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Effects of Pedometer Use in Veterans With Chronic Heart Failure

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ABSTRACT

Routine physical activity can improve exercise tolerance in individuals with chronic heart failure (HF). Lack of exercise can lead to worsening of HF. This study examined the effect of a pedometer on exercise tolerance in veterans with chronic HF. Although both pedometer and routine exercise groups improved 6-minute walk test distance, the use of a pedometer was not better than routine exercise in improvement in exercise tolerance after 6 weeks. Factors that may have impacted the effectiveness of pedometer use include pedometer malfunction, low pedometer compliance, and severe wintery weather.

Keywords: 6-minute walk test, chronic heart failure, exercise tolerance, pedometer

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Exercise intolerance, fatigue, and dyspnea are the most common complaints among patients with chronic heart failure (HF). These symptoms have a substantial impact on patients' activity of daily living and overall sense of well-being. Consequently, the lack of physical activity fosters further deconditioning of general health leading to worsening of HF.

It is often assumed that dyspnea is the main factor causing exercise intolerance in patients with HF. However, approximately 50% of HF individuals reported leg fatigue, not dyspnea, being the main reason for their exercise intolerance.[1]

A number of previous studies have discovered relationships among pedometer use, exercise tolerance, and health outcomes. Evangelista et al[2] found significant functional improvement in New York Heart Association (NYHA) class II-IV HF patients with greater distance walked measured by a pedometer. Additionally, patients with severe chronic obstructive pulmonary disease (COPD) in a home-based pulmonary rehabilitation program using pedometers showed significant improvements in exercise tolerance, dyspnea score, and quality of life score after 6-12 weeks.[3] Studies have also identified pedometers as a motivational tool to increase physical activity and functional measurements.[4,5]

The purpose of this study was to evaluate the impact of pedometer use on exercise tolerance among veterans with chronic HF. Specifically, we sought to evaluate the effect of a home-based nonsupervised exercise regimen using a pedometer compared with verbal instructions in veterans with chronic HF.

THEORETICAL FRAMEWORK

The Health Promotion Model is a middle-range nursing theory that was used to guide this study. The foundation of Health Promotion Model focuses on factors that influence an individual's ability to achieve health-promoting behaviors.[6]

METHODS

Design

A prospective randomized controlled design was used in this study. Using permuted block randomization, veterans were assigned to either the control (routine exercise) group or the pedometer (exercise with a pedometer) group.

Setting and Sample

Veterans were recruited from the Veterans Administration Connecticut Healthcare System. Veterans with NYHA class II-III HF symptoms and confirmed ejection fraction $\leq$ 45% were eligible to participate. Exclusion criteria included unstable angina, untreated cardiac dysrhythmias, COPD, severe lower back pain, peripheral neuropathy, peripheral artery disease, dementia, blindness, and admission within 6 weeks before enrollment.

Twelve veterans (46.2%) were randomized into the pedometer exercise group, whereas 14 (53.8%) were randomized to the routine exercise group. All participants continued to receive optimized medical treatment during the study.

Data Collection

Baseline blood pressure, weight, serum B-type natriuretic peptide, and 6-minute walk test (6MWT) results were collected on the initial visit and at the end of 6 weeks. Veterans in both groups were given verbal instructions to exercise for at least 30 minutes 5 times a week. Although veterans in the control group exercised on their own merits and recorded the total minutes walked daily, veterans in the experimental group were provided a spring-levered pedometer and asked to keep a daily recording of the number of steps taken and asked to maintain or increase their daily steps taken. The exact number of steps taken daily was not used for the primary data analysis; it was used as a means to monitor compliance and to assess if veterans were able to maintain or exceed the number of steps each day. Differences in the number of meters walked in 6 minutes between baseline and postexperiment were recorded and analyzed.

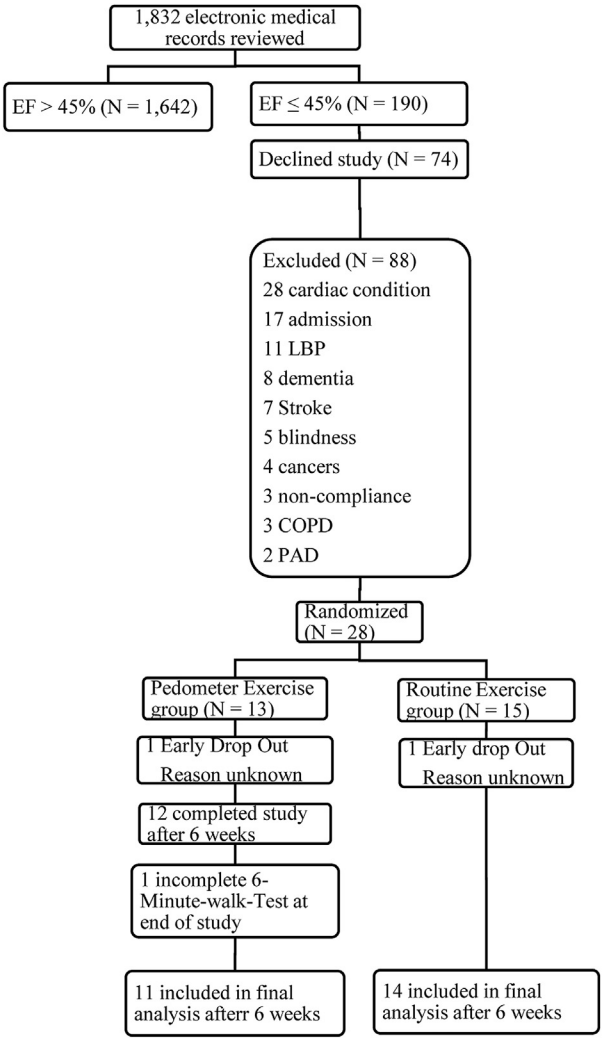
Statistical Analysis

Descriptive statistics were used to describe demographic characteristics. Inferential statistics were used to compare demographic and baseline clinical characteristics between the 2 groups. One-sample *t*-tests were applied to each group to test for 6MWT improvements within each group. Finally, a 2-sample *t* test was used to assess improvement in 6MWT between the groups. Data were analyzed using SPSS software version 18.0 (SPSS Inc, Chicago, IL). A P value $\leq .05$ was considered statistically significant.

A minimal clinically importance difference (MCID) in an outcome is the smallest difference that is considered to be clinically meaningful. Sample sizes were calculated to have good power to detect the MCID in 6MWT scores at a significance level of .05.

The MCID for HF was found to be in the range of 54 to 80 m.[7] Dallas et al[3] studied changes in 6MWT scores and provided a standard deviation of 59 m in those changes. Although this study was done in patients with COPD, it has been recognized that patients with COPD and HF have similar levels of exercise capacity and health status.[8] With this standard deviation of 59 m, the range of MCID values from 54 to 80 corresponds to a range of effect sizes from 0.92 to 1.36. Using Monte Carlo simulations, for MCID = 80 and MCID = 54, the sample sizes required to achieve power over 0.8 (80%) are n = 8 and n = 16, respectively, per group. Therefore, the target sample size for this study was a total of 16 to 32 subjects.

Figure 1. Patient selection process.



RESULTS

A total of 102 veterans meeting the criteria were identified. Seventy-four veterans declined to