Diabetes & Metabolic Syndrome: Clinical Research & Reviews xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original Article

# Outpatient cardiac rehabilitation: Effects on patient improvement outcomes

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ARTICLE INFO

Article history:
Available online xxx

*Keywords:*
Cardiovascular diseases
Rehabilitation
Acute coronary syndrome
Outpatients
Diabetes mellitus

ABSTRACT

*Objective:* To determine if the Cardiac rehabilitation (CR) program had positive effects on the patient medically as well as effects on pathological risk factors, functional capacity, and mental health; and the extent to which targets for blood pressure (BP) control in patients with hypertension (HT) and diabetes mellitus (DM) are achieved.
*Methodology:* CR participant data was collected from 1st June 2014 until 31st December 2015 (19 months), which included: demographics, medical history, social history, medications, lipid profiles and anthropometric measurements. Additional data was collected on The Patient Health Questionnaire (PHQ-9) factors, and on the participants 6 min walk test (6MWT). Study participants were eligible to participate in the study if they attended 10 or more CR program sessions out of 12 at the Calvary Public Hospital Canberra.
*Results:* Seventy nine (79) participants participated in the study. Significant reductions in BP ($n = 79$) ($p = < 0.05$), blood LDL cholesterol levels ($n = 26$) ($p = < 0.05$), and improvements in participants PHQ-9 scores ($n = 79$) ($p = < 0.001$), and their 6MWT ($n = 78$) ($p = < 0.001$) were noted. Participants were also able to better manage their medication ($p = < 0.05$). Importantly, results indicated that significant improvements ($p = < 0.05$) were made in DM patients ($n = 18$) diastolic BP, physical ability and depression and anxiety.
*Conclusion:* A CR program can reduce risk factors associated with CVD, and improves mental health and physical fitness of participants.
*Results:* Indicated that the CR program reduces DM patient risk factors through improved physical fitness and reductions in depression and anxiety, leading to reduced risk of future cardiovascular and renal disease.



## 1. Introduction

Cardiovascular disease (CVD) is a leading cause of deaths globally; therefore it is essential that interventions that are effective in slowing progression of the disease are used. Cardiac rehabilitation (CR) is an intervention that is strongly associated with reduction in all-cause mortality [1]. However, no studies within the Australian Capital Territory (ACT) have investigated the effects of a CR program on pathological risk factors, such as pre and post CR program measurements of blood pressure (BP), heart rate (HR), and weight and girth. Furthermore, no ACT studies have considered changes in the physical fitness and mental health of patients as a result of CR participation.

Bright reported the association between chronic kidney disease (CKD) and CVD by taking the view that renal disease is the primary disorder and cardiovascular changes are secondary i.e. establishing the concept of the renal origin of CVD [2]. Several studies [3,4] have reported that low estimated glomerular filtration rate (eGFR) and raised albuminuria are associated with CVD and found that cardiovascular mortality was about twice as high in patients with stage 3 CKD and three times higher in stage 4, than that in patients with normal kidney function [5]. CVDs are associated with impaired kidney function and the risk of heart failure roughly doubles in patients with eGFR lower than 60 mL/min per 1.73 $m^2$, compared to patients with preserved eGFR [6]. This risk is similarly

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http://dx.doi.org/10.1016/j.dsx.2017.07.034
1871-4021/

increased for stroke, peripheral artery disease, coronary heart disease, and atrial fibrillation [5]. CKD is frequently the result of HT and DM [5], and those with CKD are viewed as high-risk for CVD [7]. Even with this association, it appears that no ACT studies have directly considered the benefits of CR program to DM and HT patients.

The American Heart Association (AHA) advises that lack of knowledge on the benefits of CR programs is a major contributor to its underutilisation and stresses that more research is needed that demonstrate CR program benefits [8]. Studies have considered medical benefits associated with CR programs [9,10], and the barriers to patient attendance [11], but no Australian studies have measured the improvements gained by CVD patients who have other chronic diseases. This specifically includes patients with DM and HT, and the benefits associated with participating in a CR program.

Therefore the research objectives are to determine:

1) whether the CR program benefited the patient medically, including reductions to pathological risk factors, improvements to functional capacity, and improvements in mental health; and
2) the extent to which the targets for BP control in patients with HT and DM are achieved.

The research has the following hypotheses – that the CR program:

- reduces pathology risk factors associated with CVD;
- improves the mental health and physical fitness of the participants;
- reduces the DM patient's pathology risk factors; and
- has positive effects on BP management.

## 2. Methods

The project was approved by the Calvary Public Hospital Bruce Research Ethics Committee (reference number: 33-2016), and the Charles Sturt University (CSU) Human Research Ethics Committee (reference number: H17009). The Calvary Hospital Bruce is a 256 bed public hospital located in Canberra Australia. The hospital is a teaching hospital with associations with local universities. The CR program takes patients who have had a cardiac event, acute coronary syndrome (ACS), arterial blood gas measurement (ABG) done, stents inserted, heart failure, atrial fibrillation (AF), and those at high risk of coronary artery disease (CAD). Patients for CR are required to be in a stable condition. Study participants were included if they attended 10 or more CR program sessions out of 12.

Patients in the CR program are offered a comprehensive multidisciplinary rehabilitation for 6 weeks. This consists of one or more group-based therapies, including education on risk factors for heart disease, anatomy and physiology of the heart, physiotherapy and exercise, stress management, medications, healthy eating, and balanced lifestyle and relaxation. Furthermore, there are presentations from GPs and Health Support Australia on their roles in regards to the patients' conditions and rehabilitation. Therapy segments are operated by a multidisciplinary team, including cardiac nurses, physiotherapists, social workers, pharmacists, dietitians, general practitioners, and occupational therapists.

Data was collected on patient key pathological risk factors from the 1st June 2014 until the 31st December 2015 (19 months). This timeframe was chosen due to staff availability and administrative support. The data collected included patient' demographic information (age, gender, ethnicity), past medical history such as angina, prior myocardial infarction (MI), prior percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG), heart failure, AF, and valvular heart disease. Information on current diagnosis, and pathophysiological risk factors (hyperlipidemia, smoking history, and family history of heart disease, HT, DM, exercise status, and history of depression and/or anxiety) was also collected.

Data was collected on the patient's height, weight, girth, BP, HR, and medications and participants were given the option to have their blood total cholesterol, Trigs, HDL, and LDL levels measured before and after the CR program.

The patient health questionnaire: PHQ-9 (Table 1) is a multipurpose instrument for screening, diagnosing, monitoring and measuring depression severity [12]. Participants were asked to complete the form before and after the CR program (Table 1) to determine whether changes in pathology correlated with changes in mental health as a result of the CR program.

Participant data was also collected on the 6 min walk test (6MWT), which is performed on a straight and flat corridor of 30 m, with two colour floor markings (start and end point of lap) [13]. A clinician supervised the 6MWT and a trained physiotherapist calculated the distance, from the number of laps (1 = 60 m), to the nearest meter. The 6MWT was used to evaluate the functional capacity of participants, before and after the CR program and this is recommended [14,15].

**Table 1**
The Patient Health Questionnaire (PHQ-9).[a]

| Patient Name: | Date of visit: | | | |
|---|---|---|---|---|
| Over the past 2 weeks, how often have you been bothered by any of the following problems? | Not at all | Several days | More than half the days | Nearly every day |
| 1. Little interest or pleasure in doing things | 0 | 1 | 2 | 3 |
| 2. Feeling down, depressed or hopeless | 0 | 1 | 2 | 3 |
| 3. Trouble falling asleep, staying asleep, or sleeping too much | 0 | 1 | 2 | 3 |
| 4. Feeling tired or having little energy | 0 | 1 | 2 | 3 |
| 5. Poor appetitive or overeating | 0 | 1 | 2 | 3 |
| 6. Feeling bad about yourself- or that you're a failure or have let yourself or your family down | 0 | 1 | 2 | 3 |
| 7. Trouble concentrating on things, such as reading the newspaper or watching television | 0 | 1 | 2 | 3 |
| 8. Moving or speaking so slowly that other people could have noticed. Or, the opposite- being so fidgety or restless that you have been moving around a lot more than usual | 0 | 1 | 2 | 3 |
| 9. Thoughts that you would be better off dead or hurting yourself in some way. | 0 | 1 | 2 | 3 |
| Column Totals: | | | | |
| Add Totals Together: | | | | |

[a] Reference ranges: 5–9: Minimal symptoms (escalate if present >2 years); 10–14: Minor depression (escalate if present >1 month), dysthymia (escalate if present >2 years), or mild/major depression; 15–19: Major depression, moderately severe; ≥20: Major depression, severe.

Please cite this article in press as: F.W. Gardiner, et al., Outpatient cardiac rehabilitation: Effects on patient improvement outcomes, Diab Met Syndr: Clin Res Rev (2017), http://dx.doi.org/10.1016/j.dsx.2017.07.034