Research paper

Key participant characteristics influencing completion of a phase II cardiac rehabilitation program: A cross-sectional analysis☆

Elizabeth W. Regan *, Stacy L. Fritz

Department of Exercise Science, University of South Carolina, Columbia, SC, United States of America

ABSTRACT

Study objective: Cardiac rehabilitation (CR) programs are effective at reducing cardiovascular disease risk factors, yet programs in the United States (US) have poor participation and completion. The current study evaluates characteristics related to completion and drop-out for CR participants.
Design: A cross-sectional study design compared participants who completed the program (finishers) and those did not finish (non-finishers). Variables were compared to determine differences between the dichotomous groups included demographic data, initial six-minute walk test, Zung Depression Index, and Quality of Life Measure (QLM). Logistical regression using variables with differences between groups determined impact on program completion.
Setting: Phase two outpatient hospital based cardiac rehabilitation program.
Participants: Ninety-seven participants were part of the sample; 61 completed the program, and 36 dropped out.
Main outcome measure: Completion of CR.
Results: Ninety-seven participants are included; 61 (63 %) were finishers and 36 (37 %) were non-finishers. Finishers were older, had a higher proportion of females and Medicare insurance recipients, had lower depression scores, and reported higher quality of life. Results of the final logistic regression revealed finishers were more likely to have Medicare (odds ratio (OR) = 5.215, confidence interval (CI) 1.897–14.338), be female (OR = 4.597, 95 % CI 1.532–13.795) and have higher QLM Family Sub scores (OR = 1.129, 95 % CI 1.023–1.246). The model correctly classified 71.9 % of cases.
Conclusion: The analysis highlights Medicare insurance and family support are associated with program completion. Interventions to increase family and social support, and to provide financial assistance for those with financial burden through lack of insurance or high co-pays may increase cardiac rehabilitation completion rates.

1. Introduction

1.1. Background and rationale

Cardiac rehabilitation (CR) programs are essential components in recovery and secondary prevention of cardiovascular disease yet continue to have suboptimal participation and completion [1,2]. CR is a recommended and covered service by Medicare in the United States (US) for acute myocardial infarction, chronic stable angina, coronary artery bypass grafting (CABG), percutaneous coronary intervention (PCI), cardiac valve surgery, cardiac transplantation and stable chronic heart failure with reduced ejection fraction [3].

While effectiveness in increasing exercise tolerance, reducing

secondary risk factors and improving quality of life is well documented, evolving heterogeneity in participant diagnosis, participant medical status, as well as program interventions and delivery methods, render programs and participants difficult to evaluate and compare [4–6]. Studies have examined varying definitions of participation, adherence, and completion of CR for specific diagnoses [7,8], impacts of depression [9–11], demographics (older age [12,13], gender [14,15], socioeconomic status [13]), and traditional vs. home based programs [16,17].

Rates of completion of CR in the United States (US) vary between 40 and 60 % [18]. Factors influencing participant drop out include cost, work or home responsibilities, co-morbidities, belief that the programs are too hard or too easy, and dissatisfaction with staff or facilities [19,20]. Many of the quantitative studies and meta-analyses evaluating

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factors contributing to completion and adherence in CR are performed outside the US; results are mixed for age, gender, depression, and diagnosis of diabetes [6]. Different dosage, cultural expectations and insurance systems may influence the conflicting results [21]. There is limited evaluation of multiple factors contributing to completion or non-completion in US CR programs with differing definitions of adherence and completion complicating results. Additionally, regional variations in the US exist related to participation factors and program availability [22]. The aim of the current study is to evaluate participants who successfully completed the program against those who began but did not complete the program (finishers versus non-finishers) to identify key characteristics related to drop-out to allow for targeted intervention for these participants for retention.

2. Materials and methods

A retrospective cross-sectional analysis of a phase II outpatient cardiac rehabilitation program at a single location of a regional hospital system in the southeastern US was completed. Hospital System Institutional Review Board approval was received prior to data extraction.

The program was a standard 12-week, three times a week, 36 visit intervention. Participants began an aerobic exercise program at prescribed metabolic equivalent levels based on an initial six-minute walk test (6MWT). Exercise was prescribed and monitored by cardiac rehabilitation staff including exercise physiologists and nurses. Interventions included individual aerobic activity (at least 31 min per visit) and supplementary, optional group exercise including yoga, strengthening, stretching, and relaxation sessions. Patients progressed as tolerated throughout the program to longer exercise minutes and greater intensity. Heart rate, blood pressure, and rate of perceived exertion were monitored to assist with progression. Participants attended weekly education sessions on varying topics including disease knowledge, medication adherence, healthy eating and physical activity. Participants had the opportunity to meet with a registered dietician and licensed counselor. The program was certified by the American Association of Cardiac and Pulmonary Rehabilitation Programs.

The program utilized standard clinical measures for aerobic capacity (six-minute walk test (6MWT)), quality of life (Ferrans and Powers Quality of Life Measure (QLM)), and Depression (Zung Depression Index). The 6MWT is a measure of cardiovascular endurance and community walking capacity and a standard measure of most CR programs [23,24]. Standard procedures are used with the exception of the use of an oval track instead of a straight corridor [25]. The minimal detectable change for cardiac participants is 25 m [24].

QLM is a cardiac specific assessment of quality of life components and the importance of those items to the individual. The result is an overall score, and scores for each subscale: health and functioning, socioeconomic, psychological/spiritual and family. Each subscale and the total score have a result of 0–30, with higher scores reflecting higher quality of life [26,27].

The Zung Depression Index is a 20-item self-assessment screening of depressive symptoms. Raw score is converted to an index resulting in a score from 0 to 100; <50 indicates no depression, 50–59 indicates mild to moderate depression, 60–69 moderate to severe depression and 70 and greater indicates severe depression [28,29].

2.1. Data collection

All paper charts available for patients starting phase II cardiac rehabilitation from June 2016–June 2017 at a hospital-based outpatient facility in the Southeast were reviewed along with the corresponding electronic medical records (EMR) for a retrospective analysis. The primary investigator gathered data, entered data into excel and double checked for accuracy. Data were initially gathered from the paper chart, and then supplemented with demographic data from the EMR. The following data were obtained from the paper chart: sex (male/female),

age, qualifying diagnosis code, height (inches), weight (lbs.), initial/final 6MWT (feet), initial/final QLM Total Score and section subscores, initial/final Zung Depression Index, total visits, and total exercise minutes. The following data were obtained from the EMR: race, currently married (yes/no), primary and secondary insurance, co-pay (yes/no), currently employed (yes/no), current tobacco use (yes/no), diabetes diagnosis (yes/no), and hypertension diagnosis (yes/no). A Medicare insurance field was created and was "yes" if the patient had primary or secondary insurance listed as Medicare and "no" if not. The following data were calculated: initial body mass index (BMI) ((weight / height^2) * 703), race category (White (W) if race = W, Not White (NW) if other), initial/final 6MWT meters (6MWT feet / 3.28), change in 6MWT (final 6MWT m – initial 6MWT m).

2.2. Data analysis

Finishers were defined as participants who completed at least part of the program, where discharged as complete with final clinical measures available. Participants were dichotomized into independent groups based on finish status.

Numerical variables were tested for normality using the Shapiro Wilk test and then compared by finish status (yes/no) in independent groups. Those with normal distribution (BMI, initial 6MWT(m), Zung Depression Index) were compared using independent sample t-tests. Those with non-normal distributions (Age, QLM total score and subscales) were compared using the Mann Whitney U test.

Categorical variables were compared using a Pearson chi-squared test by finish status (yes/no). The following demographic and preprogram variables were tested: sex, race category, currently employed, married, Medicare insurance, co-pay, diabetes, hypertension, current tobacco use.

Logistical regression was performed with all variables with statistically significant differences between finishers and non-finishers to determine their impact on odds of completing CR. Linearity was tested for the continuous variables using the Box-Tidwell procedure. Continuous variables with statistically significant differences were tested for correlation to rule out multicollinearity. For those with correlations, the variable with the largest difference between groups was retained in the logistic regression. Remaining variables were included in the initial logistic regression equation. Variables that did not retain statistical significance in the equation were removed.

3. Results

One hundred cases of a population of 212 participants who started CR in the year period were available for review; 97 were valid cases. One was eliminated due to death after one visit, and two were eliminated because the participants completed initial orientation but did not start the program. There were no statistically significant differences between groups based on primary qualifying diagnosis (Table 1). Demographic and clinical characteristics are presented in Table 2.

Sixty-one participants completed the program (finishers), and 36 did not complete the program (non-finishers). The completion rate was 63

Table 1
Primary qualifying diagnosis.

	Full sample	Finishers	Non-finishers
N	97	61	36
Angina	1	1	0
Coronary artery bypass graft	19	13	6
Chronic heart failure	14	7	7
Myocardial infarction	4	2	2
Percutaneous coronary intervention	40	27	13
Cardiac valve surgery	19	11	8

No statistically significant difference in diagnoses between finishers and non-finishers ($\chi^2 = 0.748$).

Table 2

Demographic and clinical characteristics.

	Full sample	Finishers	Non-finishers	p value
N	97	61	36	
Age, median (range)	66 (24–84)	68 (40–84)	60 (24–82)	0.004* (Mann-Whitney U)
Female/male %	37/63	46/54	22/78	0.020* (χ^2)
Non-White/White[a] %	31/69	31/69	31/97	0.425 (χ^2)
Employed/not employed[a] %	48/52	40/60	62/38	0.111 (χ^2)
Married/not married[a] %	64/36	65/35	62/38	0.538 (χ^2)
Medicare insurance/other insurance %	54/46	66/34	33/66	0.002* (χ^2)
Copay/no copay %	38/62	38/62	39/61	0.908 (χ^2)
Diabetes/no diabetes %	32/68	36/64	25/75	0.259 (χ^2)
Hypertension/no hypertension %	94/6	95/5	92/8	0.419 (χ^2)
Tobacco/no tobacco %	4/96	2/98	8/92	0.109 (χ^2)
Initial 6MWT(m), mean (SD)[a]	448.35 (115.40)	440.11 (121.21)	462.06 (105.19)	0.370 (t-test)
Initial BMI, mean (SD)[a]	29.47 (5.79)	29.15 (5.75)	30.06 (5.93)	0.497 (t-test)
Initial Zung Depression Index, mean (SD)	46.35 (12.03)	44.41 (1.38)	49.64 (13.47)	0.038* (t-test)
Initial QLM Total Score, median (range)[a]	20.72 (3.82–29.82)	23.72 (12.40–29.92)	20.72 (3.82–29.82)	0.020* (Mann-Whitney U)
Initial QLM Family Subscore, median, range[a]	24.00 (10.10–30.00)	26.40 (10.80–30.00)	21.00 (10.10–30.00)	<0.0001* (Mann-Whitney U)
Initial QLM Health & Functioning Subscore, median, range[a]	20.79 (2.11–30.00)	20.97 (9.47–30.00)	20.67 (2.11–29.60)	0.190 (Mann-Whitney U)
Initial QLM Social & Economic Subscore, median, range[a]	23.84 (4.64–30.00)	25.33 (13.36–30.00)	22.36 (4.64–30.00)	0.016* (Mann-Whitney U)
Initial QLM Psychological & Spiritual Subscore, median, range[a]	24.11 (1.93–30.00)	24.50 (10.29–30.00)	21.00 (1.93–30.00)	0.144 (Mann-Whitney U)
Number of visits, mean (SD)		35.21 (2.80)	15.22 (8.62)	
Total exercise minutes per visit, mean (SD)		41.17 (14.83)	38.89 (3.91)	

Note: Non-White/White (1), employed/not employed (15), married/not married (3), initial 6MWT (1), BMI (13), QLM Total Score and Subscores (1). Abbreviations: Six-Minute Walk Test (6MWT), meters (m), standard deviation (SD), body mass index (BMI), Quality of Life Measure (QLM).

* Statistically significant result.
[a] One or more missing data points.

%. Number of visits for each finisher and non-finisher is presented in Fig. 1.

Finishers completed an average of 35.21 (2.80) visits with a range of 21–36 total visits. Three finishers had <30 visits (21, 22, and 28) with planned discharges and final clinical measures. Of the 61 finishers, one did not have any 6MWT data due to being non-ambulatory, and two did not have final 6MWT measures despite completing 36 visits and having all other completion data. Finishers completed an average of 41.17 (14.83) minutes of exercise per visit. They improved their 6MWT by a mean of 90.48 m (67.53). Five of the 61 finishers did not improve their 6MWT distance by the minimal detectable change of 25 m (three decreased in distance and two improved by <10 m).

Non-finishers completed an average of 15.22 (8.62) visits with a range of 1–33 total visits. Three non-finishers had 30 or more visits (30, 31, 33). These three non-finishers dropped out due to health issues (2), and insurance issues (1). Non-finishers completed an average of 38.89 (3.91) minutes of exercise per visit. Non-Finishers had varied reasons for

dropping the program including insurance issues (9), health issues (6), work demands (4), lack of interest (4), relocation (2), and transportation (1). The remaining 10 non-finishers reason for drop out is unknown due to dropping out without alerting staff and being unreachable.

Numerical and categorical variables with statistically significant differences between groups were age (p = 0.006), sex (p = 0.020), Zung Depression Index (p = 0.038), Medicare insurance (p = 0.002), QLM Total Score (p = 0.020), QLM Family Subscore (p < 0.0001) and QLM Social and Economic Subscore (p = 0.016) (Table 2). QLM Total Score, QLM Social and Economic Subscore and QLM Family Subscore are related to the same overall test and had moderate-strong positive correlations between them (r_s = 0.561–0.879, p < 0.01). QLM Total Score and QLM Social and Economic Subscore were removed from analysis; QLM Family Subscore was retained because it had the largest and most significant difference between finishers and non-finishers. Zung Depression Index had negative correlations with Age (r_s = −0.223, p = 0.029) and QLM Family Subscore (r_s = −0.510, p < 0.0001). Zung
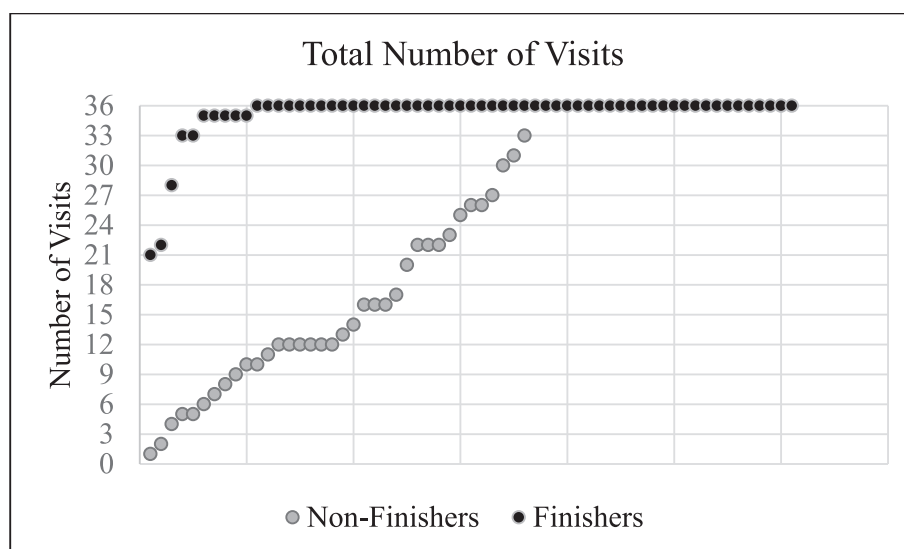
Fig. 1. Distribution of number of visits for finishers and non-finishers.

Finishers completed an average of 35.21 (2.80) visits with a range of 21–36 total visits. Three finishers had <30 visits (21, 22, and 28) with planned discharges and final clinical measures. Non-finishers completed an average of 15.22 (8.62) visits with a range of 1–33 total visits. Three non-finishers had 30 or more visits (30, 31, 33). These three non-finishers dropped out due to health issues (2), and insurance issues (1).

Depression Index was removed from the analysis as a result. Logistic regression was performed on the remaining four variables (age, sex, Medicare insurance and QLM Family Subscore) to determine their impact on completing CR. Linearity for the continuous variables was found to be related to the logit of the dependent variable. One standardized residual was retained in the analysis and one case did not have quality of life measures available resulting in 96 cases included in the logistic regression.

In the original four variable logistic regression, age was not statistically significant in the equation (p = 0.438) and was removed. The final logistic regression model included sex, Medicare insurance status and QLM Family Subscore. The final model was statistically significant (Chi-Square = 25.521, p < 0.0001) with the model explaining 31.9 % (Nagelkerke R^2) of the variance between finishers and non-finishers and correctly classifying 71.9 % of cases. Those with Medicare had 5 times greater odds than those without to finish CR, odds ratio (OR) = 5.215 (95 % confidence interval (CI) 1.897–14.338). Additionally, females had >4 times greater odds to complete CR than males, OR = 4.597 (95 % CI 1.532–13.795). Higher QLM Family Subscores were also associated with an increased odds of finishing CR (OR = 1.129 95 % CI 1.023–1.246). Results of the logistic regression are presented in Table 3 and Fig. 2.

4. Discussion

Finishers and non-finishers had similar physical function characteristics including aerobic capacity (6MWT) and BMI. They also had several demographic characteristics that did not vary including race (as Non-White versus White), employment, marital status and existing co-morbid health conditions. They differed in statistically significant ways, with finishers being older, having a higher proportion of females and Medicare insurance recipients, having lower depression scores, and having higher quality of life measures especially those related to social support. The analysis predicts females, those with Medicare and higher family support are more likely to complete CR.

Higher depression status was different between finishers and non-finishers, with non-finishers having larger Zung Depression Index scores. Depression was negatively correlated also with age and QLM Family Subscore (higher depression levels for younger participants and higher depression levels for those with lower QLM Family Subscore). Depression is well established as reason for non-adherence and drop-out [6,11,19] and current study findings confirm this knowledge. Participants in the current study program had the opportunity to meet with a licensed psychologist, and those with higher depression scores are encouraged to do so. Because of the correlation with social support and younger age, interventions to address these areas may also assist with improving dropout related to depression.

The current study findings related to older age and Medicare status are consistent with other US study findings; Gaalema et al. noted that those older than 65 were more likely to complete CR, Zhang et al. found those with older age, and those without an insurance co-pay had better adherence and Scotto et al. noted insurance issues as a reason for program dropout [13,19,30]. The Medicare finding highlights a public policy issue unique to the US, as most (73 %) of the world CR programs are primarily publicly funded [21]. Pressure for private insurance companies to reduce or eliminate co-pays exists as a recommendation to increase adherence [22,30]. However, in the continued fee-for-service private sector, insurance companies have limited financial incentive to do so [31]. A charity fund to support participants who face cost barriers is an additional suggested strategy to combat insurance coverage related CR drop-outs [22]. The Million Heart's Initiative recommends this strategy by targeting former participants to donate [22]. Other possible interventions to address insurance concerns, and possibly the needs of younger participants, are hybrid programs and programs with lower dosage for those in better condition (noting the need to achieve the same benefits) [6,19,22].

QLM Subscores for Family, and Social and Economic factors were different between finishers and non-finishers with finishers having higher scores reflective of higher satisfaction and importance to their quality of life. The Family Subscore reflects satisfaction and importance in the areas of family health, children, family happiness, spouse/lover/partner, and emotional support from family. The Social and Economic Subscore combines ratings of satisfaction and importance of friends, emotional support from people other than family, neighborhood, home, job/not having a job, education, and financial needs. Finishers had higher initial scores in both subscores, as well as overall quality of life. Family Subscore was a part of the logistical regression, with an odds ratio of 1.129, suggesting increased odds of completion with each additional point. For example, a participant scoring 25 (out of 30) on the Family Subscore has 5.645 increased odds to finish than a participant scoring 20. This positive impact of social support on completion is consistent with existing research; after a cardiac event, patients report health related quality of life and coping to be impacted by social support [32–35]. One qualitative review found that CR participants related their quality of recovery to support from family and friends, and the importance of shared experiences with other CR participants [33]. Another study found while social support was important for both men and women, it was the primary factor in physical and psychological health related quality of life for women [34]. Recognizing participants who lack family or social support at the start of CR could allow for intervention to reduce drop-out. Social support could be augmented through inclusion of family members in orientation, recommendations of local support groups, social activities or outings with other CR participants, and specific encouragement from CR staff [33,34,36,37].

Within the current study, females have five times the odds of finishing CR than males. The existing literature is more mixed; with several studies finding females are less likely to enroll in CR, but studies examining adherence and completion show females both more and less likely than males to finish [2,6,15,38]. A qualitative synthesis reviewing adherence and drop-out reasons for women found that lack of family support or role conflict between CR and family caregiving was a contributor to drop-out unique to women [15]. When looking at just female participants in the current study, QLM Family Subscores and Social and Economic Subscores become significantly different between finishers and non-finishers with finishers having higher scores in both. Therefore, in the current study, there were more women with social support, allowing them to be more likely to finish. Further research into

Table 3
Logistical regression results predicting finishing cardiac rehabilitation by dichotomous variable (Medicare, sex), and continuous variables (Family Quality of Life Measure (QLM) Subscore).

Predictor	B	SE β	Wald	Df	p	e^β (odds ratio)	e^β CI
Medicare (yes)	1.651	0.516	10.241	1	0.001*	5.215	1.897–14.338
Sex (female)	1.744	0.603	8.373	1	0.007*	4.597	1.532–13.795
Family QLM Sub score (each additional point)	0.141	0.052	7.375	1	0.016*	1.129	1.023–1.246
Constant	−3.667	1.275	8.267	1	0.004		
χ^2	25.439						
Df	3						
% completing cardiac rehab	63 %						

* Represents statistically significant findings.
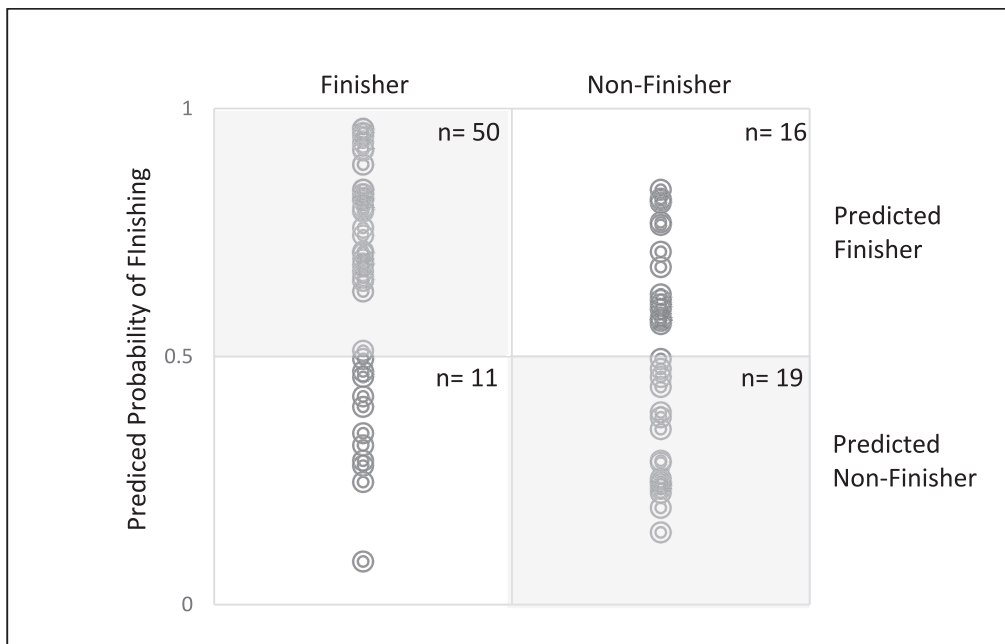
Fig. 2. Observed and predicted frequencies for finishing cardiac rehabilitation.

Logistical regression including Medicare insurance (yes), sex (female) and Family Quality of Life Measure Subscore (continuous variable, higher score more likely to finish). Note: Percentage accuracy in classification = 71.9 %, sensitivity = 82.0 %, specificity = 54.3 %, positive predictive value = 75.8 %, negative predictive value = 63.3 %.

the reasons for larger drop-out for males may provide deeper understanding of the unique factors (both barriers and facilitators) impacting males in this region above Medicare insurance and social support.

While specific factors are important in targeting interventions to improve adherence and completion, it is important not to overlook the perspective of the individual participant, and the unique program characteristics and community factors when implementing change [22,39,40]. Participant-centric interventions could offer broader reach by offering individual variation in program frequency (two times a week versus 3 times a week), dosage (shorter or hybrid center/home programs for those with more exercise self-efficacy or existing aerobic capacity) or flexible program times (include evenings and weekends) [2,22,30,41]. While research in these areas is emerging, more research on alternative offerings within existing program offerings is required to understand feasibility and impact. Additionally, more research in specific interventions to increase adherence and completion is warranted to establish best practices after enrollment. Finally, standardized definitions of referral, enrollment, adherence and completion, like those proposed by the International Council and Canadian Association of Cardiovascular Prevention and Rehabilitation [41] would allow for easier review and meta-analysis.

4.1. Study limitations

The study utilized a random sample of data from only one program in an urban area of Southeastern US. Generalizability to other regions of the country or more rural settings is limited. Only 32 % of variance in finish status is explained in the results, so there are more variables and conditions to investigate to fully understand finishers versus non-finishers. Lack of reasoning for non-completion for ten of the 36 non-finishers limits evaluation of individual reasons and comparison to logistical regression results. Participant input through a tandem qualitative approach would add context to the quantitative results. Finally, the current study was limited to personal factors about individual participants. More research is needed on program, hospital system and community factors impacting adherence and completion.

5. Conclusions

Determining characteristics of differences between finishers and

non-finishers of cardiac rehabilitation programs provides important information on where interventions may be applied to increase completion rates. The findings of this study highlight the importance of insurance coverage, social support and sex on the odds of program completion. Interventions at the individual and program level to address financial burden and to provide peer and staff social support may improve completion. More research on the different needs and desires of females and males is also warranted. Improving CR completion rates using evidence-based interventions may impact secondary cardiovascular disease factors and overall public health in the US.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] G.J. Balady, P.A. Ades, T. Bazzarre, et al., Core components of cardiac rehabilitation/secondary prevention programs: statement for healthcare professionals from the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation, J. Cardiopulm. Rehab. Prev. 20 (5) (2000) 310–316.

[2] G.J. Balady, P.A. Ades, V.A. Bittner, et al., Referral, enrollment, and delivery of cardiac rehabilitation/secondary prevention programs at clinical centers and beyond, Circulation. 124 (25) (2011) 2951–2960.

[3] Center for Medicare and Medicaid Services, Billing and coding: oupatient cardiac rehabilitation 2022. https://www.cms.gov/medicare-coverage-database/view/article.aspx?articleid=54068&ver=38&articleStatus=all&sortBy=title&bc=3. (Accessed 26 July 2023).

[4] L. Anderson, R.S. Taylor, Cardiac rehabilitation for people with heart disease: an overview of Cochrane systematic reviews, Int. J. Cardiol. 177 (2) (2014) 348–361.

[5] B. Abell, P. Glasziou, T. Hoffmann, The contribution of individual exercise training components to clinical outcomes in randomised controlled trials of cardiac

rehabilitation: a systematic review and meta-regression, Sports Med. Open 3 (1) (2017) 19.

[6] G.H. Taylor, S.L. Wilson, J. Sharp, Medical, psychological, and sociodemographic factors associated with adherence to cardiac rehabilitation programs: a systematic review, J. Cardiovasc. Nurs. 26 (3) (2011) 202–209.

[7] D. Spiroski, M. Andjić, O.I. Stojanović, et al., Very short/short-term benefit of inpatient/outpatient cardiac rehabilitation programs after coronary artery bypass grafting surgery, Clin. Cardiol. 40 (5) (2017) 281–286.

[8] J.M. Bachmann, A.S. Shah, M.S. Duncan, et al., Cardiac rehabilitation and readmissions after heart transplantation, J. Heart Lung Transplant. 37 (4) (2018) 467–476.

[9] B.-J. Shen, J.-T. Gau, Influence of depression and hostility on exercise tolerance and improvement in patients with coronary heart disease, Int. J. Behav. Med. 24 (2) (2017) 312–320.

[10] J.-C. Chauvet-Gelinier, B. Bonin, Stress, anxiety and depression in heart disease patients: a major challenge for cardiac rehabilitation, Ann. Phys. Rehab. Med. 60 (1) (2017) 6–12.

[11] E. Casey, J.W. Hughes, D. Waechter, R. Josephson, J. Rosneck, Depression predicts failure to complete phase-II cardiac rehabilitation, J. Behav. Med. 31 (5) (2008) 421–431.

[12] A. Salzwedel, K. Wegscheider, L. Herich, A. Rieck, G. Strandt, H. Völler, Impact of clinical and sociodemographic patient characteristics on the outcome of cardiac rehabilitation in older patients, Aging Clin. Exp. Res. 27 (3) (2015) 315–321.

[13] D.E. Gaalema, P.D. Savage, J.L. Rengo, et al., Patient characteristics predictive of cardiac rehabilitation adherence, J. Cardiopulm. Rehab. Prev. 37 (2) (2017) 103.

[14] C. Blanchard, H.M. Arthur, E. Gunn, Self-efficacy and outcome expectations in cardiac rehabilitation: associations with women's physical activity, Rehab. Psychol. 60 (1) (2015) 59.

[15] D.M. Resurreccion, E. Motrico, A. Rigabert, et al., Barriers for nonparticipation and dropout of women in cardiac rehabilitation programs: a systematic review, J. Women's Health 26 (8) (2017) 849–859.

[16] S. Kachur, V. Chongthammakun, C.J. Lavie, et al., Impact of cardiac rehabilitation and exercise training programs in coronary heart disease, Prog. Cardiovasc. Dis. (2017) 103–114.

[17] L. Anderson, G.A. Sharp, R.J. Norton, et al., Home-based versus centre-based cardiac rehabilitation, Cochrane Database Syst. Rev. (2017) 6, https://doi.org/10.1002/14651858.CD007130.pub4/abstract (accessed July 26, 2023).

[18] A.R. Menezes, C.J. Lavie, R.V. Milani, D.E. Forman, M. King, M.A. Williams, Cardiac rehabilitation in the United States, Prog. Cardiovasc. Dis. 56 (5) (2014) 522–529.

[19] C.J. Scotto, D. Waechter, J. Rosneck, Factors affecting program completion in phase II cardiac rehabilitation, Can. J. Cardiovasc. Nurs. 21 (2) (2011) 15–20.

[20] O.R. Herber, K. Smith, M. White, M.C. Jones, 'Just not for me'–contributing factors to nonattendance/noncompletion at phase III cardiac rehabilitation in acute coronary syndrome patients: a qualitative enquiry, J. Clin. Nurs. 26 (21–22) (2017) 3529–3542.

[21] E. Pesah, M. Supervia, K. Turk-Adawi, S.L. Grace, A review of cardiac rehabilitation delivery around the world, Prog. Cardiovasc. Dis. 60 (2) (2017) 267–280.

[22] P.A. Ades, S.J. Keteyian, J.S. Wright, et al., Increasing Cardiac Rehabilitation Participation From 20% to 70%: A Road Map From the Million Hearts Cardiac Rehabilitation Collaborative, Elsevier, 2017, pp. 234–242.

[23] P.L. Enright, M.A. McBurnie, V. Bittner, et al., The 6-min walk test*: a quick measure of functional status in elderly adults, Chest. 123 (2) (2003) 387–398.

[24] V. Gremeaux, O. Troisgros, S. Benaïm, et al., Determining the minimal clinically important difference for the six-minute walk test and the 200-meter fast-walk test during cardiac rehabilitation program in coronary artery disease patients after acute coronary syndrome, Arch. Phys. Med. Rehabil. 92 (4) (2011) 611–619.

[25] A.E. Holland, M.A. Spruit, T. Troosters, et al., An official European Respiratory Society/American Thoracic Society technical standard: field walking tests in chronic respiratory disease, Eur. Respir. J. 44 (6) (2014) 1428–1446.

[26] C.E. Ferrans, M.J. Powers, Quality of life index: development and psychometric properties, Adv. Nurs. Sci. 8 (1) (1985) 15–24.

[27] C.E. Ferrans, M.J. Powers, Psychometric assessment of the Quality of Life Index, Res. Nurs. Health 15 (1) (Feb 1992) 29–38.

[28] D.A. Dunstan, N. Scott, A.K. Todd, Screening for anxiety and depression: reassessing the utility of the Zung scales, BMC Psychiatry 17 (1) (2017) 1–8.

[29] W.W. Zung, A self-rating depression scale, Arch. Gen. Psychiatry 12 (1) (1965) 63–70.

[30] L. Zhang, M. Sobolev, I.L. Piña, D.Z. Prince, C.C. Taub, Predictors of cardiac rehabilitation initiation and adherence in a multiracial urban population, J. Cardiopulm. Rehab. Prev. 37 (1) (2017) 30–38.

[31] H. Mead, S. Grantham, B. Siegel, Improving cardiovascular care through outpatient cardiac rehabilitation: an analysis of payment models that would improve quality and promote use, J. Cardiovasc. Nurs. 29 (2) (2014) 158–164.

[32] M.J. Blikman, H.R. Jacobsen, G.E. Eide, E. Meland, How important are social support, expectations and coping patterns during cardiac rehabilitation, Rehabil. Res. Pract. 2014 (2014).

[33] T. Pryor, K. Page, H. Patsamanis, K.A. Jolly, Investigating support needs for people living with heart disease, J. Clin. Nurs. 23 (1–2) (2014) 166–172.

[34] M. Staniute, J. Brozaitiene, R. Bunevicius, Effects of social support and stressful life events on health-related quality of life in coronary artery disease patients, J. Cardiovasc. Nurs. 28 (1) (2013) 83–89.

[35] K.L. Wierenga, S.M. Moore, J. Liu, A. Sattar, Factors influencing the impact of depressive symptoms on physical functional capacity after cardiac rehabilitation, Rehabi. Nurs. 45 (6) (2020) 348.

[36] A.M. Jackson, B. McKinstry, S. Gregory, The influence of significant others upon participation in cardiac rehabilitation and coronary heart disease self-help groups, Int. J. Ther. Rehabil. 18 (8) (2011) 450–459.

[37] K.N. Karmali, P. Davies, F. Taylor, A. Beswick, N. Martin, S. Ebrahim, Promoting patient uptake and adherence in cardiac rehabilitation, Cochrane Database Syst. Rev. 6 (2014), https://doi.org/10.1002/14651858.CD007131.pub3/pdf/full (Accessed July 27, 2023).

[38] A. Ruano-Ravina, C. Pena-Gil, E. Abu-Assi, et al., Participation and adherence to cardiac rehabilitation programs. A systematic review, Int. J. Cardiol. 223 (2016) 436–443.

[39] J.M. Ellis, M.C. Whited, J.T. Freeman, et al., Life values as an intrinsic guide for cardiopulmonary rehabilitation program engagement: a qualitative analysis, J. Cardiopulm. Rehab. Prev. 38 (5) (2018) 309.

[40] C.M. Astley, L. Neubeck, R. Gallagher, et al., Cardiac rehabilitation: unraveling the complexity of referral and current models of delivery, J. Cardiovasc. Nurs. 32 (3) (2017) 236–243.

[41] C.S. de Araújo Pio, T.M. Beckie, M. Varnfield, et al., Promoting patient utilization of outpatient cardiac rehabilitation: a joint International Council and Canadian Association of Cardiovascular Prevention and Rehabilitation position statement, Int. J. Cardiol. 298 (2020) 1–7.