A comparison of barriers to use of home versus site-based cardiac rehabilitation

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STRUCTURED ABSTRACT

Purpose—Despite the established benefits of cardiac rehabilitation (CR), it remains significantly underutilized. It is unknown whether patient barriers to enrollment and adherence are addressed by offering choice of program type. The purpose of this study was to examine barriers to participation in CR by program type (site vs. home-based), and the relation of these barriers to degree of program participation and exercise behavior.

Method—1809 cardiac patients from 11 hospitals across Ontario completed a sociodemographic survey in-hospital, and clinical data were extracted from charts. They were mailed a follow-up survey one year later, which included the Cardiac Rehabilitation Barriers Scale and the Physical Activity Scale for the Elderly. Participants were also asked whether they attended CR, the type of program model attended, and the percentage of prescribed sessions completed.

Results—Overall, 939 (51.9%) patients participated in CR, with 96 (10.2%) participating in a home-based program. Home-based participants reported significantly greater CR barriers compared to site-based participants ($p < 0.001$), including distance. Mean barrier scores were significantly and negatively related to session completion and physical activity among site-based ($ps < 0.05$), but not home-based CR participants ($p > 0.05$).

Conclusion—The barriers to CR are significantly different among patients attending site vs. home-based program, suggesting appropriate use of alternative models of care. Patient preferences should be considered when allocating patients to program models. Once in CR, programs should work towards identifying and tackling barriers among site-based participants.

Keywords

Cardiac rehabilitation; barriers; program model

INTRODUCTION

The global prevalence of cardiovascular diseases is reaching epidemic proportions.¹ Research shows that exercise-based cardiac rehabilitation (CR) reduces the likelihood of cardiac-related mortality and improves quality of life.² Despite the significant benefits of CR, it is greatly under-utilized. It is estimated that only approximately 20% to 30% of eligible patients participate in CR.^{3,4}

To address many of the CR barriers such as lack of transportation access and distance to program facilities, home-based CR programs have been developed. Home-based CR programs offer the same core CR components as site-based programs,^{5,6} but communication occurs through telephone or internet contact, education occurs through provision of written materials, and exercise is undertaken in the patient's community environment. Home-based and site-based programs do not differ in terms of mortality rates, cardiac events, exercise capacity, smoking cessation, or health-related quality of life.⁷

Patients reporting greater barriers to CR use are significantly less likely to enrol, and are more likely to dropout, ultimately not achieving the health benefits of CR.⁸ Yet, many patient barriers to CR could be addressed by appropriate allocation to site or home-based programs, although this has yet to be investigated. Thus, the objectives of this study were to: (1) describe and compare barriers to participation, and (2) investigate whether these barriers are related to (a) program adherence (percentage of site or phone CR sessions attended) and (b) exercise behavior, among patients participating in site versus home-based CR programs.

METHOD

Design and Procedure

This is a secondary analysis of a larger study⁹ for which cardiac in-patients from 11 hospitals in Ontario were recruited. CR services were provided through provincial healthcare at no cost to patients (although patients pay for transportation and/or parking at each visit). Ethics approval was granted from all participating institutions. After obtaining consent, clinical data were extracted from medical charts, and a self-report survey was provided to patients for completion. Among other variables, this survey assessed sociodemographic characteristics.

One year later, participants were mailed a follow-up survey assessing physical activity, CR barriers, and CR use. The cross-sectional analyses herein were based on this latter cohort of retained participants who reported attending CR.

Participants

A total of 2635 stable cardiac inpatients were recruited. The inclusion criteria for the larger study were: confirmed acute coronary syndrome diagnosis, and patients who had undergone

percutaneous coronary intervention or coronary artery bypass graft surgery, or had heart failure. The exclusion criteria for the larger study were: participation in CR within the past two years, and significant orthopedic, neuromuscular, visual, cognitive and/or any serious mental illness which would preclude CR participation.

Overall, there were 1809 (68.6%) participants retained in the study who completed the one year follow-up survey. There were some significant differences in the characteristics of participants retained versus lost-to-follow-up that are reported elsewhere.⁹

Measures

Self-reported sociodemographic variables measured in the initial survey through forced-choice response options included patient's marital status and ethnocultural background (response options were based on Statistics Canada). Patients were asked at the time of recruitment whether they lived within a 30-minute drive of a hospital, and were coded as rural if they responded "no." The MacArthur Scale of Subjective Social Status was also administered.¹⁰ Participants were asked to demarcate their socioeconomic status on a 10-rung ladder compared to others in Canada. Scale scores ranged from 1 to 10, with higher scores indicating greater subjective socioeconomic status. Sociodemographic data obtained from the medical chart included date of birth and sex.

Participants were also administered the Duke Activity Status Index in the initial survey.¹¹ This scale correlates highly with peak VO_2 and functional capacity.¹¹ Clinical variables obtained from the chart included diabetes mellitus, hypertension, and comorbidities.

The one year follow-up survey assessed self-reported CR utilization, through forced-choice response options for participation (yes/no), as well as a patient's estimate of percentage of prescribed CR sessions attended. CR program type was assessed by asking participants to report whether they attended a home-based or site-based CR program. The following two psychometrically-validated scales were also administered.

The Physical Activity Scale for the Elderly (PASE) is a valid and reliable 10-item brief questionnaire which measures the level of physical activity in individuals aged 65 years or older. The respondent is asked how many days per week, and how much time was spent in each activity over the past week, graded in four categories.¹²

The Cardiac Rehabilitation Barriers Scale (CRBS) is a valid and reliable measure which assesses patients' perceptions of patient, provider, and health system-level barriers to CR enrollment and participation.⁸ Participants were asked to rate their level of agreement on each of the 21 statements. Items were rated on a 5-point Likert-type scale that ranged from 1 = *strongly disagree* to 5 = *strongly agree*. A mean score is computed, and higher scores indicate greater barriers to patient participation in a CR program.

Statistical Analyses

SPSS Version 20.0 was used to analyze the data. Student's *t*-tests and chi-square analyses were performed as appropriate to compare sociodemographic and clinical characteristics between those who attended home versus site-based CR. To test the first objective, *t*-tests

were performed to compare CR barriers between patients reporting participation in home versus site-based CR. Given that multiple tests were being performed to test each individual barrier, a Bonferroni correction of $p < 0.002$ was applied. To test the second objective, Pearson's correlation was used to assess the associations between total CR barriers with physical activity and with percentage of CR sessions attended, overall and among those who attended home versus site-based CR. Where significant, an examination of the relation to each barrier was undertaken.

RESULTS

Respondent Characteristics

Of the 1809 participants, 939 (51.9%) reported enrolling in CR and comprised the sample for this study. Of these, 821 (87.4%) reported attending a site-based CR program, 96 (10.2%) reported attending a home-based CR program. Fourteen (1.5%) patients reported attending a hybrid program that consisted of both site-based and home-based CR, and these patients were excluded from the sample to avoid contamination of the data. Eight (0.9%) patients failed to report the type of program that they attended. Table 1 displays the sociodemographic and clinical characteristics of the CR participants by home versus site-based program use. There were no significant differences in these characteristics between participants enrolled in either program model.

CR Barriers

Table 2 displays the CR barriers in descending order. The highest endorsed barrier among site-based participants was travel, and among home-based participants was already exercising at home or in one's community. Home-based CR participants reported significantly greater barriers overall compared to site-based CR participants. More specifically, home-based CR participants rated the following two barriers significantly higher than site-based CR participants: distance and already exercising in one's home or community. The nature of these barriers is such that they are addressed by provision of home-based programs.

CR Barriers in Relation to Program Adherence and Physical Activity

The mean percentage of on-site CR sessions attended for site-based participants was $83.2 \pm 26.5\%$, and of phone sessions for home-based participants was $82.7 \pm 30.6\%$ ($p > 0.05$). The percentage of sessions attended was significantly and negatively related to barriers among site-based participants ($r = -0.36$, $p < 0.001$), but not among home-based participants ($r = -.15$, $p = 0.29$). All of the items were significantly and negatively related to percentage of sessions attended for site-based CR participants ($p < 0.001$) except for "severe weather" ($r = -.13$, $p = 0.002$) and "travel" ($r = -.05$, $p > 0.05$).

The PASE scores suggest that overall, 280 (29.8%) participants were meeting physical activity guidelines of 150 minutes of moderate-to-vigorous physical activity per week at one year post-hospitalization. The mean physical activity score was 139.0 ± 88.2 for site-based CR participants, and 165.1 ± 93.7 for home-based participants ($p < 0.05$). The total CRBS score was significantly and negatively related to physical activity for site-based ($r = -0.11$,

$p < 0.05$), but not home-based CR participants ($r = -.12$, $p > 0.05$). The following items were significantly and negatively related to physical activity for site-based CR participants: “I find exercise tiring or painful” ($p = 0.001$) and “I don’t have the energy” ($p < 0.01$).

DISCUSSION

Although CR barriers were generally low, patients who attended home-based CR programs reported significantly greater barriers to CR utilization compared to those who attended site-based CR. Also, the nature of these barriers such as distance, suggest patients are being appropriately allocated to program model. The finding that program adherence rates were high overall, and the lack of significant difference in program adherence between home and site-based CR, further suggest that patients were highly engaged in CR. Overall, this indicates that programs are using a patient-centered approach to program model allocation, and that this approach may serve to promote CR adherence.

However, only approximately 11% of patients participated in home-based CR, and these participants were engaging in significantly more exercise one year post-hospitalization than their site-based counterparts. Many of the CR barriers were significantly related to lower program adherence and exercise behavior among participants who had attended site-based programs. Indeed, this could be due to lack of integration of patients’ exercise routine into their home and community environment. These subsequent findings have important implications in terms of home-based service capacity, and promotion of program adherence and exercise maintenance following site-based programs.

Program model allocation and CR Barriers

The results of this study suggest that patient perceptions of their CR barriers are taken into consideration when allocating patients to CR program models. Although several indicators of disease severity were not related to CR model allocation, distance to the program as perceived by patients and having an established routine for exercise in one’s home or community setting were taken into consideration. Similar to our findings, Bruhal et al. (2012) reported no significant differences between program models in terms of the sociodemographic characteristics of participants. However, contrary to the current findings, they found that patients attending a site-based CR program had lower functional status compared to their home-based counterparts, suggesting that higher acuity patients were being appropriately allocated to a supervised program.¹³ It is worrisome that such differences were not observed in the current sample.

In a randomized controlled trial with four arms (randomization to home or site-based CR or patient preference to home or site-based CR), researchers compared the clinical effectiveness of home-based versus site-based CR after myocardial infarction. First, they found that choice of a model did not significantly affect clinical outcomes.¹⁵ This again highlights the value of considering patient preference in program model allocation. Second, adherence to home-based CR was comparable between the randomized (73%) and preference arms (75%). This suggests that if patients were to be allocated to a home-based program based on low disease severity for instance, it would less likely have a negative impact on their program adherence.

Limitations

Caution is warranted when interpreting these results due to several study limitations. First, the generalizability of the findings is limited by sample selection and retention bias. Second, due to the nature of the cross-sectional study design, causal conclusions cannot be drawn. Third, there was a relatively small sample of home-based CR participants when compared to the site-based sample. The lack of significant relationships between the CRBS and program adherence, as well as exercise behavior among the home-based CR participants could be due to lack of power. Finally, there are some measurement limitations. CR barriers were assessed one year post-hospitalization, and therefore patient reports could have been affected by recall bias. We did not ascertain CR program model allocation, reasons for CR program model allocation, or degree of patient participation directly from CR programs. Moreover, degree of program adherence reported by participants may be inflated due to socially-desirable responding. However, this influence would be minimal as literature shows that self-reported and site-verified rates of program participation are highly concordant.¹⁶ In addition, there may be some measurement error related to the appropriateness of some of the CRBS items and hence their interpretation by home when compared to site-based CR participants. Lastly, we failed to ask participants to report the number of CR sessions prescribed. Likely home-based participants would have significantly fewer sessions than site-based participants, which may have led to errors in our comparison of program adherence by model. This should be tested more comprehensively in future research.

Conclusions

In summary, home-based CR participants reported greater CR barriers when compared to site-based CR participants. The nature of these barriers can be overcome through home-based CR provision, suggesting they are being appropriately allocated to this alternative model of care. In addition, several barriers and perceptions among site-based CR participants, notably lack of energy, were related to lower program participation and exercise. Given there are several established interventions to promote program adherence and post-program exercise behavior, perhaps these should be targeted to patients reporting these specific barriers.

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Table 1

Sociodemographic and clinical characteristics of participants by CR program model

	Site-based (n=821; 87.4%) Mean±SD/n (%)	Home-based (n=96; 10.2%) Mean±SD/n (%)	Total (N=939*) Mean±SD/n (%)
Sociodemographic Variables			
Age	64.3±9.76	63.1±10.2	64.1±9.9
Sex (men)	646 (78.7%)	72 (75.0%)	718 (78.3)
Ethnicity (white)	664 (83.5%)	78 (84.8%)	742 (83.7%)
Marital status (married)	677 (83.1%)	78 (81.2%)	755 (82.9%)
Education (High school)	647 (80.9%)	76 (82.6%)	723 (81.1%)
Work status (Retired)	385 (48.4%)	46 (50.0%)	431 (48.5%)
Annual family income (\$50,000CAD)	393 (59.5%)	49 (61.3%)	442 (59.7%)
Subjective socioeconomic status	6.50±1.70	6.46±1.83	6.50±1.70
Rurality	124 (15.1%)	22 (22.9%)	146 (15.9%)
Clinical Variables			
Primary reason for cardiac admission			
Coronary artery bypass graft surgery	417 (50.9%)	57 (59.4%)	474 (51.8%)
Myocardial infarction	281 (34.4%)	34 (35.4%)	315 (34.5%)
Percutaneous coronary intervention	226 (27.6%)	23 (24.0%)	249 (27.2%)
Heart failure	76 (9.3%)	6 (6.2%)	82 (9.0%)
Valve (Repair)	20 (25.6%)	0 (0%)	20 (24.4%)
Risk factors			
Body mass index	29.0±5.26	28.8±4.42	29.0±5.13
Diabetes mellitus	220 (29.1%)	27 (29.3%)	247 (29.2%)
Family history of cardiovascular disease	405 (64.0%)	56 (70.0%)	461 (64.7%)
Hypertension	546 (72.0%)	63 (69.2%)	609 (71.7%)
Hypercholesterolemia	583 (81.1%)	76 (87.4%)	659 (81.8%)
Current smoking	44 (5.5%)	1 (1.1%)	45 (5.1%)
Other			
Physical activity	139.0±88.2	165.1±93.7	142.2±89.8
Functional status	27.1±17.1	28.6±18.7	27.2±17.2
Comorbidities	484 (65.5%)	60 (67.4%)	544 (65.7%)

* All participants who reported enrolling in CR are shown here.

Table 2Mean cardiac rehabilitation barrier scores ($\pm$ standard deviation) by program model

Barriers	Site-based (n=821; 89.5%)	Home-based (n=96; 10.5%)	Total [†] (N=917)
Travel	2.44 $\pm$ 1.45	2.32 $\pm$ 1.37	2.41 $\pm$ 1.44
I already exercise at home or in my community	2.25 $\pm$ 1.36	3.07 $\pm$ 1.56	2.34 $\pm$ 1.40 *
Work responsibilities	2.18 $\pm$ 1.37	2.28 $\pm$ 1.34	2.17 $\pm$ 1.36
Severe weather	2.03 $\pm$ 1.32	2.54 $\pm$ 1.48	2.10 $\pm$ 1.34
Time constraints	2.03 $\pm$ 1.28	2.14 $\pm$ 1.25	2.04 $\pm$ 1.27
Other health problems prevent me from going	1.95 $\pm$ 1.29	1.94 $\pm$ 1.09	1.95 $\pm$ 1.27
Distance	1.85 $\pm$ 1.21	2.81 $\pm$ 1.59	1.95 $\pm$ 1.29 *
I find exercise tiring or painful	1.89 $\pm$ 1.18	2.01 $\pm$ 1.14	1.91 $\pm$ 1.18
Cost	1.81 $\pm$ 1.17	2.56 $\pm$ 1.46	1.89 $\pm$ 1.23 *
I don't have the energy	1.80 $\pm$ 1.11	2.13 $\pm$ 1.13	1.84 $\pm$ 1.12
Family responsibilities	1.82 $\pm$ 1.14	1.97 $\pm$ 1.08	1.83 $\pm$ 1.13
Transportation problems	1.72 $\pm$ 1.08	2.39 $\pm$ 1.47	1.78 $\pm$ 1.13 *
I prefer to take care of my health alone	1.67 $\pm$.98	1.97 $\pm$ 1.13	1.70 $\pm$ 1.00
It took too long to get referred and into the program	1.60 $\pm$.96	1.92 $\pm$ 1.14	1.64 $\pm$.99
I can manage on my own	1.58 $\pm$.89	1.71 $\pm$.86	1.59 $\pm$.89
I don't need CR	1.58 $\pm$.97	1.75 $\pm$ 1.03	1.59 $\pm$.97
Many people with heart problems don't go to CR and they are fine	1.53 $\pm$.81	1.70 $\pm$.95	1.55 $\pm$.82
My doctor didn't feel it was necessary	1.48 $\pm$.84	1.72 $\pm$.91	1.50 $\pm$.84
I am too old	1.47 $\pm$.79	1.72 $\pm$.89	1.49 $\pm$.79
I think I was referred but the rehab program didn't contact me	1.47 $\pm$.84	1.68 $\pm$.96	1.49 $\pm$.85
I didn't know about CR	1.44 $\pm$.85	1.72 $\pm$ 1.05	1.47 $\pm$.87
Total	1.72 $\pm$.65	2.05 $\pm$.70	1.75 $\pm$.66 *

*
p<0.002[†]Total number of participants who reported attending one type of program model.