Published in final edited form as:

J Gerontol Nurs. 2011 December ; 37(12): 36–44. doi:10.3928/00989134-20111103-01.

Initial Efficacy of a Cardiac Rehabilitation Transition Program: Cardiac TRUST

Mary A. Dolansky, PhD, RN[Assistant Professor],

Frances Payne Bolton School of Nursing, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106-4904

Melissa Zullo, PhD[Assistant Professor],

Department of Public Health, Kent State University

Rebecca Boxer, MD[Assistant Professor], and

Department of Medicine, University Hospitals, Case Medical Center

Shirley M. Moore, PhD, RN[Associate Dean for Research]

Case Western Reserve University

Abstract

Patients recovering from cardiac events are increasingly using postacute care, such as home health care and skilled nursing facility services. The purpose of this pilot study was to test the initial efficacy, feasibility, and safety of a specially designed postacute care transitional rehabilitation intervention for cardiac patients. Cardiac Transitional Rehabilitation Using Self- Management Techniques (Cardiac TRUST) is a family-focused intervention that includes progressive low-intensity walking and education in self-management skills to facilitate recovery following a cardiac event. Using a randomized two-group design, exercise self-efficacy, steps walked, and participation in an outpatient cardiac rehabilitation program were compared in a sample of 38 older adults; 17 who received the Cardiac TRUST program and 21 who received usual care only. At discharge from postacute care, the intervention group had a trend for higher levels of self-efficacy for exercise outcomes ($X=39.1$, $SD=7.4$) than the usual care group ($X=34.5$; $SD=7.0$) (t -test 1.9, $p=.06$). During the 6 weeks following discharge, compared with the usual care group, the intervention group had more attendance in out-patient cardiac rehabilitation (33% compared to 11.8%, $F=7.1$, $p=.03$) and a trend toward more steps walked during the first week ($X=1,307$, $SD=652$ compared to $X=782$, $SD=544$, t -test 1.8, $p=.07$). The feasibility of the intervention was better for the home health participants than for those in the skilled nursing facility and there were no safety concerns. The provision of cardiac-focused rehabilitation during postacute care has the potential to bridge the gap in transitional services from hospitalization to outpatient cardiac rehabilitation for these patients at high risk for future cardiac events. Further evidence of the efficacy of Cardiac TRUST is warranted.

Keywords

cardiac rehabilitation; self-management; postacute care; transitional rehabilitation

Introduction

Advances in medical and surgical treatments for cardiac disease have resulted in an increased prevalence of older adults surviving cardiac events. Due to the advanced age of survivors, disability rates as high as 45% to 75% have been reported following hospitalization for myocardial infarction, heart failure, and cardiac surgery (Dolansky & Moore, 2008a; van Jaarsveld et al. 2001). Disability related to a cardiac event is due to loss of aerobic capacity and lower thresholds for physical function and concurrent comorbidities. As a result, there is an increase in use of postacute care services such as skilled nursing facility (SNF) and home healthcare (HHC) to assist patients to transition from hospital to home (Dolansky, Xu, Zullo, Shishehbor, Moore, & Rimm, 2010).

To prevent disability following a cardiac event, the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) has published guidelines for a continuum of cardiac rehabilitation (CR) services ranging from inpatient programs (during hospitalization), transitional programs (during postacute care such as SNF and HHC), outpatient programs (6 weeks following hospital discharge and continue for up to 12 weeks), and long-term maintenance programs (following completion of outpatient programs) (AACVPR, 2004). The majority of research on the efficacy of CR is focused on outpatient programs. Outpatient CR results in documented benefits that include a 20% to 31% reduction in mortality from coronary heart disease and a beneficial effect on functional capacity (Jolliffe et al., 2000), reduction in risk factors, improvement in emotional health and quality of life (Wenger et al., 1995), and improvement in cognitive function (Gunstad et al., 2005). Unfortunately, older adults are less likely to attend outpatient CR (Cooper, Jackson, Weinman, Horne, 2002) and notably, older adults who are discharged to a SNF or to HHC are less likely than younger adults to attend outpatient CR (Dolansky & Moore, 2008b). This is unfortunate, as older people benefit as much, if not more, from CR as younger persons (Ades et al., 1999).

Given the low use of outpatient CR by older persons, despite the established benefits, there is a need to study the efficacy of approaches to increase their participation in outpatient programs. Since many older adults require postacute care services following a cardiac event, there may be an opportunity to use these transitional services to increase participation in the longer-term outpatient CR. Postacute care services traditionally include physical and occupational therapy to enhance independence in activities of daily living. Cardiac rehabilitation services are not reimbursed in postacute care, and therefore few CR services are offered in these transitional care environments. Yet, postacute care settings such as SNF and HHC provide a unique opportunity to deliver CR services to bridge the transition from hospital to outpatient CR for older cardiac patients. Addressing this opportunity, the Cardiac Transitional Rehabilitation Using Self-Management Techniques (Cardiac TRUST) intervention was developed to engage older patients, with the help of their families, in low-intensity walking and education about cardiac self-management skills with the aim to facilitate better recovery and participation in outpatient CR. The purpose of the study was to determine if older adults who participate in the Cardiac TRUST intervention have greater exercise self-efficacy, more steps walked, and enter outpatient CR programs more frequently than do older adults who receive usual care. The feasibility and safety of the Cardiac TRUST intervention also was assessed. In addition, the influence of a set of possible confounding factors (gender, comorbidity, cardiac function, fatigue, depression and fear of falling) was explored.

Methods

This pilot study used a two-group randomized design. Patients who were discharged from the hospital after a cardiac event were recruited at entry to a SNF or referral to HHC services. Using a random numbers table, participants were randomized to the Cardiac TRUST intervention group (N=17; 13 SNF and 4 HHC) or the usual care group (N=21; 17 SNF and 4 HHC).

Sample

Participants were recruited from five SNFs and one home care agency, all in Northeast Ohio. Inclusion criteria were (1) age 65 or older, (2) admitted to a SNF or HHC following hospitalization for one of the following cardiac events: myocardial infarction, coronary artery bypass surgery, cardiac valve surgery, and percutaneous coronary interventions, and (3) cognitively intact as determined by the *Mini-cog* (clock drawing test and 3-item recall) (Borson et al., 2000). Exclusion criteria consisted of (1) inability to walk due to musculoskeletal or neurological problem, (2) documented exercise contraindications (unstable ischemia, uncompensated heart failure, uncontrolled arrhythmias, severe aortic stenosis, severe pulmonary hypertension, hypertrophic obstructive cardiomyopathy, thrombophlebitis, systemic or pulmonary embolus, and severe arterial hypertension), (3) hospital length of stay greater than 40 days due to major complications, and (4) no family member or significant other to support participation.

Of 133 patients screened for study participation, 69 (52%) met the inclusion criteria. Of the 69 patients approached to participate, 29 (32%) refused. The major reason given for nonparticipation was fatigue and 'not feeling up to it.' Two participants were lost to follow-up. The average age of participants was 77.1 (SD=6.8), of which 65.8% were women and 26.3% were African American (See Table 1). At baseline, there were some differences between the study groups in demographic characteristics; more participants in the usual care group were caregivers, lived with others, and were African American than those in the intervention group.

The Cardiac TRUST Intervention

The Cardiac TRUST intervention was developed based on the self-management framework of Lorig and Holman (2003). In this framework, patient self-management is directed by six skills: problem solving, decision making, resource utilization, formation of patient-provider partnership, action planning, and self-tailoring. Figure 1 provides a list of the intervention components and teaching tools. The Cardiac TRUST program is designed to be an intermediate phase in the continuum of CR services (between in-hospital CR and outpatient CR) and consists of cardiac self-management instruction and exercise monitoring during postacute care. The education component consists of two 30-minute family sessions with a registered nurse that includes identification of values and goals (benefits of exercise), problem-solving skills (overcoming barriers, symptom management), decision making (monitoring of exercise and safety), and healthcare partnerships (communication strategies to effectively coordinate services that relate to exercise). The action component consists of monitoring the cardiac response to physical therapy and a research associate walking with the participant in the evening. The distance walked was individually tailored and started at 10 feet and progressively increased each day. During the action component, patients were taught to rate their exertion using the BORG (1982) rating of perceived exertion scale (RPE) and to self-monitor for signs of exercise intolerance (e.g. chest pain or dizziness). Participants were instructed to keep an exercise log (a graphic display of the number of minutes exercised) so they could self-monitor their progress. All family members were given an intervention binder. When able, the participant's family member or significant

other joined the patient in the two education sessions with the nurse and were encouraged to participate in the walking sessions. If the family member was unable to attend sessions, they were called and the content of the session reviewed over the phone. The first education session occurred after assessing participants' readiness and the second one took place prior to discharge from postacute care.

Procedure

Following Human Subjects Review Board approval, written informed consent was obtained. Each participant was given \$20 for participation in the study. Data were collected at baseline, at discharge from postacute care and during the six weeks after discharge. The intervention group received usual care and the Cardiac TRUST program as described above. All participants received usual postacute care services that included daily sessions of physical and occupational therapies as well as discharge instruction on physical activity level, medications, and follow-up. Pedometers were given to participants at baseline and they were asked to wear the devices daily for 2 weeks and keep an exercise log of the number of minutes walked per day. Participants mailed pedometers and exercise logs back to the study team.

Measures

Outcome Variables—*Exercise Self-efficacy* was measured using two scales. The Self-efficacy for Exercise (SEE) Scale is a 9-item scale measuring the perception of capability to exercise in the face of common barriers. The Outcomes Expectancy for Exercise (OEE) Scale is a 12-item instrument measuring the participant's expectations of exercise (Resnick & Jenkins, 2000). The internal consistency alpha values range from .72 to .88 and validity for the instruments has been confirmed using hypothesis testing (Resnick et al., 2004). *Number of steps walked* was measured using pedometers worn by participants during a 1-week period during postacute care and 1 week after postacute care discharge. *Outpatient cardiac rehabilitation attendance* was measured by the participants' self-report of actual attendance at an outpatient CR program measured 6 weeks following discharge.

Possible Confounding Variables—A set of possible influencing variables was collected to assess potential factors affecting outcome measures. *Comorbidity* was measured using the Charlson Comorbidity Index (Charlson et al., 1986). The instrument measures the number and seriousness of comorbid diseases using a weighted index. Summing the weighted comorbid conditions present at discharge derives a total score. *Cardiac functional status* was measured using the New York Heart Association (NYHA) Classification that assigns participants to one of four classes based on participants' responses to questions about the amount of fatigue, dyspnea or pain they experience at varying levels of physical activity. Scores range from 1 (no symptoms) to 4 (symptoms at rest). *Depression* was measured by the Geriatric Depression Scale and consists of 15 items representing depressed mood that do not include physical symptoms that might be present in older adults after cardiac events (Yesavage et al., 1983). Patients identify items that best reflect their feelings in the past week (1= "felt like this" and 0 "did not feel like this"). *Social support* was measured by the Multidimensional Scale of Perceived Social Support scale (Zimet, 1990). *Fatigue* was measured using the PROMIS fatigue instrument (Christodoulou et al., 2008). This 7-item instrument measures the level of fatigue experienced in the last 7 days on a Likert-type scale. We also added a question that elicited participants' fear of falling. All influencing variables are scored in the positive direction; higher scores reflect more of the characteristic.

Feasibility and Safety—Feasibility was measured as the participant's acceptability of the intervention, satisfaction with the program, and problems reported. Safety was measured as the number of cardiac events, rehospitalizations, and episodes of cardiac decompensation

(significant decrease in blood pressure, pulse, or pulse oximeter readings after walking or therapy sessions).

Analysis—Analyses were performed using SPSS for Windows version 17 (SPSS, 2009). Exploratory analyses included distributions of data and relations among variables using correlation coefficients. Differences between the study groups regarding self-efficacy, steps walked, and outpatient cardiac rehabilitation attendance were analyzed using chi-square and independent *t*-tests. Analysis of Covariance was used if there were significant correlations between the confounding and outcome variables. A significance value of .05 was set. Significance values of .06 to .1 also are reported as they may represent a trend in these pilot data to be considered.

Results

Initial Efficacy of the Cardiac TRUST Program

There were no associations of gender, comorbidity, cardiac function, and depression with exercise self-efficacy, steps walked, or outpatient CR attendance. Fatigue (baseline and 6-weeks) was inversely associated with exercise self-efficacy (baseline $r = -.39$, $p = .05$; 6 week $r = -.37$, $p = .06$). Since there were no differences between the study groups reporting level of fatigue, there was no attempt to control for this variable in the tests of differences in self-efficacy between the study groups. For all participants' fear of falling at baseline was noted to be associated with decreased walking at 6 weeks ($r = -.48$, $p < .05$).

Postacute Care Discharge Outcomes

There were no differences in self-efficacy for exercise at discharge from postacute care (first measurement point after the intervention). A trend toward significance was noted in self-efficacy for exercise outcomes ($t = 1.9$, $p = .06$) (Table 2). The number of steps taken during the postacute period is not reported as there was missing data for greater than 40% of the sample.

Outcomes during the Six Weeks after Discharge

During the six-weeks after discharge, a trend toward significance was noted in that the intervention group had a greater average number of steps taken compared with the usual care group ($t = 1.8$, $p = .07$). There was a significant difference between the study groups in relation to outpatient CR attendance following postacute care; 33% of the intervention group reported attending outpatient CR compared to 11.8% of the usual care group ($\chi^2 = 4.5$, $p < .05$). Additional statistical tests were performed to control for race as the control group had more African Americans than the intervention group and African Americans attend CR at lower rates than Caucasians (Allen, Scott, Stewart, Rohm, 2004). The analysis of covariance indicated the difference between the control and intervention groups remained when controlling for race ($F = 7.1$, $p = .013$).

Feasibility and Safety of the Cardiac TRUST Program

Feasibility was greater in the HHC group compared with the SNF group. Field notes by the intervention nurse indicated that the duration of the educational sessions had to be decreased for the majority of SNF participants because they frequently complained of fatigue. This adjustment was not required for HHC participants. Family attendance at the educational sessions was achieved in only 10% of the sessions for the SNF group as compared to 80% of the HHC group. Research staff was able to walk patients in the SNF on average only two evenings due to fatigue and getting to the facilities. Home Health Care participants did complete daily walking.

Satisfaction surveys at discharge from postacute care indicated that the majority of the intervention participants rated the Cardiac TRUST intervention (additional walking sessions, key rings, and education) as useful. Forty percent of the participants felt that wearing the pedometer was a burden and 68% did not participate in completing their exercise log. At 6 weeks, 58% of the participants reported using the exercise log (80% of the participants from the HHC cohort) and 40% reported having used the key rings that contained information on contact information, emergency plan, and BORG RPE scale.

There were no adverse events with the walking program, and blood pressure, pulse and oximeter readings did not indicate any cardiac decompensation following walking. Eight of the SNF participants commented that they were hesitant to walk due to fear of falling and that they were instructed by hospital personnel to not get up. There was no difference in rehospitalization rates between the intervention (21.6%) and control groups (18.4%). There were, however, three rehospitalizations (two from the usual care group and one from the intervention group) directly related to therapy (patients experienced chest pain or cardiac decompensation during a physical therapy session).

Discussion

In this pilot study, initial evidence of the efficacy of the Cardiac TRUST program was generated. The intervention group had higher levels of outpatient CR attendance than the usual care group. This difference remained when controlling for race as prior studies have indicated that African Americans are less likely to attend outpatient CR. At discharge from postacute care, there was a trend toward significance in intervention participants reporting more self-efficacy for exercise outcomes. The intervention participants also demonstrated a trend toward significantly more steps walked during the first week after discharge from postacute care. Both of these findings are consistent with those of Grando and colleagues (2009), who found that nursing home residents who were able to complete a comprehensive nursing rehabilitation program following hospitalization believed the program helped them improve their physical functioning and had actual improvements in their performance of activities in daily living.

There are some issues regarding feasibility of the Cardiac TRUST program for SNF participants. The feasibility concerns are related to the educational and daily walking components of the intervention. The SNF participants had many complaints of fatigue and thus could not complete a 30-minute education session. Fatigue is a significant factor in the delivery of rehabilitation interventions in SNF in other studies (Grando et al., 2009). Another issue for SNF participants was that many were hesitant to walk as staff told them to not get up due to the possibility of falling. We also found that participants who reported a fear of falling had lower average numbers of steps taken per day. The fear of falling has been found to be related to reduced activity in other studies of participants in assisted living care settings (Resnick & D'Adamo, 2011).

Overall, the Cardiac TRUST program appears more feasible for the HHC participants compared with the SNF participants. Participants in HHC participated more in daily walking and recorded the activity in their exercise log more than those in SNF. The HHC participants also recorded blood pressure, pulse, and BORG RPE before and after exercise in greater numbers than persons in SNF. The majority of HHC participant's family members were present during educational sessions and this added support contributes to recovery.

Limitations

Although the pilot test of the Cardiac TRUST program in SNF and HHC patients has demonstrated beginning evidence of its efficacy and feasibility, there were limitations. This

initial study had a small sample size leading to potential for bias in the findings. Another limitation was the small percentage of HHC group participants that inhibited comparisons between the HHC and SNF. These limitations can be addressed in a future large randomized controlled trial.

Lessons Learned from this Pilot Study

We learned several things from this pilot study that will be useful for future research in the design and testing of interventions for this population. First, the presence of fatigue and fear of falling suggests that adding a component to the intervention that empowers patients to address and cope with fatigue and fear of falling may assist patients to sustain rehabilitation efforts when they return home. The intervention also could be improved by including the family member as a study participant so that they are more actively involved in the intervention. In addition, it is important to identify the perceptions of family members regarding their role in assisting with the transition of care from postacute care to independence.

We also learned that it is necessary to address participants' levels of fatigue and the differences between SNF and HHC environments in future research regarding Cardiac TRUST or similar interventions. Fatigue levels need to be taken into account in the intervention delivery and modifications made that include targeting the intervention to people later in the rehabilitation process perhaps during the last week of the SNF stay. Future research may benefit from using an adaptive intervention approach in which different dosages of certain program components are given to individuals as a form of tailoring the intervention using explicit decision rules (Collins, Murphy, and Bierman, 2004). For example, the intervention could be adapted for individuals based on levels of fatigue or involvement of family members. Using prespecified decision rules, different doses of the walking component could be delivered base on level of fatigue.

One important lesson learned was the three adverse events of cardiac decompensation during physical and occupational therapy. Future research is needed to understand the role of monitoring cardiac response to therapy, the incidence of adverse events, and the usefulness of the Borg RPE Scale to assess effort to alleviate potential complications.

Findings from this pilot study demonstrate that integrating education on CR can impact attendance at outpatient CR. The AACVPR provides guidelines for incorporating rehabilitation principles into postacute care to ensure the continuum of CR services. Further research is needed on the efficacy of integrating CR principles into the care of SNF and HHC patients in order to assess the impact on self-efficacy, walking, and attendance at outpatient CR programs.

Acknowledgments

Funding: The project described was supported by award number P30NR010676 from the National Institute of Nursing Research. The contents of this article are solely the views of the authors and do not necessarily represent the official views of the National Institute of Nursing Research or the National Institutes of Health.

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Figure 1 Components of the Cardiac TRUST Intervention

SESSION 1

- 1) Self-analysis of stage of behavior change using a self-assessment
- 2) Develop a value statement
- 3) Discussion of individual benefits of incorporating a walking program into their daily life
- 4) Exercise safety and survival skills (what to do if they experience chest pain or dizziness)

TOOL:

Tailored motivational poster: “How will I get Stronger?”

SESSION 2

- 1) Develop a walking plan (validated by the family member)
- 2) Identify exercise barriers
- 3) Problem-solving skills to overcome barriers
- 4) Decision-making skills to address what to do if symptoms occur
- 5) Symptom awareness and education on monitoring respiratory rate and exertion perception (Borg RPE scale)
- 6) Health care partnerships are addressed and the participant family dyads are taught communication techniques to coordinate care among physicians, therapists, and nurses

TOOL:

Key Ring: The information gained from the intervention sessions was used to create five index cards placed on a key ring and contained the following information: Borg RPE scale; exercise goals, values, barriers and action plan; resources and contact information; four top reasons to walk; what to do if having chest pain (nitroglycerin instructions); nearest cardiac rehabilitation program and contact information, and a specific plan for incorporating the daily exercise.

Note: participants were coached to share their TRUST key-ring with their physicians, therapists, and homecare nurse.

ACTION COMPONENT

- 1) Daily walking program was done in the evening and was directed by research associates. Family members were encouraged to participate in the evening walking program so that they could encourage and assist walking when the patient returned home. Using the guidelines for early activity after a cardiac event from the AACVPR (2004), the intensity of the walk was guided by the use of the RPE scale and participants were instructed to keep walking intensity at an RPE of 12 or less (fairly light, 40% of maximal heart rate).
- 2) Blood pressure and heart rate were both taken before and after walking sessions.

TOOLS:

Family Information binder

Daily Walking Log

1. .

Table 1
Comparison of Baseline Characteristics of the Total Sample, Intervention, and Usual Care Groups

		Total Sample N=38 N(%)	Intervention n=17 n(%)	Usual care n=21 n(%)
Gender	Women	25 (65.8)	9 (52.9)	15 (71.4.2)
Living Arrangements	Live Alone	11 (28.9)	6 (35.3)	5 (23.8)*
Marital Status	Married	14 (36.8)	6 (35.3)	8 (38.1)
Race	African American	10 (26.3)	3 (17.6)	7 (33.3)*
	Caucasian	26 (68.4)	13 (76.5)	13 (61.9)
Education	High School	11 (28.9)	3 (17.6)	8 (38.1)
Caregiver	Yes	6 (15.8)	1 (5.9)	5 (23.8)*
Type of Cardiac Event	CABG	21 (55.3)	9(52.9)	12 (5.7)
	MI	9 (23.7)	7(41.2)	10 (47.6)
	Cardiac Valve	17(44.7)	7(41.2)	10 (47.6)
NYHA	1-2	9 (23.7)	5 (29.4)	4(19.0)
	3-4	29 (76.3)	11 (64.7)	18(85.7)

	M	SD	M	SD	M	SD
Age	77.1	6.8	77.6	6.9	76.5	6.7
Comorbidity	2.2	1.8	1.6	1.3	2.8	2.0
Hospital Length of stay	15.3	8.6	15.1	9.2	15.6	8.1
Hospital Complications	1.2	1.2	1.4	.58	1.0	.87
Fatigue	20.1	5.6	19.2	4.9	20.8	6.3
Social Support	26.3	3.8	26.4	3.8	26.2	4.0
Depression	3.5	3.1	2.9	2.7	4.2	3.5
Self Efficacy	57.3	15.0	59.4	17.4	55.0	12.5

* p<.05

Note: NYHA=New York Heart Association Cardiac Functional Classification, CABG= coronary artery bypass graft; MI=myocardial infarction.

Table 2

Comparison of Outcomes between the Intervention and Usual Care Groups

	Intervention n=17		Usual care n=21		<i>t-test</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Self Efficacy for Exercise (SEE)	59.4	17.0	55.0	12.5	.83
Outcome Expectations for Exercise (OEE)	39.1	7.4	34.5	7.0	1.9 *
<i>1 week after Postacute Care Discharge</i>					
	Intervention n=12		Usual care n=17		<i>t-test</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Daily Steps	1307	652	782	544	1.8**
<i>6 weeks after Postacute Care Discharge</i>					
	Intervention n=12		Usual care n=17		<i>t-test</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Self Efficacy for Exercise	68.8	16.9	56.7	21.5	1.7
	<i>n</i>	%	<i>n</i>	%	<i>chi square</i>
Attending Cardiac Rehabilitation	7	58.3	2	11.8	4.5***
Controlling for Race					ANCOVA <i>F</i> 7.1***

*

p=.06

**

p=.07

p<.05