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A propensity-matched study of the association of physical function and outcomes in geriatric heart failure

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Abstract

Most heart failure (HF) patients are older adults. However, the association of functional status and outcomes in ambulatory older adults with chronic HF has not been well studied. Of the 7788 Digitalis Investigation Group (DIG) trial participants, 4036 were ≥65 years. Of these, 1369 (34%) had New York Heart Association (NYHA) class III–IV symptoms. We calculated propensity scores for NYHA III–IV symptoms for all 4036 patients using a non-parsimonious logistic regression model. We used propensity scores to match 1010 (74% of 1369) NYHA III–IV patients with 1010 of NYHA I–II patients. Kaplan–Meier and matched Cox proportion hazard analyses were used to estimate associations of NYHA class III–IV with mortality and hospitalizations. Patients had a mean age of 73 years, 31% were female, and 11% were nonwhites. All-cause mortality occurred in 394 (rate, 1385/10000 person-years) NYHA I–II and 452 (rate, 1654/10000 person-years) NYHA III–IV patients, respectively, during 2967 and 2733 years of follow up (hazard ratio: {HR}, 1.28; 95% confidence interval {CI}, 1.09–1.50; $p = 0.002$). NYHA III–IV class was associated with increased cardiovascular (HR, 1.25; 95% CI, 1.04–1.49; $p = 0.016$) and HF mortality (HR, 1.51; 95% CI, 1.16–1.97; $p = 0.002$). NYHA III–IV class was not significantly associated with hospitalizations due to all causes (HR, 1.10; 95% CI, 0.96–1.25; $p = 0.165$), cardiovascular causes (HR, 1.11; 95% CI, 0.96–1.29; $p = 0.150$), or worsening HF (HR, 1.09, 95% CI, 0.92–1.30; $p = 0.330$). Baseline NYHA functional class was associated with mortality but not with hospitalization in ambulatory older adults with chronic HF.

Keywords: Heart failure; Geriatric patients; NYHA class; Physical function; Outcomes of HF in elderly

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1. Introduction

Aging and heart failure (HF) are both characterized by decline in physical function. However, the effect of functional status on outcomes in geriatric HF patients has not been well studied. Functional status in HF is often assessed using the NYHA functional classification (Hunt et al., 2005; Radford et al., 2005). According to NYHA classification, depending on the severity of HF symptoms and the degree of effort needed to elicit those symptoms, patients are classified into one of the four classes: class IV (symptoms of HF are present at rest), class III (symptom are present on less-than-ordinary activity), class II (symptoms on ordinary exertion), and class I (no symptoms at ordinary physical activity) (Radford et al., 2005).

We have recently demonstrated in a propensity-matched study that in ambulatory chronic HF patients, presence of NYHA III–IV symptoms was associated with a significant 23% increase in mortality (Ahmed, 2007). A subgroup analysis of that study suggested that the associations of NYHA class III–IV symptoms and mortality were significant in both younger (age <65 years) and older (age ≥ 65 years) patients. However, the association was significantly weaker among older adults ($p = 0.002$ for interaction) (Ahmed, 2007).

Evidence for elderly HF patients is frequently extrapolated from younger patients, as elderly HF patients are often excluded from randomized trials. Unlike in randomized trials, results of non-randomized studies can be more readily replicated in a cost-effective manner, obviating the need for such extrapolation. Therefore, the objective of this study was to determine the association between NYHA functional class and mortality and hospitalizations in a propensity score matched cohort of ambulatory older adults with chronic HF.

2. Subjects and methods

2.1. Data source and patients

A public use copy of the Digitalis Investigation Group (DIG) data sets was used for the current analysis. The DIG trial enrolled 7788 ambulatory chronic HF patients in normal sinus rhythm from 302 clinical centers in the US (186 centers) and Canada (116 centers) between January 1991 and August 1993 (The Digitalis Investigation Group, 1996, 1997). Of these patients, 4036 were 65 years and older, and 3405 (84%) had left ventricular ejection fraction (LVEF) $\leq 45\%$.

2.2. The NYHA classes

Participants in the DIG trial were classified by DIG investigators into one of the four NYHA classes depending on the severity of HF symptoms and the degree of effort needed to elicit those symptoms: class I ($n = 516$), class II ($n = 2151$), class III ($n = 1276$), and class IV ($n = 93$). Because of functional similarity and convenience of propensity matching, we combined patients with NYHA class I and II symptoms as