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Clinical Determinants of Functional Capacity at Hospital Discharge in Patients with Heart Failure: A Secondary Observational Analysis

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Abstract

Introduction. Functional capacity is a key prognostic marker in heart failure (HF), yet it is frequently under-assessed at hospital discharge, and its clinical and demographic determinants during this critical period remain insufficiently characterized. This study aims to identify the clinical determinants of functional capacity at hospital discharge in patients with heart failure with reduced ejection fraction (HFrEF).

Methods. Cross-sectional observational study conducted at a tertiary center in Brazil with 140 patients. Functional capacity was assessed using the Veterans Specific Activity Questionnaire (VSAQ) and expressed in metabolic equivalents (METs). Sociodemographic, clinical (congestion score and visual analogue scale for dyspnea), and laboratory variables were collected. Multiple linear regression was used to identify independent predictors of age-adjusted METs.

Results. Mean age was 64.8 ± 14.0 years and mean left ventricular ejection fraction (LVEF) was 30.5 ± 6.5%. Mean functional capacity was 4.34 ± 3.43 METs, indicating severe impairment. In the multivariate analysis, NYHA functional class ($\beta = -1.033$; $p = 0.015$), congestion score ($\beta = -0.235$; $p = 0.015$), and dyspnea ($\beta = -0.232$; $p = 0.012$) were independent predictors of lower functional capacity. LVEF was not independently associated with functional capacity ($p = 0.583$).

Discussion. Functional capacity at discharge is determined

by symptom burden and functional class rather than LVEF alone. A substantial proportion of patients are discharged with significant functional impairment, underscoring the need for systematic functional assessment and early rehabilitation planning as part of heart failure care transition.

Keywords: Heart Failure, Functional Capacity, Hospital Discharge, Metabolic Equivalents, Nursing Assessment

Introduction

Heart failure (HF) represents a major global public health problem, associated with high rates of morbidity, mortality, and recurrent hospitalizations. Despite therapeutic advances, patients with HF, particularly those with reduced ejection fraction, continue to experience significant clinical and functional impairment (Savarese et al., 2023). In this context, functional capacity has emerged as a relevant prognostic marker, reflecting not only cardiovascular status but also the interaction among the musculoskeletal, respiratory, and metabolic systems.

Functional capacity, frequently expressed in metabolic equivalents (METs), constitutes an objective and clinically useful measure of exercise capacity (González-Mariscal et al., 2025). Reduced MET levels are associated with poorer quality of life, higher risk of rehospitalization, and increased mortality in patients with HF (Almeida-Neto et al., 2025). Therefore, assessment of this variable at the time of hospital discharge may provide important information for risk stratification and therapeutic planning.

Patients hospitalized for acute decompensated heart failure frequently exhibit significant deterioration in functional capacity, resulting from factors such as congestion, hypoperfusion, systemic inflammation, and physical deconditioning. Although clinical stabilization is the primary goal during hospitalization, many patients are discharged while still presenting with substantial functional limitations, which may negatively impact their short- and medium-term prognosis (Almeida-Neto et al., 2025; Silva et al., 2021).

Several clinical factors have been associated with functional capacity in patients with HF, including age, New York Heart Association (NYHA) functional class, and left ventricular ejection fraction (Bozkurt et al., 2021; Savarese et al., 2023). However, most studies focus on outpatient populations or clinically stable conditions, leaving a knowledge gap regarding the determinants of functional capacity specifically at the time of hospital discharge following an episode of decompensation.

The present study aims to characterize the clinical and demographic profile and to identify the clinical and demographic factors associated with functional capacity in patients hospitalized for heart failure with reduced ejection fraction at the time of hospital discharge.

Methods

Study design and setting

This is a cross-sectional observational study conducted in a public tertiary hospital in Brazil. Data were collected at hospital discharge between 2023-2025.

Participants

Eligible participants were adults (age >18 years) hospitalized for acute decompensated heart failure with reduced ejection fraction (HFrEF), defined as left ventricular ejection fraction (LVEF) < 40% on echocardiography performed during the index hospitalization. Patients on the heart transplant waiting list or with a life expectancy of less than 6 months documented in the medical records were excluded.

Variables

Sociodemographic variables

Sociodemographic variables included age

(years), sex (male/female), race/ethnicity (White, Brown, Black), and education level (low vs high). Heart failure–related variables included etiology (ischemic, hypertensive, Chagas disease, idiopathic), LVEF, New York Heart Association (NYHA) functional class (I–II vs III–IV), and hemodynamic profile (warm vs cold).

Clinical variables

Congestion score was assessed using a composite clinical score ranging from 0 to 22, calculated by summing scores from seven clinical signs and symptoms of heart failure: orthopnea (0–4), pulmonary crackles (0–4), elevated jugular venous pressure (0–4), peripheral edema (0–4), third heart sound (0–1), hepatojugular reflux (0–1), and NYHA functional class (1–4). Higher scores indicate greater degree of congestion (Rohde, et al. 2004).

Dyspnea was assessed using a simple visual analogue scale (VAS, 0–10), in which patients were asked to rate their current dyspnea sensation, with 0 indicating no dyspnea and 10 indicating the worst dyspnea imaginable.

Besides, body mass index (BMI, kg/m^2), systolic blood pressure (SBP, mmHg), diastolic blood pressure (DBP, mmHg), and heart rate (beats per minute, bpm) were collected. Laboratory measurements included hemoglobin (g/dL), creatinine (mg/dL), sodium (mEq/L), potassium (mEq/L), and urea (mg/dL).

Comorbidities were recorded as binary variables (yes/no) and included hypertension, diabetes mellitus, prior myocardial infarction, atrial fibrillation, depression, stroke, and chronic obstructive pulmonary disease.

Functional capacity

Functional capacity was assessed using the Veterans Specific Activity Questionnaire (VSAQ) (Domingues, et al. 2011). This instrument consists of 13 items designed to identify the level of daily physical activity associated with symptoms of cardiovascular disease, yielding a raw score ranging from 1 to 13; lower scores indicate greater functional limitation (Domingues et al., 2011). During the validation of the VSAQ, the authors observed that patient age and the VSAQ score were the most significant predictors of functional capacity expressed in METs, and accordingly developed a nomogram based on the equation METs = 4.7 + 0.97 × (VSAQ score) − 0.06 × (age) (Domingues et al., 2011), which converts the raw VSAQ score into an age-adjusted MET value. In the present study, two complementary measures of functional capacity were therefore analyzed: the raw VSAQ score (1–13 scale, unadjusted) and the age-adjusted MET value, calculated by applying the full nomogram equation above. Throughout the Results, "VSAQ" refers to the unadjusted score and "METs" refers to the age-adjusted value obtained from the nomogram.

Data sources and measurement

All variables were assessed at the time of hospital discharge by trained cardiovascular nurses as part of the primary trial data collection. Sociodemographic, clinical, laboratory, and functional capacity data were collected exclusively at this single discharge time point; admission-only values and longitudinal in-hospital trends (e.g., serial blood pressure or laboratory measurements) were not available for this secondary analysis.

Study size

The sample size was determined to provide an adequate number of observations for multiple linear regression analysis. Based on the recommendation of at least 10 participants per predictor variable, a minimum sample of 120 participants was considered sufficient for the planned model. A total of 140 participants were included, providing adequate statistical power for the exploratory analyses.

Statistical approach

All analyses were performed using R (R Core Team, 2024). Continuous variables were described as mean ± standard deviation (SD) or median (interquartile range, IQR) according to distribution. Categorical variables were described as frequency and proportion.

Bivariate associations between clinical variables and functional capacity were assessed using parametric tests, given the large sample size (n = 140) and the robustness of these methods under the central limit theorem.

Associations between METs and continuous predictor variables were assessed using the Pearson correlation coefficient (r). Between-group comparisons for binary variables (sex and hemodynamic profile) were performed using the independent samples t-test with Welch correction for unequal variances. For categorical variables with three or more groups (NYHA functional class and HF etiology), between-group differences were assessed using one-way analysis of variance (ANOVA).

When the overall ANOVA was statistically significant, post-hoc pairwise comparisons were conducted using the Tukey Honestly Significant Difference (HSD) test, which controls the familywise error rate across all pairwise comparisons simultaneously.

To identify independent predictors of functional capacity, a multiple linear regression model was fitted with log-transformed age-adjusted METs as the outcome variable. Logarithmic transformation was applied to approximate normality of the outcome distribution. All candidate predictors were entered simultaneously. Model fit was assessed by the coefficient of determination (R^2) and adjusted R^2.

Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki. The primary trial was approved by the Institutional Review Board, protocol number 5.568.868. All participants provided written informed consent prior to enrollment.

Results

A total of 140 patients were included, with a mean age of 64.8 ± 14.0 years, and 60.7% were male. Regarding race/ethnicity, 45.7% were White, 40.0% Brown, and 14.3% Black. Most participants had a low education level (58.6%).

The most common heart failure etiologies were ischemic (26.4%) and hypertensive (26.4%), followed by Chagas disease (23.6%) and idiopathic causes (16.4%). Mean left ventricular ejection fraction was 30.5 ± 6.5%. Most patients were classified as NYHA functional class I–II (66.4%), and 67.9% had a warm hemodynamic profile at discharge.

At discharge, the median congestion score was 2.0 (IQR 0.0–4.2), and mean dyspnea score was 4.3 ± 3.6. Mean body mass index was 26.7 ± 5.6 kg/m^2. Mean systolic and diastolic blood pressure were 114.2 ± 18.8 mmHg and 71.5 ± 14.2 mmHg, respectively, and mean heart rate was 77.5 ± 15.6 bpm.

Laboratory parameters showed a mean hemoglobin level of 12.9 ± 2.4 g/dL. Median creatinine and urea levels were 1.2 mg/dL (IQR 1.0–1.8) and 41.0 mg/dL (IQR 30.5–56.0), respectively. Mean sodium and potassium levels were 136.9 ± 4.7 mEq/L and 4.5 ± 3.3 mEq/L.

Comorbidities were common, with hypertension present in 72.9% of patients, followed by diabetes mellitus (44.3%), prior myocardial infarction (35.0%), atrial fibrillation (7.9%), depression (10.0%), stroke (9.3%), and chronic obstructive pulmonary disease (5.0%).

The mean raw VSAQ score was 4.34 ± 3.43, corresponding to a mean age-adjusted MET value of 5.02 ± 3.56, yielding a difference of +0.68 METs (Figure 1). No statistically significant difference was observed between the unadjusted and age-adjusted values ($p = 0.890$).

Bivariate associations between clinical variables and functional capacity are presented in Table 2. Among continuous variables, dyspnea showed the strongest inverse correlation with both raw and age-adjusted METs ($r = -0.540$ and $r = -0.498$, respectively; both $p < 0.001$), followed by congestion score ($r = -0.451$ and $r = -0.426$; $p < 0.001$) and LVEF ($r = +0.277$ and $r = +0.232$; $p < 0.001$). The association between age and functional capacity differed substantially between versions: while the correlation with the raw VSAQ score was weak ($r = -0.169$; $p = 0.046$), the correlation with age-adjusted METs was moderate and stronger ($r = -0.393$; $p < 0.001$), reflecting the age correction embedded in the nomogram.

Heart rate and creatinine were not significantly associated with either version of METs.

Table 1. Characteristics of the study sample.

Variable	Total (n = 140)
Sociodemographic characteristics	
Age (years), mean ± SD	64.8 ± 14.0
Male sex, n (%)	85 (60.7%)
Race/ethnicity, n (%)	
White	64 (45.7%)
Brown	56 (40.0%)
Black	20 (14.3%)
Education level, n (%)	
Low (illiterate or incomplete primary)	82 (58.6%)
High (complete primary or above)	58 (41.4%)
Heart failure characteristics	
HF etiology, n (%)	
Ischemic	37 (26.4%)
Hypertensive	37 (26.4%)
Chagas disease	33 (23.6%)
Idiopathic	23 (16.4%)
LVEF (%), mean ± SD	30.5 ± 6.5
NYHA class, n (%)	
I–II	93 (66.4%)
III–IV	47 (33.6%)
Hemodynamic profile, n (%)	
Warm	95 (67.9%)
Cold	45 (32.1%)
Clinical parameters	
Congestion score, median (IQR)	2.0 (0.0–4.2)
Dyspnea VAS, mean ± SD	4.3 ± 3.6
BMI (kg/m^2), mean ± SD	26.7 ± 5.6
SBP (mmHg), mean ± SD	114.2 ± 18.8
DBP (mmHg), mean ± SD	71.5 ± 14.2
Heart rate (bpm), mean ± SD	77.5 ± 15.6
Laboratory parameters	
Hemoglobin (g/dL), mean ± SD	12.9 ± 2.4
Creatinine (mg/dL), median (IQR)	1.2 (1.0–1.8)
Sodium (mEq/L), mean ± SD	136.9 ± 4.7
Potassium (mEq/L), mean ± SD	4.5 ± 3.3
Urea (mg/dL), median (IQR)	41.0 (30.5–56.0)
Comorbidities	
Hypertension, n (%)	102 (72.9%)
Diabetes mellitus, n (%)	62 (44.3%)
Prior MI, n (%)	49 (35.0%)
Atrial fibrillation, n (%)	11 (7.9%)
Depression, n (%)	14 (10.0%)
Stroke, n (%)	13 (9.3%)
COPD, n (%)	7 (5.0%)

Education: "Low" = illiterate or incomplete primary education; "High" = complete primary education or above. NYHA: "Compensated" = NYHA I–II; "Advanced" = NYHA III–IV. Hemodynamic profile: "Warm" = warm-dry + warm-wet; "Cold" = cold-wet + cold-dry. HF = heart failure; BMI = body mass index; COPD = chronic obstructive pulmonary disease; DBP = diastolic blood pressure; IQR = interquartile range; LVEF = left ventricular ejection fraction; SD = standard deviation; MI = myocardial infarction; NYHA = New York Heart Association; SBP = systolic blood pressure; VAS = visual analogue scale; bpm = beats per minute.

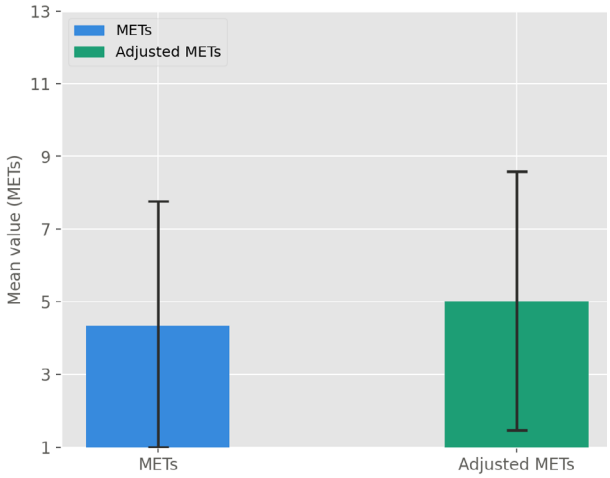


Figure 1. Raw and age-adjusted METs at hospital discharge in patients with heart failure, Brazil, 2026.

Table 2. Pearson correlations between continuous clinical variables and functional capacity.

Variable	r (VSAQ score)	p	r (METs age-adj.)	p
Dyspnea VAS	−0.540	< 0.001	−0.498	< 0.001
Congestion score	−0.451	< 0.001	−0.426	< 0.001
Age (years)	−0.169	0.046	−0.393	< 0.001
LVEF (%)	+0.277	< 0.001	+0.232	0.006
Creatinine (mg/dL)	−0.127	0.136	−0.125	0.143
Heart rate (bpm)	−0.098	0.251	−0.054	0.527

r = Pearson correlation coefficient. n = 140. VSAQ score = raw activity score (1–13 scale, unadjusted). METs age-adjusted = 4.7 + 0.97 × VSAQ − 0.06 × age (VSAQ nomogram). Parametric tests used given n = 140 (central limit theorem). Variables sorted by magnitude of correlation with the raw VSAQ score. Highlighted rows and bold values = p < 0.05. LVEF = left ventricular ejection fraction; METs = metabolic equivalents; VAS = visual analogue scale; VSAQ = Veterans Specific Activity Questionnaire.

Sex and hemodynamic profile were not significantly associated with functional capacity (table 3). Male and female patients presented similar raw VSAQ scores (4.67 ± 3.60 vs 3.84 ± 3.10; mean difference +0.83, 95% CI: −0.29 to 1.96; p = 0.160) and age-adjusted METs (5.39 ± 3.74 vs 4.46 ± 3.22). Similarly, no significant difference was observed between patients with warm and cold hemodynamic profiles in either raw VSAQ (4.29 ± 3.46 vs 4.44 ± 3.39; mean difference −0.15, 95% CI: −1.36 to 1.06; p = 0.81) or age-adjusted METs (4.95 ± 3.58 vs 5.19 ± 3.55).

Table 3. Functional capacity by binary clinical variables, t-test comparisons.

Variable	Group	n	VSAQ score mean ± SD	METs age-adj. mean ± SD	Mean difference (95% CI)	p
Sex	Male	85	4.67±3.60	5.39 ± 3.74	0.83 (−0.29 to 1.96)	0.160
	Female	55	4.46 ± 3.22	4.46 ± 3.22		
Hemodynamic profile	Warm	95	4.29 ± 3.46	4.95 ± 3.58	−0.15 (−1.36 to 1.06)	0.810
	Cold	45	4.44 ± 3.39	5.19 ± 3.55		

NYHA functional class was strongly associated with both raw and age-adjusted METs (ANOVA: F = 33.88 and F = 26.71; p < 0.001). Post-hoc analysis revealed that NYHA class I was significantly different from all other classes (all p ≤ 0.006).

HF etiology was also significantly associated with functional capacity (ANOVA: F = 4.36, p = 0.006; F = 4.89, p = 0.003 for age-adjusted). Despite overall significance, post-hoc comparisons did not reach statistical significance, with the largest difference observed between Chagas disease and idiopathic etiology (diff = −3.06 raw, p = 0.089; diff = −3.36 adj, p = 0.062), suggesting a trend toward lower functional capacity in Chagas patients.

Table 4. Functional capacity by categorical clinical variables, one-way ANOVA.

Variable	Group (n)	VSAQ score mean ± SD	F	METs age-adj. mean ± SD	F	df	p
NYHA class	Class I (33)	8.18 ± 4.09	33.88	8.77 ± 4.24	26.71	3, 136	< 0.001
	Class II (60)	3.82 ± 1.85		4.44 ± 2.11			
	Class III (38)	2.21 ± 1.44		3.01 ± 1.62			
	Class IV (9)	2.78 ± 3.87		3.67 ± 4.08			
HF etiology	Ischemic (37)	4.70 ± 3.49	4.36	5.00 ± 3.50	4.89	3, 136	0.006
	Hypertensive (37)	4.86 ± 3.54		5.71 ± 3.62			
	Chagas (33)	2.73 ± 1.51		3.29 ± 1.69			
	Idiopathic (23)	5.78 ± 4.57		6.65 ± 4.61			

Three predictors were independently associated with lower functional capacity after adjusting for all other variables in the model (table 5). Higher NYHA functional class was associated with lower METs (β = −1.033; 95% CI: −1.866 to −0.201; p = 0.015), indicating that each additional NYHA class was associated with a reduction of approximately 1.0 METs in age-adjusted functional capacity.

Higher congestion score (β = −0.235; 95% CI: −0.424 to −0.046; p = 0.015) and higher dyspnea (β = −0.232; 95% CI: −0.412 to −0.051; p = 0.012) were also independently associated with lower functional capacity.

LVEF was not a significant independent predictor after adjusting for the other variables (β = −0.023; p = 0.583), suggesting that its effect on functional capacity is largely mediated by symptom severity. HF etiology was not significantly associated with functional capacity when compared to the ischemic reference category (all p > 0.21), although a trend toward lower METs was observed in patients with Chagas disease (β = −0.695; p = 0.306).

Table 5. Multiple linear regression, independent predictors of functional capacity (METs age-adjusted).

Predictor	β	95% CI	SE	t	p-value
R^2 = 0.374 | Adjusted R^2 = 0.341 F (7, 132) = 11.27 | p < 0.001					
NYHA class (ordinal)	−1.033	(−1.866, −0.201)	0.421	−2.455	**0.015**
LVEF (%)	−0.023	(−0.108, +0.061)	0.043	−0.550	0.583
Congestion score	−0.235	(−0.424, −0.046)	0.095	−2.464	**0.015**
Dyspnea VAS	−0.232	(−0.412, −0.051)	0.091	−2.537	**0.012**
HF etiology					
Hypertensive vs Ischemic	+0.527	(−0.758, +1.811)	0.649	+0.811	0.419
Chagas vs Ischemic	−0.695	(−2.033, +0.642)	0.676	−1.028	0.306
Idiopathic vs Ischemic	+0.943	(−0.539, +2.425)	0.749	+1.258	0.210

Outcome: METs age-adjusted (nomogram: 4.7 + 0.97 × VSAQ − 0.06 × age). β = unstandardized regression coefficient; SE = standard error; 95% CI computed using t-distribution (df = 132). Etiology entered as dummy variables with ischemic etiology as reference category. Highlighted rows and bold values = p < 0.05. LVEF = left ventricular ejection fraction; METs = metabolic equivalents; NYHA = New York Heart Association; VAS = visual analogue scale

Discussion

The present study identified that functional capacity at hospital discharge in patients with heart failure with reduced ejection fraction (HFrEF) is not independently determined by left ventricular ejection fraction (LVEF), but rather by a constellation of clinical determinants reflecting multisystemic reserve, particularly symptom burden, including dyspnea and congestion, and NYHA functional class.

These findings align with the contemporary literature in demonstrating that hemodynamic stabilization and improvement in systolic function do not necessarily translate into recovery of cardiorespiratory fitness at the point of care transition (Bozkurt et al., 2021; Savarese et al., 2023).

The mean age-adjusted MET value observed in this sample (5.02 ± 3.56) indicates a state of severe functional impairment, placing most patients below the critical threshold of 5 METs required for independent performance of basic activities of daily living. Savarese et al. (2023) have shown that cardiorespiratory fitness is a more reliable predictor of survival than LVEF itself, given that each 1-MET increment is associated with up to a 15% reduction in all-cause mortality. The mean value observed here therefore suggests that these patients are discharged at a "frailty threshold," where diminished metabolic reserve predisposes them to adverse clinical outcomes and early rehospitalization.

The transition from tertiary care to the home setting represents the period of greatest patient vulnerability, frequently referred to as the "vulnerable risk phase." Our findings demonstrate that severe functional limitation amplifies these risks, as patients with low exercise reserve experience greater difficulty distinguishing between fatigue attributable to physical deconditioning and early signs of new decompensation (Sethares et al., 2023).

Dyspnea, assessed by visual analogue scale (VAS), showed the strongest correlation with METs ($r = -0.540$), suggesting that the patient's subjective perception serves as a sensitive indicator of cardiopulmonary integrity. Correa Nascimento et al. (2023) recently reported that persistent residual dyspnea at discharge is an independent predictor of adverse events within 30 days.

Our data add a physiological dimension to this observation, indicating that dyspnea at discharge is not merely a risk marker, but a direct reflection of objectively impaired cardiorespiratory fitness, possibly compounded by ventilatory mechanics compromised by persistent subclinical congestion. Although direct measurement of peak oxygen uptake (peak VO_2) via cardiopulmonary exercise testing remains the gold standard for assessing functional capacity, this approach is often impractical in the acute post-discharge setting due to equipment and staffing requirements. MET-based estimation tools such as the VSAQ offer a more feasible and sustainable alternative for routine clinical use, and Bozkurt et al. (2021) have noted that such estimates show clinically acceptable correlation with functional performance and quality of life.

Among the most notable findings of this study is the independent association between congestion score and functional capacity. This suggests that residual congestion exerts a bimodal detrimental effect: first, by reducing pulmonary compliance and increasing the work of breathing; and second, by inducing peripheral tissue edema that impairs oxygen and nutrient diffusion to skeletal myocytes (Pirrota et al., 2021).

This mechanism may partly account for the absence of an independent association between LVEF and functional capacity in the multivariate model ($p = 0.583$), a phenomenon referred to as the "functional paradox." Li et al. (2025) demonstrated that physical performance in HFrEF is predominantly governed by non-cardiac mechanisms, including mitochondrial dysfunction and structural alterations of skeletal muscle, independent of pump function. Accordingly, improvements in cardiac contractility may occur while the peripheral "motor", skeletal muscle, remains in a state of functional failure, limiting oxygen consumption during exertion (Li et al., 2025).

Regarding NYHA functional class, a reduction of approximately 1.0 MET per class increment was observed. Notably, however, the plateau of low functional capacity identified across classes II, III, and IV suggests that a recent episode of acute decompensation exerts a leveling effect on functional reserve. This pattern indicates that, at the time of discharge, even patients reporting symptomatic improvement share a common substrate of severe deconditioning

with those who remain more clinically limited.

Finally, the trend toward worse functional performance observed in patients with Chagas disease etiology reinforces the aggressiveness of this condition, which combines extensive myocardial fibrosis with autonomic instability and persistent inflammation (Marcondes-Braga et al., 2021). Taken together, these findings underscore that objective assessment of functional capacity at hospital discharge should be integrated as an essential clinical parameter. Identifying this state of functional frailty enables individualized care planning, supports the early prescription of cardiovascular rehabilitation, and optimizes the transition to home-based self-care (Wu et al., 2024).

Practical implications

These findings have direct implications for clinical practice. First, the identification of residual dyspnea and congestion as independent determinants of functional capacity at discharge reinforces that complete decongestion, rather than only hemodynamic stabilization, should be the one important therapeutic goal prior to discharge in patients with HFrEF.

Second, the results support the routine incorporation of functional capacity assessment into the discharge plan. The VSAQ is a brief, equipment-free instrument that can be readily administered by professional healthy, enhancing risk stratification and informing decisions regarding rehabilitation referral and post-discharge follow-up intensity.

Third, although LVEF remains a cornerstone of HFrEF diagnosis and management, its lack of independent association with functional capacity after adjustment for symptom burden suggests that echocardiographic parameters alone may not fully capture a patient's functional status at the time of discharge. Structured functional assessment should therefore complement, rather than replace, traditional clinical markers in discharge planning.

Finally, the trend toward lower functional capacity in patients with Chagas disease etiology suggests this subgroup may benefit from more intensive post-discharge monitoring, given the distinctive burden of autonomic dysfunction and progressive myocardial damage associated with this condition.

Limitations

Some limitations should be acknowledged. First, the cross-sectional design cannot provide causal inference, as all measures reflect concurrent assessments at the time of discharge. Second, the single-center sample may limit generalizability to other healthcare settings or populations with distinct sociodemographic profiles. Third, functional capacity was estimated using the VSAQ rather than cardiopulmonary exercise testing; although the VSAQ is validated and feasible in hospitalized patients, self-report measures may not fully capture true physiological limits, particularly in those recently recovering from acute decompensation.

Additionally, the population profile of this sample may limit generalizability. Nearly 24% of patients had HF related to Chagas disease, an etiology that is uncommon outside Latin America; future studies should evaluate whether the impact of etiology on functional capacity varies according to the prevalence of different HF etiologies across regions. Similarly, nearly 67% of the sample was in NYHA class I or II, a distribution that may not reflect populations with a higher burden of advanced disease, potentially limiting extrapolation of these findings to more symptomatic cohorts. Finally, this analysis focused on a predefined set of clinical variables; other potentially relevant factors, such as chronic obstructive pulmonary disease, depression, cognitive impairment, discharge hemoglobin level, and in-hospital mobilization practices, were not modeled and may independently influence functional capacity. Future studies should explore these variables, alongside the mobilization and rehabilitation strategies applied during hospitalization, as their inclusion may substantially refine risk stratification at discharge.

Conclusion

In patients hospitalized for HFrEF, functional capacity at discharge is primarily determined by symptom burden, particularly dyspnea, residual congestion, and NYHA functional class, rather than by LVEF alone. A substantial proportion of patients are discharged with severe functional impairment, revealing a clinically meaningful gap between hemodynamic stabilization and true functional recovery.

This dissociation has direct implications for care transition, as many patients return home with limited capacity to perform basic activities and engage in adequate self-care. These findings support the systematic incorporation of functional capacity assessment into discharge planning, alongside traditional clinical parameters. Identifying residual symptoms and functional limitation at this critical juncture may guide more targeted interventions, including optimization of decongestion, early cardiovascular rehabilitation, and individualized care planning, ultimately moving the therapeutic goal in heart failure beyond stabilization toward functional recovery.

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