (4.2)1.000SGLT2i (%)10 (2.2)17 (6.1)0.0087 (2.7)16 (6.2)0.086After dischargeNo. visits per year3.8 $\pm$ 4.34.3 $\pm$ 3.70.1374.2 $\pm$ 4.34.5 $\pm$ 3.70.391Outpatient rehabili (%)36 (7.8)30 (10.7)0.18519 (7.3)27 (10.4)0.280Followed by GP (%)322 (69.5)135 (48.2)<0.001	Loop at discharge (%)	260 (56.2)	156 (55.7)	0.939	145 (56.0)	143 (55.2)	0.930
TLV continue (%) $71$ (15.3) $49$ (17.5) $0.472$ $43$ (16.6) $43$ (16.6) $1.000$ TLV dose (mg) $6.4 \pm 3.3$ $6.6 \pm 3.4$ $0.836$ $6.35 \pm 3.24$ $6.22 \pm 3.10$ $0.850$ PDE III i (%) $14$ (3.0) $16$ (5.7) $0.083$ $11$ (4.2) $11$ (4.2) $1.000$ SGLT2i (%) $10$ (2.2) $17$ (6.1) $0.008$ $7$ (2.7) $16$ (6.2) $0.086$ After dischargeNo. visits per year $3.8 \pm 4.3$ $4.3 \pm 3.7$ $0.137$ $4.2 \pm 4.3$ $4.5 \pm 3.7$ $0.391$ Outpatient rehabili (%) $36$ (7.8) $30$ (10.7) $0.185$ $19$ (7.3) $27$ (10.4) $0.280$ Followed by GP (%) $322$ (69.5) $135$ (48.2) $<0.001$ $155$ (59.8) $131$ (50.6) $0.042$	Loop dose (mg)	$13.0 \pm 10.0$	$14.2 \pm 17.5$	0.659	10.0 [0.0, 80.0]		0.956
PDE III i (%) $0.4 \pm 3.5$ $0.6 \pm 5.4$ $0.636$ $0.33 \pm 3.24$ $0.22 \pm 3.10$ $0.301$ PDE III i (%) $14$ (3.0) $16$ (5.7) $0.083$ $11$ (4.2) $11$ (4.2) $1.000$ SGLT2i (%) $10$ (2.2) $17$ (6.1) $0.008$ $7$ (2.7) $16$ (6.2) $0.086$ After dischargeNo. visits per year $3.8 \pm 4.3$ $4.3 \pm 3.7$ $0.137$ $4.2 \pm 4.3$ $4.5 \pm 3.7$ $0.391$ Outpatient rehabili (%) $36$ (7.8) $30$ (10.7) $0.185$ $19$ (7.3) $27$ (10.4) $0.280$ Followed by GP (%) $322$ (69.5) $135$ (48.2) $<0.001$ $155$ (59.8) $131$ (50.6) $0.042$	TLV continue (%)	/ I (15.3) 6 4 ± 2 2	49 (17.5)	0.472	43 (10.0) 6 35 ± 3 34	43(10.0)	
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After discharge         17 (6.7)         0.000         7 (2.7)         10 (0.2)         0.000           After discharge         No. visits per year         3.8 ± 4.3         4.3 ± 3.7         0.137         4.2 ± 4.3         4.5 ± 3.7         0.391           Outpatient rehabili (%)         36 (7.8)         30 (10.7)         0.185         19 (7.3)         27 (10.4)         0.280           Followed by GP (%)         322 (69.5)         135 (48.2)         <0.001	SGIT2i (%)	10 (2.2)	17 (6 1)	0.003	7 (2 7)	16 (6 2)	0.026
No. visits per year         3.8 ± 4.3         4.3 ± 3.7         0.137         4.2 ± 4.3         4.5 ± 3.7         0.391           Outpatient rehabili (%)         36 (7.8)         30 (10.7)         0.185         19 (7.3)         27 (10.4)         0.280           Followed by GP (%)         322 (69.5)         135 (48.2)         <0.001	After discharge	10 (2.2)	17 (0.1)	0.000	/ \2./)	10 (0.2)	0.000
Outpatient rehabili (%)         36 (7.8)         30 (10.7)         0.185         19 (7.3)         27 (10.4)         0.280           Followed by GP (%)         322 (69.5)         135 (48.2)         <0.001	No visits per vear	38+43	43+37	0 1 3 7	42 + 43	45 + 37	0 391
Followed by GP (%) 322 (69.5) 135 (48.2) <0.001 155 (59.8) 131 (50.6) 0.042	Outpatient rehabili (%)	36 (7.8)	30 (10.7)	0.185	19 (7.3)	27 (10.4)	0.280
	Followed by GP (%)	322 (69.5)	135 (48.2)	< 0.001	155 (59.8)	131 (50.6)	0.042

Data are given as n (%), the mean  $\pm$  SD or the median plus confidence interval.

ACEI/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; AF, atrial fibrillation; Alb, albumin; BB, beta-blocker; BMI, body mass index; BNP, brain natriuretic peptide; BUN, blood urea nitrogen; COPD, chronic obstructive pulmonary disease; Cr, creatinine; CRT/ICD, cardiac resynchronization therapy/implantable cardioverter defibrillator; dBP, diastolic blood pressure; DM, diabetes mellitus; EF, ejection fraction; eGFR, estimated glomerular filtration rate; Followed by GP, patients followed by general practitioner after first visit; Frequent flyer, patients hospitalized for decompensated HF at least twice in the past year; Hb, haemoglobin; HF, heart failure; HFmrEF, HF with mid-range EF; HFpEF, HF with preserved EF; HFrEF, heart failure with reduced EF; HR, heart rate; IHD, ischemic heart disease; Loop, loop diuretics; MRA, mineralocorticoid receptor agonistNo. visits per year, Number of visits to our outpatient department after first visit per year; NPPV, non-invasive positive pressure ventilation; NYHA, New York Heart Association classification; Outpatient rehabilit, patients performed outpatient rehabilitation; PDE III i, phosphodiesterase III inhibitor; sBP, systolic blood pressure; SGLT2i, sodium glucose cotransporter2 inhibitor; TLV, tolvaptan; UA, uric acid.



Figure 2 Survival curves of freedom from HF readmission (A) and HF readmissions and all-cause death (B) between the propensity matched patients with or without early follow-up after discharge by a Kaplan–Meier analysis. CI, confidence interval; HF, heart failure; HR, hazard ratio.

**Figure 3** Subgroup analysis between patients with or without early follow-up after discharge by cox proportional hazard model presented by a forest plot. EF, ejection fraction; GP, general practitioner; HF, heart failure; HFmrEF, HF with mid-range EF; HFpEF, HF with preserved EF; HFrEF, heart failure with reduced EF; IHD, ischemic heart disease; NPPV, non-invasive positive pressure ventilation.

		Hazard ratio				
		95% CI	p-value			
total		0.630 [0.444, 0.892]	0.009	· · · · · · · · · · · · · · · · · · ·		
Age	>75v o	0 660 [0 435 1 003]	0.051			
7,90	<75y.o.	0.660 [0.457, 0.954]	0.027			
0			0.010			
Sex	male	0.790 [0.544, 1.150]	0.219	· · · · · · · · · · · · · · · · · · ·		
	female	0.360 [0.170, 0.763]	0.007	· · · · · · · · · · · · · · · · · · ·		
Etiology	IHD	0.553 [0.328, 0.931]	0.025	·		
	non IHD	0.860 [0.560, 1.131]	0.490	· · · · · · · · · · · · · · · · · · ·		
FF	HErEE	0 505 [0 319 0 800]	0.003	· · _ · · · · · · · · · · · · · · · · ·		
Ei	HEmrEE	0 709 [0 313 1 612]	0.000			
		0.020 [0.513, 1.012]	0.415			
	пгрег	0.939 [0.555, 1.655]	0.020			
Cathecolamine use	(+)	0.474 [0.242, 0.927]	0.029	•		
	(-)	0.685 [0.471, 0.996]	0.048	• • • • • • • • • • • • • • • • • • •		
NPPV use	(+)	0.614 [0.216, 1.743]	0.359	•		
	(-)	0.683 [0.485, 0.962]	0.029			
boonital opty	long (>10dava)	0 914 [0 529 1 222]	0.221		_	
nospital saty	iong (>190ays)	0.014 [0.536, 1.232]	0.331			
	snort (<19days)	0.384 [0.212, 0.695]	0.001			
HF admissions	frequent flyer	0.648 [0.359, 1.167]	0.148			
	de novo	0.644 [0.435, 0.953]	0.027			
Follow up	with GP	0 724 [0 462 1 136]	0 160	• <u> </u>		
i oliow up	own facility	0.574 [0.354 0.932]	0.024	• • • • • • • • • • • • • • • • • • •		
	Own facility	0.074 [0.004, 0.802]	0.024			
			0	0.5 1	1.5	2

Figure 4 Survival curves of freedom from HF readmission between patients whether or not adjustment of medication was performed in early follow-up group by a Kaplan–Meier analysis. HF, heart failure.



### Discussion

The present study demonstrated that early follow-up at outpatient care reduced HF readmissions and improved prognosis in CHF patients in a long-term. Although there have been reports of short-term efficacy of early follow-up approach for CHF patients,<sup>14,15</sup> this is the first report of long-term efficacy. At first, we showed that the early follow-up was an independent factor associated with a reduced long-term HF readmission rate and the composite adverse outcome. Then, we compared the patients groups with or without early follow-up regarding their prognosis. Comparing the backgrounds of the two groups, the early follow-up group included more patients of younger, male, higher BMI, low EF, IHD, pneumonia, longer hospital stay, less percentage followed by GP, higher eGFR, higher Hb, higher Alb, in-hospital catecholamine use, beta-blocker use at discharge, as well as MRA and SGLT2 inhibitor. The early follow-up group seemed to have a slightly higher proportion of severe illness but includes some factors that may be related to better prognosis such as more GBMT prescribed. Thus, we further performed a propensity score matching analysis to eliminate the effects of these confounding factors. After the propensity matching, the efficacy of early follow-up for long-term HF readmissions and prognosis robustly remained. These results demonstrate that early follow-up is associated with a reduction of HF readmissions and is improving the prognosis in CHF patients in a long-term.

We further investigated what kind of intervention was performed for patients in the early follow-up outpatient care and influenced the outcome. Regardless of whether it is an early follow-up visit or not, outpatient care at first visit to our hospital after discharge included medical examinations, lifestyle guidance, and an adjustment of drugs as needed. A systematic lifestyle guidance such as salt reduction guidance, daily check of body weight, and avoidance of physical overload was performed by a cardiologist and/or a nurse.

First, we considered that medication adjustments may have affected HF readmissions. Medication adjustments were done in only 33.2% of the patients in the early follow-up group. Further, whether or not medication adjustments were done at the early follow-up was not associated with the reduction in HF readmissions. These results suggest that adjustments of medications (i.e. titration of ACE inhibitor, betablocker, and MRA) or long-term follow-up by cardiologists may not be major causes of the favourable outcome in the early follow-up group. However, it was not possible to investigate changes in the medication during the subsequent follow-up period, which is a significant limitation of the present study.

Second, it may be possible that follow-up intensity and contents have influenced the outcome. A number of visits to our hospital and outpatient rehabilitation were not associated with HF readmission in the primary univariate analysis. Furthermore, there was no difference between the two groups with regards to the number of visits to our hospital and outpatient rehabilitation. Thus, it was probable that the effects of follow-up intensity and outpatient rehabilitation did not affect the results of the present study.

The mechanism by which an early follow-up approach was associated with the favourable outcomes remains to be clarified. Outpatient care at first visit to our hospital after discharge included medical examinations, systematic lifestyle guidance, and an adjustment of drugs as needed by a cardiologist and/or a nurse of a HF team. It has been reported that follow-up by cardiologists improved prognosis.<sup>19,20</sup> It is also known that HF readmissions are likely to occur early after discharge, especially within a month.<sup>14</sup> Previous reports demonstrated that early follow-up at outpatient care 7 days after discharge reduce 30 days HF readmission.<sup>15,16</sup> It is likely that an early follow-up approach provided as a HF team intervention during periods of high likelihood of re-exacerbation of HF resulted in favourable outcomes. However, this alone cannot explain the favourable long-term outcomes in the present study.

We considered the reason why an early follow-up approach brought the long-term effect. It was possible that continuous modifications of patient factors were brought by the early follow-up. By setting up an early follow-up outpatient care after discharge, patients may become aware of the fact that they will be immediately checked whether they are keeping with the instructed lifestyle guidance and drug adherence. As a result, patients themselves will be strongly aware of self-managements such as restriction of salt intake, avoiding overwork, and daily-check of body weight after discharge. Another study has shown that self-management skills provided with educational methods do not persist without consistent follow-up and re-enforcement of education.<sup>21</sup> In the present study, patient education including lifestyle guidance had been started from the acute hospitalization period and was repeated in the follow-up visits. Contents at the first visit were not different between the early follow-up group and non-early follow-up group. It was probable that an early follow-up served as a key opportunity to immediately reconfirm the self-management learned during hospitalization, leading to a successful continuation of self-management. In other words, an early follow-up significantly influences patient factors in a long-term, and as a result, reduces HF readmissions and improves prognosis. HF readmissions have not decreased in the last decade partly because the patient factors that account for the majority of causes of HF readmissions are difficult to intervene. Our results indicated that an early follow-up after discharge may be one of a meaningful strategy to improve patient factors.

An early follow-up approach has been performed in only 37.6% of the patients in the present study. Although attending physicians feel its effectiveness, the reality is that they are not able to do it due to various reasons. Thus, we added subgroup analyses to find out in which patients we should recommend an early follow-up. The subgroup analyses showed that early follow-up approach seemed to be more effective in patients of: younger than 75 years, female, IHD, HFrEF, non-invasive positive pressure ventilation use, shorter hospital stay, de novo CHF, and follow-up by the own facility. It was possible that understanding and the effect of patient education in the early follow-up may be greater in younger and female patients. It was understandable that the educational effect of early follow-up would be high in those with shorter hospital stay and de novo CHF. Although the tendency of reduced risk with early follow-up was fairly preserved in a wide range of patient characteristics, mechanisms of greater reduction of HR observed in the subgroups of IHD and HFrEF remain to be further investigated. An early follow-up approach should be provided considering these patient backgrounds and situational factors.

Several limitations in the present study should be mentioned. First, this study is a single-centre retrospective cohort study. We therefore performed propensity score matching analysis in order to improve the statistical credibility. Second, whether or not early follow-up is performed depends on the judgement of the attending physician, so there is considerable selection bias in the present study. Third, changes in content of medication during the follow-up period may affect the results, but it is impossible to confirm them in the present study design. Further prospective study is needed.

In conclusion, the present study demonstrates that an early follow-up approach after discharge in congestive HF patients may improve the long-term prognosis. These results were not dependent on whether medication adjustment was performed. The early follow-up may be a leading strategy to improve patient factors that account for the HF worsening and readmissions.

### **Conflict of interest**

There is no conflict of interest.

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### Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

 Table S1. Association with HF readmission and composite

 outcome after propensity matching.

 Table S2. Medication adjustment at early follow-up care.

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