Heart rate control and its relation to mortality in patients with chronic heart failure at Viet Tiep Friendship Hospital

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ABSTRACT

Objectives: To evaluate the association between discharge heart rate and cardiovascular mortality within 6 months after discharge in patients with chronic heart failure. ***Methods:*** A prospective descriptive study was conducted on 105 patients with chronic heart failure treated at the Cardiology Department, Viet Tiep Friendship Hospital, from January 2024 to November 2025. Heart failure was diagnosed according to the 2021 ESC criteria. Patients were divided into two groups: discharge heart rate <70 bpm (n=42) and discharge heart rate ≥70 bpm (n=63). Baseline characteristics including age, sex, comorbidities, NYHA classification, and cardiovascular mortality within 6 months were recorded. Survival was analyzed using the Kaplan–Meier method and Cox regression model. ***Results:*** The mean age was 68.81 ± 12.1 years, with 47.62% aged ≥70 years. Females accounted for 50.48%. Most patients were classified as NYHA III–IV (77.28%). Common comorbidities included hypertension (60.95%), atrial fibrillation (29.52%), valvular heart disease (27.62%), and chronic kidney disease (21.9%). One-month mortality was 9.52% in the group with discharge heart rate ≥70 bpm versus 2.38% in the group with discharge heart rate <70 bpm (p>0.05). Six-month mortality was 3.17% in the ≥70 bpm group compared with 0% in the <70 bpm group. Kaplan–Meier analysis revealed a trend toward higher mortality in patients with discharge heart rate ≥70 bpm, although the difference was not statistically significant (HR=2.55; 95% CI: 0.71–9.13; p>0.05). ***Conclusion:*** A discharge heart rate ≥70 bpm is associated with a trend toward higher 6-month mortality in patients with chronic heart failure.

Keywords: *Chronic heart failure, heart rate, mortality, prognosis.*

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Received: October 3, 2025
Reviewed: October 5, 2025
Accepted: November 24, 2025

INTRODUCTION

Chronic heart failure (CHF) represents a major global health burden, with high rates of hospitalization and mortality, particularly in countries with rapidly aging populations. Large-scale trials such as SHIFT (Systolic Heart failure treatment with the I f inhibitor ivabradine Trial) and BEAUTIFUL (Ivabradine for patients with stable coronary artery disease and left-ventricular systolic dysfunction) have demonstrated that heart rate is an independent prognostic factor, associated with increased risk of hospitalization and death in patients with heart failure with reduced ejection fraction (HFrEF) [1],[2].

The 2021 ESC Guidelines also emphasized the importance of heart rate control, particularly achieving a target heart rate < 70 beats per minute (bpm), in improving prognosis [3]. In Vietnam, data on heart rate

control and its association with mortality in CHF patients remain limited. Therefore, we conducted this study with the objective of assessing clinical characteristics and evaluating the association between discharge heart rate and mortality among patients with chronic heart failure treated at Viet Tiep Friendship Hospital between January 2024 and November 2025.

METHODS

Study population

A total of 105 patients with chronic heart failure, diagnosed according to the 2021 ESC criteria, were enrolled [3]. All patients were admitted and treated at the Cardiology Department, Viet Tiep Friendship Hospital, between January 2024 and May 2025.

Inclusion criteria

- Written informed consent to participate.
- Diagnosis of chronic heart failure based on the 2021 ESC criteria, including BNP/NT-proBNP levels and echocardiographic findings.
- Hospitalization at the Cardiology Department during the study period (01/2024 – 05/2025).

Exclusion criteria

- Patients with impaired consciousness, unable to provide clinical information.
- Patients with permanent pacemaker implantation.
- Patients without complete 6-month follow-up after discharge.

Study design

This was a prospective descriptive study.

Sample size and sampling

Convenience sampling was used, including all eligible patients during the study period. A total of 105 patients were recruited, comprising 42 patients with a discharge heart rate <70 bpm and 63 patients with a discharge heart rate ≥70 bpm.

Data collection

- Standardized medical history forms and clinical examination records.
- Study variables included age, sex, NYHA functional class, comorbidities, and 6-month mortality.

Data analysis

- Statistical analysis was performed using Stata software 14.0.
- Continuous variables were expressed as mean ± SD, and categorical variables as percentages.
- Associations with mortality were assessed using Kaplan–Meier survival analysis and the Cox proportional hazards model.

RESULTS

Table 3.1. *General characteristics of study population*

Characteristics (n=105)		Results
Mean age (X ± SD)		68,81 ± 12,1
Age distribution (n,%)	< 40	3 (2.68%)
	40-49	2 (1.9%)
	50-59	15 (14.29%)
	60-69	35 (33.33%)
	≥ 70	50 (47.62)
Sex (n,%)	Male	52 (49.52%)
	Female	53 (50.48%)

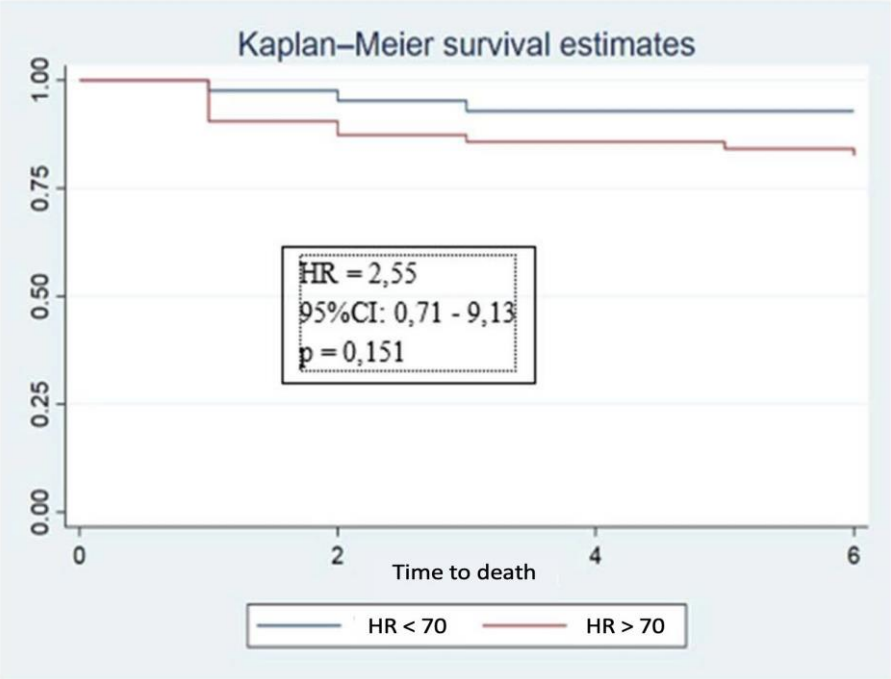
NYHA functional class (n,%)	NYHA I	1 (0.95%)
	NYHA II	26 (24.76%)
	NYHA III	56 (53.33%)
	NYHA IV	20 (23.95%)
Atrial fibrillation		31 (29.52%)
Coronary artery disease		26 (24.76%)
Coronary intervention		12 (11.43%)
prior myocardial infarction		13 (12.38%)
Valvular heart disease		29 (27.62%)
Hypertension		64 (60.95%)
COPD/Asthma		12 (11.43%)
Diabetes mellitus insulin treated		8 (7.62%)
Diabetes mellitus non-insulin-treated		26 (24.76%)
Chronic kidney disease		23 (21.9%)
Anemia		20 (19.05%)
Hemodialysis		3 (2.86%)
Smoking		25(23.81%)

Comment: The majority of patients were aged ≥60 years (80,95%), with a nearly equal male-to-female ratio. Most patients were classified as NYHA class III–IV (77,28%, and hypertension was the most prevalent comorbidity.

Table 3.2. *All-cause mortality during follow-up in two groups*

Mortality	Heart rate at discharge < 70 bpm **(n1=42)**		Heart rate at discharge ≥ 70 bpm **(n2=63)**		Total **(n=105)**		p (n1,n2)
	n	%	n	%	n	%	
1-month mortality	1	2.38	6	9.52	7	6.67	0.15
3-month mortality	3	7.14	3	4.76	6	5.71	0.61
6-month mortality	0	0	2	3.17	2	1.9	0.24
Mean survival time ($\bar{X} \pm SD$) (Max-min)	5.7 ± 1 (1-6)		5.3 ± 1,6 (1-6)		5.4 ± 1.4 (1-6)		0.57

Comment: No significant difference in all-cause mortality between the two groups (p>0.05). Kaplan-Meier curves also showed no statistically significant difference in survival probability (p>0.05).



Number of deaths \ Month	1	2	3	4	5	6
Heart rate at discharge < 70 bpm	1	1	1	0	0	0
Heart rate at discharge ≥ 70 bpm	6	2	1	1	1	1

Figure 3.1. *Cumulative incidence of all-cause mortality over time in the two study groups*

Comment: There was no statistically significant difference in the incidence of all-cause mortality between the two study groups (p > 0.05).

DISCUSSION

Age and sex: The mean age of the study cohort was 68.81 ± 12.1 years, with the majority of patients were aged ≥60 years (80,95%) nearly and half of patients (47.62%) aged ≥ 70 years, consistent with the epidemiological profile of CHF as a condition primarily affecting the elderly. This aligns with prior findings: SHIFT (2010) reported a mean age of 60.4 ± 11.5 years, while Nguyen Thi Thanh (National Geriatric Hospital, 2022) reported 72.67 ± 9.42 years [4]. The sex distribution in our study was nearly equal (49.52% male vs. 50.48% female), differing from both international and domestic studies. For example, SHIFT (2010, Swedberg et al., Lancet) included ~76% male patients, while Nguyen Duc Khanh (Cho Ray Hospital, 2024) reported 57.7% male. This relatively higher proportion of female patients in our cohort may reflect population-specific characteristics at Viet Tiep Friendship Hospital [1],[5].

NYHA classification: Most patients were admitted with advanced functional impairment: 53.33% in NYHA III and 23.95% in NYHA IV, meaning over three-quarters experienced severe dyspnea. By contrast, the CHAMP-HF registry in the US

reported 64% in NYHA II and only 9% in NYHA IV. These findings suggest that Vietnamese patients often present at more advanced stages, reflecting challenges in early diagnosis and outpatient management. Higher NYHA class is closely linked with adverse prognosis, which may partially explain the mortality observed in our study [6].

Comorbidities: Hypertension was the most frequent comorbidity (60.95%), consistent with both domestic and international literature. Coronary artery disease accounted for 24.76%, lower than the >40% typically reported in Western populations, highlighting epidemiological differences. Other frequent comorbidities included valvular heart disease (27.62%), chronic kidney disease (21.9%), diabetes mellitus (32.38%), anemia (19.05%), and COPD/asthma (11.43%). Only a small proportion required dialysis (2.86%) [7].

Mortality: Overall mortality rates were modest: 6.67% at 1 month, 5.71% at 3 months, and 1.9% at 6 months. Early mortality (within 1 month) was more frequent in the ≥70 bpm group (9.52% vs. 2.38%), although not statistically significant. This suggests that elevated discharge heart rate may predict early mortality. Kaplan-Meier analysis demonstrated a trend toward reduced survival in patients with discharge heart rate ≥70 bpm (HR=2.55; 95% CI: 0.71–9.13). These findings are consistent with landmark trials such as SHIFT (2010) and BEAUTIFUL (2008), which confirmed elevated heart rate as an independent predictor of mortality and rehospitalization in CHF [1],[2]. Similar observations have been reported in domestic studies, including Lam Duc Thang & Tran Viet An (2019), underscoring that achieving a discharge heart rate <70 bpm may confer prognostic benefit [8].

Limitations: This study has several limitations. First, it was conducted in a single tertiary hospital with a relatively small sample size, which may limit the generalizability of the findings. Second, the study population consisted of hospitalized patients, whereas major trials like SHIFT and BEAUTIFUL focused on stable outpatients; this difference may influence baseline characteristics and outcomes. Third, follow-up duration was limited to 6 months, which may not fully capture long-term mortality trends. Lastly, some potential confounders such as medication adherence and socioeconomic factors were not analyzed in depth.

CONCLUSION

A discharge heart rate ≥70 bpm was associated with a trend toward higher 6-month all-cause mortality among patients with chronic heart failure, although the difference was not statistically significant.

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