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Impact of Care-Seeking Delay on Hospital Treatment and Clinical Outcomes in Patients with Chronic Heart Failure

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Abstract

Objective: To investigate the relationship between care-seeking delay and hospital treatment as well as clinical outcomes in patients with chronic heart failure (CHF).

Methods: This retrospective cohort study included 265 heart failure patients who visited the Department of Cardiology at Peking University Third Hospital from January 2019 to December 2022. Patients were divided into two groups based on the median care-seeking delay time (7 days): the care-seeking delay group and the non-care-seeking delay group. The study analyzed demographic basic information, hospital treatment information (length of stay, average daily cost, medication use), and information related to clinical outcome (including HF-related symptoms, mortality, readmission rate within 3 months, cardiac function classification, left ventricular ejection fraction, BNP/NT-proBNP, etc.) between the two groups.

Results: The median care-seeking delay time for the 265 patients was 7 days (P_{25}=2 days; P_{75}=58 days). Statistical analysis showed that the average length of hospital stay and hospitalization costs were significantly higher in the care-seeking delay group than in the non-care-seeking delay group, with statistical significance (P<0.05). There were statistically significant differences between the two groups in the presence of exertional dyspnea, lower limb edema, decreased exercise tolerance, and dyspnea during sleep on admission (P<0.05). The use of SGLT2i, intravenous diuretics, MRA, and NOACs during hospitalization also showed statistically significant differences (P<0.05). In terms of clinical outcomes, there was no statistically significant difference in the readmission rate within 3 months between the two groups, the BNP level on discharge was lower in the care-seeking delay group than in the non-care-seeking delay group (P=0.015), and the proportion of patients with EF<40% was significantly higher in the care-seeking delay group (P=0.032).

Conclusion: Care-seeking delay significantly increases the length of hospital stay and hospitalization costs for patients with chronic heart failure and is closely related to hospital treatment and clinical outcomes.

Keywords: *Chronic heart failure, Care-seeking delay, Hospital treatment, Clinical outcomes, Retrospective study*

Heart failure is a complex clinical syndrome caused by various reasons leading to abnormal changes in cardiac structure and/or function, representing a severe manifestation or advanced stage of cardiac diseases, with high incidence and mortality rates [1]. The China Cardiovascular Health and Disease Report 2023 Summary indicates that in China, the prevalence of heart failure among adults aged ≥35 years is 1.3%, reaching 8.9 million, and this number has shown an upward trend over the years [2]. The main reason for hospital admission of heart failure patients is the exacerbation of symptoms, and care-seeking delay is an important cause of symptom progression leading to hospital admission. Studies have found that more than 50% of heart failure patients will not seek medical help before their symptoms become unbearable [3,4].

The care-seeking delay time for heart failure patients mainly refers to the total time consumed from the first presentation of heart failure symptoms to hospital admission, as well as the time interval from the presentation of subacute heart failure symptoms or early signs of heart failure deterioration to seeking medical help [5,6]. It can be divided into two stages, namely patient delay and transportation delay [7], among which the patient delay stage can more truly and accurately reflect the patients' own care-seeking behavior. Surveys have shown that the shortest patient delay in seeking medical care for heart failure patients is 1 day, the longest is 243 days, and the average care-seeking delay time is 7.5 days [8]. This duration is affected by a variety of factors, including symptom burden, depressive state, limitations of medical resources, and support from family members. In addition, individual characteristics such as educational level and socioeconomic status can also affect the care-seeking delay time [9,10]. Care-seeking delay can seriously affect the diagnosis and treatment, clinical outcomes, and quality of life of patients after hospitalization, such as length of hospital stay, medical costs, complications, mortality rate, and the use of related drugs during hospitalization [11,12]. Studies have pointed out that accurately identifying the influencing factors of the behaviors that cause care-seeking delay in heart failure patients,

thus curbing such behaviors, can effectively reduce the readmission risk and mortality rate of heart failure patients [13].

Currently, researches on care-seeking delay in chronic heart failure patients mainly focus on current situation surveys and analyses of influencing factors, and there are few studies exploring the impact of care-seeking delay on the hospital treatment and clinical outcomes of chronic heart failure patients. This study aims to explore the impact of care-seeking delay on the hospital treatment and clinical outcomes of chronic heart failure patients, in order to provide a basis for the formulation of clinical practice strategies related to care-seeking delay.

Materials and Methods

Research Subjects

Clinical data of inpatients diagnosed with chronic heart failure and admitted to the Department of Cardiology of Peking University Third Hospital from 2019 to 2022 were collected, and a retrospective cohort study was conducted. The inclusion criteria for patients in this study are as follows: ① Patients diagnosed with heart failure according to the 2018 Chinese Guidelines for the Diagnosis and Treatment of Heart Failure; ② Heart failure was the primary diagnosis for the patient's current hospitalization; ③ According to the New York Heart Association (NYHA) functional classification, the patient's cardiac function was class II-IV; ④ Age ≥18 years. Exclusion criteria for patients are as follows: ① Pregnant patients; ② Patients with a history of mental illness; ③ Patients without detailed medical records; ④ Patients participating in other studies related to heart failure treatment during the period from 2019 to 2022.

Research Methods

This study was approved by the Peking University Third Hospital Medical Science Research Ethics Committee (IRB00006761-M2024110). Clinical data of patients were retrospectively obtained from the hospital's electronic medical record system and the medical records management office, mainly including: ① Basic information: age, gender, education level, occupation, marital status, living situation, medical payment method, length of hospital stay, and average daily cost of hospitalization; ② Admission-related information: The time of the patient's first presentation of heart failure symptoms during the hospitalization and the time of the patient's first medical visit as calculated through the initial course of illness record, also includes ejection fraction, BNP/NT-proBNP, NYHA functional classification, and symptoms related to heart failure such as shortness of breath/dyspnea, decreased exercise tolerance, and lower limb edema; ③ Medication usage during hospitalization: Digitalis, beta-blockers (Luoer class), mineralocorticoid receptor antagonists (MRAs), diuretics, SGLT2 inhibitors (SGLT2i), and non-vitamin K antagonist oral anticoagulants (NOACs); ④ Discharge-related information: Ejection fraction, BNP/NT-proBNP, NYHA functional classification, and symptoms related to heart failure such as shortness of breath/dyspnea, decreased exercise tolerance, and lower limb edema; Whether the patient was alive on discharge and the number of readmissions within 3 months after this discharge. Each patient's care-seeking delay time was calculated based on the time of the patient's first medical visit and the time of the patient's first presentation of heart failure symptoms, according to which the patients were divided into the care-seeking delay group and the non-care-seeking delay group. The basic information, admission and discharge data, hospital treatment, and clinical outcomes were analyzed between the two groups.

Data Collection Methods

Two cardiology nurses who had undergone unified training reviewed the medical records for data collection and verification. In case of any discrepancies during the review process, the data query would be conducted again.

Statistical Methods

Statistical analysis was performed using SPSS 24.0 software. Normality tests were conducted on the data. Normally distributed continuous data were described using mean and standard deviation, while non-normally distributed continuous data were represented by median and interquartile range. For comparisons between groups, independent samples t-tests or Mann-Whitney U tests were used as appropriate. Categorical data were presented as frequencies and percentages, and analyzed using chi-square tests or Fisher's exact tests. Since the proportion of missing values for all variables was less than 10%, missing continuous data were imputed using mean or median, and missing categorical data were imputed using mode. All statistical inferences were conducted using two-tailed tests, with a significance level of $P<0.05$.

Results

Basic Clinical Information

①Among the 265 patients with chronic heart failure, there were 183 males and 82 females, with an average age of (71.12±13.73) years. Han ethnicity accounted for 243 cases (91.7%); retired individuals accounted for 191 cases (72.1%); 239 (90.2%) of the patients were married, 4 (1.5%) were unmarried, 7 (2.6%) were divorced, and 15 (5.7%) were widowed. 91.7% of the patients lived with family/friends. The primary method of medical payment was various types of insurance, with only 6 patients (2.3%) paying fully self-funded. There were no statistically significant differences between the two groups in terms of age, gender, occupation, marital status, living situation, and medical payment method ($P>0.05$). General information of heart failure patients is detailed in Table 1. ② The proportion of patients with exertional dyspnea, lower limb edema, fatigue, and dyspnea during sleep on admission was significantly higher in the care-seeking delay group than in the non-care-seeking delay group, with statistical significance. See Table 2 for details.

The Relationship Between Care-Seeking Delay Time and Hospital Treatment in Heart Failure Patients

① The average length of hospital stay for both groups of patients was 9.65 days, and the average hospitalization cost was 26,567.19 yuan. Patients in the care-seeking delay group had significantly longer hospital stays and higher hospitalization costs than those in the non-care-seeking delay group, with statistical significance ($P<0.05$). See Table 3 for details. ② In terms of medication use, there were no

Table 1: General information of heart failure patients.

Variables	Total (n=265)	Non-care-seeking delay group (n=123)	Care-seeking delay group (n=142)	*P*
Gender (%)				0.678
Male	183 (69.1)	87 (70.7)	96 (67.6)	
Female	82 (30.9)	36 (29.3)	46 (32.4)	
Age (mean (SD))	71.12 (13.73)	69.87 (13.83)	72.21 (13.60)	0.167
Ethnicity (%)				0.445
Han	243 (91.7)	115 (93.5)	128 (90.1)	
Minority	22 (8.3)	8 (6.5)	14 (9.9)	
Living situation (%)				0.751
Living alone	22 (8.3)	9 (7.3)	13 (9.2)	
Live with family/friends	243 (91.7)	114 (92.7)	129 (90.8)	
Occupation (%)				0.328
Government official	10 (3.8)	5 (4.1)	5 (3.5)	
Professional technician	15 (5.7)	5 (4.1)	10 (7.0)	
Business services personnel	6 (2.3)	4 (3.3)	2 (1.4)	
Worker	16 (6.0)	7 (5.7)	9 (6.3)	
Farmer	27 (10.2)	8 (6.5)	19 (13.4)	
Retiree	191 (72.1)	94 (76.4)	97 (68.3)	
Marriage (%)				0.070
Married	239 (90.2)	116 (94.3)	123 (86.6)	
Unmarried	4 (1.5)	0 (0.0)	4 (2.8)	
Divorced	7 (2.6)	1 (0.8)	6 (4.2)	
Widowed	15 (5.7)	6 (4.9)	9 (6.3)	
Health insurance (%)				0.057
Basic medical insurance for urban employees	174 (65.7)	85 (69.1)	89 (62.7)	
Basic medical insurance for urban residents	37 (14.0)	21 (17.1)	16 (11.3)	
The new rural cooperative medical system	6 (2.3)	3 (2.4)	3 (2.1)	
Commercial medical insurance	31 (11.7)	6 (4.9)	25 (17.6)	
Fully covered by public funds	11 (4.2)	6 (4.9)	5 (3.5)	
Fully self-funded	6 (2.3)	2 (1.6)	4 (2.8)	
Other Social insurance	6 (2.3)	0 (0.0)	6 (4.2)	

statistically significant differences between the two groups of patients in the proportion of using digitalis, beta-blockers, ACEI/ARB/MRA/ARNI, warfarin, and oral diuretics. However, patients in the care-seeking delay group had a lower proportion of SGLT2i medication usage and a higher proportion of spironolactone, intravenous diuretics, and NOACs usage, with statistical significance (P<0.05). See Table 4 for details.

The Relationship Between Care-Seeking Delay Time and Clinical Outcomes in Heart Failure Patients

①Among the 265 patients, there were 3 in-hospital deaths (1.13%), and the proportion of patients with readmission times within 3 months ≥1 was 34% (90/265) overall, and respectively 31% (44/142) in the care-seeking delay group, and 37.4% (46/123) in the non-care-seeking delay group, which have no statistically significant difference. ②There were no statistically significant differences between the two groups in terms of cardiac function classification, ejection fraction, and BNP levels on admission. However, the proportion of patients with EF<40% on discharge was significantly higher in the care-seeking delay group (45/142) than in the non-care-seeking delay group (26/123). The mean BNP level on discharge was also significantly lower in the care-seeking delay group (1714.5) compared to the non-care-seeking delay group (3186.2), with statistical significance. See Table 5 for details.

General Information of Heart Failure Patients with Class III/IV Cardiac Function

This study conducted a statistical analysis of heart failure patients with Class III/IV cardiac function on admission, totaling 103 individuals, of which 61 (59.2%) were in the care-seeking delay group. Compared to patients without care-seeking delay, those in the care-seeking delay group had a higher proportion of female patients, higher

Table 2: Symptom presentation of the patients on admission.

Variables	Symptom presentation	Total (n=265)	Non-care-seeking delay group (n=123)	Care-seeking delay group (n=142)	*P*
Exertional dyspnea (%)	no	120 (45.3)	72 (58.5)	48 (33.8)	0.041
	yes	145 (54.7)	51 (41.5)	94 (66.2)	
Orthopnea (%)	no	236 (89.1)	107 (87.0)	129 (90.8)	0.421
	yes	29 (10.9)	16 (13.0)	13 (9.2)	
Paroxysmal nocturnal dyspnea (%)	no	199 (75.1)	97 (78.9)	102 (71.8)	0.239
	yes	66 (24.9)	26 (21.1)	40 (28.2)	
Chest tightness (%)	no	153 (57.7)	77 (62.6)	76 (53.5)	0.171
	yes	112 (42.3)	46 (37.4)	66 (46.5)	
Chest pain (%)	no	232 (87.5)	107 (87.0)	125 (88.0)	0.946
	yes	33 (12.5)	16 (13.0)	17 (12.0)	
Lower limb edema (%)	no	145 (54.7)	82 (66.7)	63 (44.4)	<0.001
	yes	120 (45.3)	41 (33.3)	79 (55.6)	
Fatigue (%)	no	194 (73.2)	99 (80.5)	95 (66.9)	0.019
	yes	71 (26.8)	24 (19.5)	47 (33.1)	
Decreased exercise tolerance (%)	no	173 (65.3)	88 (71.5)	85 (59.9)	0.062
	yes	92 (34.7)	35 (28.5)	57 (40.1)	
Abdominal distention and Poor appetite (%)	no	222 (83.8)	103 (83.7)	119 (83.8)	1.000
	yes	43 (16.2)	20 (16.3)	23 (16.2)	
Sleep apnea (%)	no	230 (86.8)	113 (91.9)	117 (82.4)	0.037
	yes	35 (13.2)	10 (8.1)	25 (17.6)	
Syncope/loss of consciousness (%)	no	259 (97.7)	120 (97.6)	139 (97.9)	1.000
	yes	6 (2.3)	3 (2.4)	3 (2.1)	
Other symptoms (%)	no	205 (77.4)	92 (74.8)	113 (79.6)	0.435
	yes	60 (22.6)	31 (25.2)	29 (20.4)	

Table 3: Length of hospital stay and hospitalization costs of patients.

Variables	Mean	Non-care-seeking delay group (n=123)	Care-seeking delay group (n=142)	*P*
Length of hospital stay (mean (SD))	9.65 (6.29)	8.11 (5.88)	11.11 (6.61)	0.038
Hospitalization costs in Yuan (mean (SD))	26,567.19 (34,687.52)	20,303.51 (28,935.87)	32,394.18 (38,872.17)	0.044

average age, and lower proportion with basic medical insurance. See Table 6 for details.

Discussion

The care-seeking delay time for heart failure patients mainly refers to the total time consumed from the first appearance of heart failure symptoms to hospital admission. Since there is no standard cut-off point, the median value is often used to divide the delay time into shorter and longer categories. This is one of the methods used in previous studies to investigate care-seeking delay in heart failure patients [14]. In this study, the median care-seeking delay time was 7 days, which is not significantly different from the median delay time of 7.5 days found in previous studies. This duration is influenced by a variety of factors, including symptom burden, depressive state, limitations of medical resources, and support from family members. A longer care-seeking delay time is closely related to the hospital treatment and clinical outcomes of patients.

Heart Failure Patients in the Care-Seeking Delay Group had More Severe Symptoms on Admission

The most common symptom leading to hospital admission in heart failure patients is dyspnea, followed by chest pain, fatigue, and lower limb edema [15], etc. The results of this study show that the proportion of heart failure patients in the care-seeking delay group who presented with exertional dyspnea, lower limb edema, fatigue, and dyspnea during sleep on admission was significantly higher than that in the non-care-seeking delay group. This indicates that the patients who have poor recognition capability or low level of concern on common symptoms of heart failure are more likely not to consider the symptoms as emergencies, thus lead to more cases of care-seeking delay. Similar results have been found in studies worldwide, where patients' misperception of the severity of heart failure symptoms leads to delayed care-seeking [16]. Altice and Madigan reported [4] that patients with more acute heart failure symptoms are more

Table 4: Medication use of patients during hospitalization.

Variables	Medication use	Total (n=265)	Non-care-seeking delay group (n=123)	Care-seeking delay group (n=142)	*P*
Digitalis (%)	no	239 (90.2)	114 (92.7)	125 (88.0)	0.288
	yes	26 (9.8)	9 (7.3)	17 (12.0)	
Beta-blockers (%)	no	62 (23.4)	34 (27.6)	28 (19.7)	0.174
	yes (1 kind)	195 (73.6)	87 (70.7)	108 (76.1)	
	yes (2 kinds)	8 (3.0)	2 (1.6)	6 (4.2)	
ACEI/ARNI (%)	no	156 (58.9)	72 (58.5)	84 (59.2)	0.160
	yes (1 kinds)	105 (39.6)	51 (41.5)	54 (38.0)	
	yes (2 kinds)	4 (1.5)	0 (0.0)	4 (2.8)	
ARB (%)	no	234 (88.3)	106 (86.2)	128 (90.1)	0.418
	yes	31 (11.7)	17 (13.8)	14 (9.9)	
MRA (%)	no	144 (54.3)	79 (64.2)	65 (45.7)	0.049
	yes	121 (45.7)	44 (35.8)	77 (54.2)	
SGLT2i (%)	no	239 (90.2)	103 (83.7)	136 (95.8)	0.002
	yes	26 (9.8)	20 (16.3)	6 (4.2)	
Ivabradin (%)	no	264 (99.6)	122 (99.2)	142 (100.0)	0.943
	yes	1 (0.4)	1 (0.8)	0 (0.0)	
Oral diuretics (%)	no	37 (14.0)	19 (15.4)	18 (12.7)	0.270
	yes (1 kind)	171 (64.5)	84 (68.3)	87 (61.3)	
	yes (2 kinds)	47 (17.7)	16 (13.0)	31 (21.8)	
	yes (3 kinds)	10 (3.8)	4 (3.3)	6 (4.2)	
Intravenous diuretics (%)	no	137 (51.7)	76 (61.8)	61 (43.0)	<0.001
	yes (1 kind)	92 (34.7)	27 (22.0)	65 (45.8)	
	yes (2 kinds)	21 (7.9)	7 (5.7)	14 (9.9)	
	yes (3 kinds)	13 (4.9)	11 (8.9)	2 (1.4)	
	yes (4 kinds)	2 (0.8)	2 (1.6)	0 (0.0)	
Tolvaptan (%)	no	260 (98.1)	121 (98.4)	139 (97.9)	1.000
	yes	5 (1.9)	2 (1.6)	3 (2.1)	
Warfarin (%)	no	237 (89.4)	112 (91.1)	125 (88.0)	0.549
	yes	28 (10.6)	11 (8.9)	17 (12.0)	
NOACs (%)	no	193 (72.8)	91 (74.0)	102 (71.8)	0.033
	yes (1 kinds)	67 (25.3)	27 (22.0)	40 (28.2)	
	yes (2 kinds)	5 (1.9)	5 (4.1)	0 (0.0)	

Note: ACEI, Angiotensin-Converting Enzyme Inhibitors; ARNI, Angiotensin Receptor, Neprilysin Inhibitors; ARB, Angiotensin Receptor Blockers; MRA, Mineralocorticoid Receptor Antagonists; SGLT2i, Sodium-Glucose Co-Transporter 2 Inhibitors; NOACs, Novel Oral Anticoagulants.

likely to seek medical attention promptly, while those with chronic symptoms are more likely to delay their care-seeking. Therefore, in the management of heart failure patients, emphasis should be placed on intervention strategies for improving symptom recognition, symptom assessment, and timely response to symptoms, thus patients' perception of symptoms can be enhanced. The American Heart Association (AHA) has published a self-check plan for heart failure management [17], which proposes different responses based on changes in patients' exercise tolerance, weight, edema, and respiratory rate, and recommends that patients who perceive a worsening of heart failure symptoms seek medical attention immediately. In addition, remote monitoring devices can be used to help patients monitor heart failure symptoms and remind them to seek medical attention in a timely manner when necessary [18].

Care-Seeking Delay Increases the Burden of Hospitalization for Heart Failure Patients

In developing countries, the medical expenses for heart failure patients are the highest among all patients with various diseases, with an average cost of approximately $4,080 per patient per year. Hospitalization costs account for 66% of the total annual expenditure for heart failure (HF) patients [19,20]. Considering the high treatment costs and high incidence rate, heart failure imposes a significant economic and social burden in China. The results of this study show

Table 5: Changes on Cardiac Function Classification, Ejection Fraction, and BNP in the Two Groups

Variables	Total (n=265)	Non-care-seeking delay group (n=123)	Care-seeking delay group (n=142)	*P*
Cardiac function classification on admission (%)				0.321
2	162 (61.1)	81 (65.8)	61 (57.0)	
3	84 (31.7)	32 (26.0)	52 (36.6)	
4	19 (7.2)	10 (8.1)	9 (6.3)	
Cardiac function classification on discharge (%)				0.621
2	179 (67.5)	87 (70.7)	92 (64.8)	
3	71 (26.8)	29 (23.6)	42 (29.6)	
4	15 (5.7)	7 (5.7)	8 (5.6)	
Ejection fraction (mean (SD))				
On admission	46.91 (16.24)	46.80 (14.98)	47.01 (17.31)	0.920
On discharge	49.17 (15.56)	48.71 (14.80)	49.56 (16.23)	0.656
Ejection fraction difference	2.25 (8.03)	1.90 (7.03)	2.56 (8.82)	0.510
Ejection fraction group on admission (%)				0.175
<40%	91 (34.3)	36 (29.3)	55 (38.7)	
≥50%	104 (39.2)	49 (39.8)	55 (38.7)	
40 ~ 50%	70 (26.4)	38 (30.9)	32 (22.5)	
Ejection fraction group on discharge (%)				0.032
<40%	71 (26.8)	26 (21.1)	45 (31.7)	
≥50%	120 (45.3)	54 (43.9)	66 (46.5)	
40 ~ 50%	74 (27.9)	43 (35.0)	31 (21.8)	
BNP (mean (SD))				
On admission	3,222.21 (5,223.88)	3,776.39 (6,915.73)	2,742.18 (3,035.08)	0.108
On discharge	2,397.61 (4,946.84)	3,186.20 (6,855.82)	1,714.54 (2,034.08)	0.015
Difference	-824.60 (4,014.16)	-590.19 (5,247.74)	-1,027.65 (2,500.52)	0.377

Note: BNP, Brain Natriuretic Peptide.

that the average length of hospital stay for heart failure patients in the care-seeking delay group was 11.11 days, with hospitalization costs of 32,394.18 yuan, which were significantly higher than the 8.11 days and 20,303.51 yuan for the non-care-seeking delay group. This is consistent with previous studies that found care-seeking delay leads to higher hospitalization rates [21], which may be related to the more severe symptom presentation on admission. Care-seeking delay also affects the use of medications during hospitalization. According to the results of this study, the proportion of patients who used intravenous diuretics, mineralocorticoid receptor antagonists (MRAs), and non-vitamin K antagonist oral anticoagulants (NOACs) during hospitalization was significantly higher in the care-seeking delay group compared to the non-care-seeking delay group. Conversely, the proportion of patients who used sodium-glucose co-transporter 2 inhibitors (SGLT2i) was lower in the care-seeking delay group. Diuretics and MRAs are both guideline-recommended medications that can improve patient prognosis [22], and are used to alleviate symptoms of dyspnea and reduce the degree of edema. These two medications have higher usage rate in the care-seeking delay group, corresponding to a finding in this study that the patients in the care-seeking group statistically have more severe symptoms on admission. Therefore, reducing the care-seeking delay time and helping patients seek treatment in a timely manner is an important factor for relieving the symptoms and improving the survival rate of heart failure patients, thereby reducing the economic and social burdens caused by the disease.

Care-Seeking Delay Seriously Affects the Clinical Prognosis of Heart Failure Patients

Cardiovascular death is an important indicator for evaluating the prognosis of patients with chronic stable heart failure, and the number of cardiovascular-related readmissions is a key indicator for assessing the frequency of acute exacerbations in patients with chronic stable heart failure [23]. In previous studies, care-seeking delay has been shown to increase the risk of cardiac death and readmission in heart failure patients [24,25]. However, in the samples included in this study, there was no statistically significant difference in the 3-month readmission rate between the two groups. The possible reasons may be the insufficient number of samples and the retrospective nature of the study, which lacks long-term follow-up of patients outside the hospital. And, The method of medical record review alone may result in significant differences in the statistics of cardiovascular-related mortality and readmission rates. BNP, as an important indicator for prognostic assessment in heart failure patients, showed in this study that the mean BNP level on discharge for heart failure patients in the care-seeking delay group (1714.5) was significantly lower than that in the non-care-seeking delay group (3186.2). However, other studies

Table 6: General information of heart failure patients with cardiac function Class III/IV.

Variables of interest	Total (n=103)	Non-care-seeking delay group (n=42)	Care-seeking delay group (n=61)	*P*
Gender (%)				0.022
Male	69 (67.0)	34 (81.0)	35 (57.4)	
Female	34 (33.0)	8 (19.0)	26 (42.6)	
Age (mean (SD))	74.68 (13.36)	71.14 (15.26)	77.11 (11.37)	0.025
Ethnicity (%)				0.194
Han	94 (91.3)	36 (85.7)	58 (95.1)	
Minority	9 (8.7)	6 (14.3)	3 (4.9)	
Living situation (%)				0.778
Living alone	7 (6.8)	2 (4.8)	5 (8.2)	
Live with family/friends	96 (93.2)	40 (95.2)	56 (91.8)	
Occupation (%)				0.743
Government official	6 (5.8)	2 (4.8)	4 (6.6)	
Professional technician	3 (2.9)	1 (2.4)	2 (3.3)	
Business services personnel	1 (1.0)	1 (2.4)	0 (0.0)	
Worker	4 (3.9)	1 (2.4)	3 (4.9)	
Farmer	10 (9.7)	3 (7.1)	7 (11.5)	
Retiree	79 (76.7)	34 (81.0)	45 (73.8)	
Marriage (%)				0.502
Married	92 (89.3)	38 (90.5)	54 (88.5)	
Unmarried	1 (1.0)	0 (0.0)	1 (1.6)	
Divorced	1 (1.0)	1 (2.4)	0 (0.0)	
Widowed	9 (8.7)	3 (7.1)	6 (9.8)	
Health insurance (%)				0.003
Basic medical insurance for urban employees	71 (68.9)	30 (71.4)	41 (67.2)	
Basic medical insurance for urban residents	12 (11.7)	9 (21.4)	3 (4.9)	
The new rural cooperative medical system	6 (5.8)	3 (7.1)	3 (4.9)	
Commercial medical insurance	13 (12.6)	0 (0.0)	13 (21.3)	
Fully covered by public funds	1 (1.0)	0 (0.0)	1 (1.6)	
Fully self-funded	0 (0.0)	0 (0.0)	0 (0.0)	
Other Social insurance	0 (0.0)	0 (0.0)	0 (0.0)	

[26] have indicated that care-seeking delay leads to higher BNP levels. The possible reason is that BNP is influenced by various cardiovascular factors/diseases, especially comorbidities such as advanced age, atrial fibrillation, and renal insufficiency. Another finding of this study showed that the proportion of patients with EF<40% on discharge in the care-seeking delay group (45/142) was significantly higher than that in the non-care-seeking delay group (26/123), indicating that heart failure patients in the care-seeking delay group had lower cardiac function levels on discharge, more severe heart failure conditions, and poorer clinical prognosis. Our study results provide evidence for the potential adverse consequences of care-seeking delay, proving the importance of seeking medical help in a timely manner when heart failure symptoms worsen to improve the clinical prognosis of heart failure.

Heart Failure Patients with NYHA Class III/IV had a Higher Proportion of Care-Seeking Delay

Another finding of this study revealed that patients with poorer NYHA status on admission (Class III/IV) had a higher proportion of care-seeking delay (59.2%), which is consistent with previous heart failure research results [27,28]. The care-seeking delay group had higher proportion of female patients, higher average age, and lower proportion with basic medical insurance. Possible reasons may include that patients with poorer NYHA functional status are more accustomed to moderate to severe symptoms, are less likely to perceive the worsening of heart failure symptoms, feel desperate about heart failure due to long-term medical visits and are reluctant to visit hospitals, and are concerned about the cost of treatment. While a longer care-seeking delay time may lead to poorer clinical outcomes for patients. Therefore, it is necessary to conduct qualitative research to investigate the reasons for care-seeking delay in patients with poorer NYHA functional status.

Conclusion

The phenomenon of care-seeking delay is relatively common among heart failure patients and is influenced by a variety of factors. In addition to the patients' own perception of symptoms, health

literacy, and depression levels, it is also closely related to the medical environment and the support of caregivers. The results of this study show the following points: ① The median care-seeking delay time for heart failure patients in this study was 7 days; ② Heart failure patients in the care-seeking delay group had more severe symptoms on admission, and had higher proportions of exertional dyspnea, lower limb edema, fatigue, and dyspnea during sleep; ③ Care-seeking delay significantly increased the length of hospital stay and hospitalization costs for heart failure patients, and also caused higher use of intravenous diuretics, MRAs, and NOACs during hospitalization; ④ The proportion of patients with EF<40% on discharge was higher in the care-seeking delay group. On the other hand, this study has the following limitations: ① The onset time description of heart failure symptoms in the electronic medical records is not accurate enough. The recording of onset time of symptoms mainly relies on the patients' recall. However, symptom perception is subjective, thus the calculation of care-seeking delay time still needs to be refined; ② The size and variety of the sample coming from one tertiary hospital in Beijing is insufficient. In addition, there are many limitations such as the lack of standardized and long-term follow-up outside the hospital, the absence of heart function-related evaluation indicators, and no attention to the psychological state assessment of patients. In future studies, research can be carried out on the development of risk assessment tools and models for care-seeking delay in heart failure patients. By implementing effective intervention measures, the care-seeking delay time of patients can be reduced, and the clinical prognosis of patients can be improved.

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