



ORIGINAL ARTICLE

## Predictors of changes in functional capacity on a cardiac rehabilitation program<sup>☆</sup>



Carlos Branco<sup>a</sup>, Sofia Viamonte<sup>b,\*</sup>, Carlos Matos<sup>b</sup>, Sandra Magalhães<sup>b</sup>, Inês Cunha<sup>b</sup>, Ana Barreira<sup>b</sup>, Preza Fernandes<sup>b</sup>, Severo Torres<sup>b</sup>

<sup>a</sup> Instituto de Ciências Biomédicas Abel Salazar, Porto, Portugal

<sup>b</sup> Unidade de Prevenção e Reabilitação Cardiovascular, Centro Hospitalar do Porto, Porto, Portugal

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### KEYWORDS

Cardiac rehabilitation;  
Functional capacity;  
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### Abstract

**Introduction:** The effectiveness of cardiac rehabilitation programs (CRP) strongly influences the recovery of functional capacity (FC), resulting in improved prognosis and survival.

**Objective:** To determine the cardiovascular risk factors that predict changes in FC in patients on CRP.

**Methods:** We performed a cross-sectional descriptive retrospective study of patients who began a CRP between January 2008 and December 2013. The dependent variable was changes in FC estimated in metabolic equivalents (METs) achieved in stress testing at the beginning and end of the phase II program. The independent variables were age, gender, dyslipidemia, diabetes, smoking, body mass index, physical activity level and reason for referral to the CRP.

**Results:** The sample included 1399 patients, of whom 1125 (80.4%) completed the program. FC improved in most patients (93%), with a mean gain of  $1.45 \pm 1.19$  METs. Patients aged 45–65 and over 65 years achieved a greater increase in FC compared with other age groups. Patients admitted to the CRP after coronary artery bypass graft surgery obtained a greater improvement in FC compared to patients with acute coronary syndrome. Non-diabetic patients benefited more than diabetic patients. No significant differences were seen between the groups in the other variables.

**Conclusion:** This study highlights the need for new and individualized approaches in certain subgroups of patients on CRP.

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\* Corresponding author.

E-mail address: [sofiaviamonte@gmail.com](mailto:sofiaviamonte@gmail.com) (S. Viamonte).

**PALAVRAS-CHAVE**

Reabilitação  
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Fatores de risco  
cardiovasculares

**Fatores preditores da evolução da capacidade funcional num programa de reabilitação cardíaca****Resumo**

**Introdução:** A eficácia dos programas de reabilitação cardíaca (PRC) associa-se fortemente à recuperação da capacidade funcional (CF) dos doentes, traduzindo-se na melhoria do prognóstico e na sobrevida.

**Objetivo:** Determinar os fatores de risco cardiovascular que podem atuar como preditores da evolução da CF em doentes em PRC.

**Métodos:** Estudo descritivo transversal retrospectivo de doentes que iniciaram um PRC, entre janeiro de 2008 e dezembro de 2013. A variável dependente é a evolução da CF estimada em equivalentes metabólicos (MET) obtidos na prova de esforço, realizada no início e no final da fase II do programa. As variáveis independentes foram a idade, género, dislipidemia, diabetes *mellitus*, hábitos tabágicos, índice de massa corporal, nível de atividade física e diagnóstico de admissão a PRC.

**Resultados:** A amostra incluiu 1399 doentes dos quais 1125 (80,4%) finalizaram a fase II do programa. Verificou-se melhoria da CF na maioria dos doentes (93%) com um ganho médio de  $1,45 \pm 1,19$  MET. Os doentes na faixa etária (45-65] e superior a 65 anos obtiveram um incremento na CF superior quando comparados com a restante faixa etária. Os doentes admitidos para PRC após *Coronary Artery Bypass Graft* obtiveram um benefício superior da CF quando comparados com doentes com síndrome coronária aguda. Os doentes não diabéticos obtiveram um incremento da sua CF superior comparativamente com doentes diabéticos. Nas restantes variáveis estudadas não se obteve uma diferença significativa entre os grupos.

**Conclusão:** Este estudo salienta a necessidade de novas e individualizadas estratégias de atuação em determinados subgrupos de doentes em PRC.

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**Introduction**

Cardiovascular disease is the leading cause of mortality and morbidity in Portugal, making atherosclerotic disease an important public health issue that requires measures for primary and secondary prevention.<sup>1,2</sup>

The 2008 Framingham general cardiovascular risk profile identified the main risk factors for cardiovascular disease (CVD) as age, gender, total cholesterol, high-density lipoprotein (HDL) cholesterol, systolic blood pressure, diabetes and smoking.<sup>3</sup> Of these, most are modifiable, offering a window of opportunity to significantly reduce the global burden of CVD.

Exercise-based cardiac rehabilitation programs (CRP) are an important element in the prevention and treatment of CVD and in the control of cardiovascular risk factors.<sup>4</sup>

A significant factor in the effectiveness of CRP is their positive effect on patients' functional capacity, which results in improved prognosis and survival after diagnosis of CVD. Functional capacity following a cardiovascular event is known to be a strong independent predictor of mortality.<sup>5</sup>

Participation in a CRP has been shown to improve exercise tolerance, raise ischemic threshold, help control cardiovascular risk factors and improve general health.<sup>6,7</sup>

The objective of the present study is to determine the cardiovascular risk factors that predict changes in functional capacity in patients who have completed a CRP.

**Methods**

We performed a cross-sectional descriptive retrospective study of consecutive patients diagnosed with ischemic heart disease referred for a multidisciplinary exercise-based CRP between January 2008 and December 2013.

**Cardiac rehabilitation program**

The CRP included individual counseling on strategies for control of cardiovascular risk factors, group health education sessions, and supervised exercise sessions.

**Supervised exercise**

All patients participated in a twice-weekly exercise program supervised by physicians (physiatrist and cardiologist) with support from a physiotherapist, lasting 8–12 weeks. Each session lasted 60–90 min and included an exercise protocol consisting of a warm-up period, aerobic training (treadmill and arm and leg cycle ergometers), resistance training (using resistance bands, dumbbells, exercise balls and other strength training equipment), a cool-down period and flexibility exercises. The intensity of aerobic exercise was determined for each individual patient, based on their exercise heart rate calculated by the Karvonen formula using the data obtained from exercise testing, and complemented

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