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# Patient Preferences for Home-based Versus Hospital-based Cardiac Rehabilitation

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The efficacy of hospital-based cardiac rehabilitation (CR) in the domains of mortality, morbidity, quality of life, health behavior change, risk reduction, and psychosocial well-being has been well established.<sup>1-3</sup> However, because of financial constraints, physician referral practices, geographic and transportation barriers, and patient preferences, access to CR services is suboptimal.<sup>4-8</sup> Cardiac rehabilitation programs and policymakers alike have been looking to alternative models of service delivery to reduce cost and reach a greater number of patients, while continuing to provide effective programming.<sup>9</sup> The delivery of home-based programs is now growing,<sup>10</sup> and evidence does support its equivalent impact on exercise tolerance, lipid profile, systolic blood pressure, and psychosocial well-being when compared to traditional hospital-based programs.<sup>11-14</sup> Home-based programs are also shown to be as safe and more cost-effective than as hospital-based CR programs.<sup>15-17</sup>

Whereas patient preferences for hospital-based CR programs have been examined,<sup>18,19</sup> preferences for home-based programs have not. The literature suggests several factors, which may affect patient preferences for these programs. First, women may prefer home-based programs to minimize travel time, distance, and transportation barriers.<sup>20,21</sup> Second, women demonstrate improvements in both exercise capacity and lipid profile following home- and hospital-based CR<sup>11</sup> although evidence also suggests that women may not fare as well as men in home-based programs, with lower exercise adherence, cardiac knowledge, and stress management.<sup>22</sup> Finally, the literature also suggests that older cardiac patients, in general, may prefer home-based services.<sup>20,23</sup> In that women tend to be older at the time of their entry into CR, this may be of particular importance. The objective of this study was to compare

patient preferences for home-based versus hospital-based CR programs.

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## METHODS

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The University Health Network Cardiac Care and Heart Health Program is located in a multiethnic community in the downtown area of a major metropolitan center. At the initial visit to the comprehensive secondary prevention program group education session, patients are provided with the option to attend home- or hospital-based CR. During the initial assessment, the exercise specialist reviews the graded exercise test, discusses the patient's exercise history and exercise precautions, composes an exercise prescription based on American College of Sports Medicine guidelines,<sup>24</sup> and discusses follow-up plans (ie, frequency and mode of contact, record of activity). In the home-based program, patients are generally contacted by telephone or e-mail every 2 weeks for 4 months. The content of these contacts may include a review of activity patterns, medication and nutrition education, review of lifestyle changes, and referrals as required. Patients are also asked to come on-site monthly to review their progress and to ensure

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that they are exercising properly. The program is flexible to meet individual patient needs with regard to frequency, mode, and duration of contact. In the hospital-based program,<sup>25</sup> participants exercise on-site for 48 sessions. Participants are also offered education sessions and asked to exercise at home between on-site visits.

## PARTICIPANTS

All home-based CR participants from December 2000 to November 2003 were identified and included in the sample. A random subsample of hospital-based participants from this same time interval was also abstracted from the Cardiac Care and Heart Health Program charts and was matched on the basis of age and sex. This search strategy resulted in a group of 54 (38.3%) home-based participants and 87 (61.7%) hospital-based participants. Of the total 141 patients identified, 80 agreed to participate and responded to the survey, 41 were ineligible, and 20 refused to participate. Reasons for ineligibility included address change and could not locate ( $n = 17$ ), lack of English-language proficiency ( $n = 8$ ), dropped out after intake assessment ( $n = 8$ ), medical ineligibility for CR ( $n = 1$ ), deceased ( $n = 1$ ), service closure at TWH due to SARS crisis ( $n = 1$ ), and participated at an alternate CR site closer to home ( $n = 1$ ).

## Procedure and Design

This cross-sectional observational study was approved by the institutional Research Ethics Board. Basic demographic data on identified patients were abstracted from charts, and patients were mailed a survey. Using a modified Dillman method,<sup>26</sup> participants were mailed a reminder postcard 2 weeks later. Nonresponders were then mailed a replacement questionnaire at 4 weeks and were telephoned at 8 weeks.

## MEASURES

Clinical data included age, sex, type of cardiac event or procedure, comorbid conditions, length of hospital stay, date of CR referral, and choice of hospital-based CR versus home-based CR. The survey consisted of demographic items, quantitative and qualitative investigator-generated items, and standardized psychometric instruments. The self-reported demographic items included ethnocultural background, marital status, living arrangements, educational level, work status, gross family income, height and weight, smoking status, travel time to the CR site in minutes, and primary form of transportation.

## Patient Preferences

The quantitative investigator-generated items included 14 barriers to home exercise adherence (relevant to both home- and hospital-based participants). These 5-point Likert-type items were generated on the basis of a review of the literature and pilot tested.<sup>27</sup> Other investigator-generated qualitative items assessed the issues that factored into the decision to choose home- or hospital-based CR and the benefits and drawbacks of the chosen program.

## Statistical Analyses

Potential differences in demographic characteristics between participants and nonparticipants, as well as participants who chose the home-based versus hospital-based program, were assessed with chi-square and  $t$  tests as appropriate. A principal components analysis was conducted on the exercise barrier items. Finally, a logistic regression analysis was used to test for the factors, which predicted patient preference for home-based versus hospital-based CR. Analyses were conducted in SPSS v.12.0.

## RESULTS

As shown in Table 1, the characteristics of the participants did not significantly differ from nonparticipants except for mean length of hospital stay. Participants had a significantly longer length of stay than did nonparticipants.

Among participants, the most frequent basis for referral was acute myocardial infarction (MI,  $n = 31$ , 39.2%), followed by a high-risk primary prevention group ( $n = 18$ ; 22.8%), coronary artery bypass grafting ( $n = 13$ ; 16.5%), angina ( $n = 7$ ; 8.9%), percutaneous coronary interventions ( $n = 5$ ; 6.3%), and other cardiac conditions ( $n = 5$ ; 6.3%). The high-risk primary prevention group was included in the sample because of the evidence that event rates are high in such patients. Twenty-five (32.1%) participants

**Table 1 • CHARACTERISTICS OF PARTICIPANTS VERSUS NONPARTICIPANTS**

Characteristic	Participants ( $n = 80$ )	Nonparticipants ( $n = 61$ )
Age ( $M \pm SD$ )	61.10 $\pm$ 10.83	61.45 $\pm$ 11.08
Sex (% female)	29 (36.3%)	24 (39.3%)
Length of hospital stay (days)	5.33 $\pm$ 5.27	3.85 $\pm$ 3.00*
Type of CR (% home-based)	27 (33.8%)	27 (44.3%)
Referral event (% myocardial infarct)	30 (38.0%)	19 (35.8%)

CR, cardiac rehabilitation.

\* $P = .04$ .

**Table 2 • DEMOGRAPHIC CHARACTERISTICS OF HOME-BASED VERSUS HOSPITAL-BASED CR PARTICIPANTS (N = 80)**

Characteristic	Home (n = 27)	Hospital (n = 53)
Referral event (% myocardial infarct)	10 (38.5%)	20 (37.7%)
Age ( $M \pm SD$ )	57.63 $\pm$ 9.79	61.66 $\pm$ 11.25
Sex (% female)	10 (37.0%)	19 (35.8%)
Marital status (% married)	19 (73.1%)	32 (60.4%)
Ethnic background (% non-White)	4 (17.4%)	25 (49.0%)*
Gross family income (% below Can \$50,000)	7 (30.4%)	25 (55.6%)†
Education (% above high school)	18 (66.7%)	27 (52.9%)
Employment status (% full- or part-time)	16 (59.3%)	12 (23.1%)‡
Smoker (% yes)	2 (7.4%)	4 (7.5%)
Live alone (% yes)	7 (26.9%)	12 (23.1%)
Length of hospital stay ( $M \pm SD$ )	6.00 $\pm$ 5.59	4.98 $\pm$ 5.12
# Months from CR referral to survey completion ( $M \pm SD$ )	14.83 $\pm$ 10.55	19.96 $\pm$ 5.45*
Body mass index ( $M \pm SD$ )	27.45 $\pm$ 5.87	27.21 $\pm$ 4.28
Number of weeks in CR program ( $M \pm SD$ )	18.37 $\pm$ 34.87	18.46 $\pm$ 14.05
# Minutes to travel to CR site 1 way	45.00 $\pm$ 43.41	39.20 $\pm$ 24.13

CR, cardiac rehabilitation.

\* $P < .01$ .

† $P < .05$ .

‡ $P < .001$ .

self-reported a comorbid condition which they perceived to impact their exercise behavior, and most often these were musculoskeletal conditions ( $n = 15$ ). Participants' ages ranged from 36 to 83 years, the number of weeks in CR ranged from 1 to 120 with a median of 12 weeks, and the number of minutes to travel 1 way to the CR site ranged from 7 to 240, with a median of 30 minutes. The most frequent means of transportation to CR were bus ( $n = 48$ ; 64.9%), subway ( $n = 42$ ; 56.8%), and car ( $n = 38$ , 51.4%; participants checked all that apply).

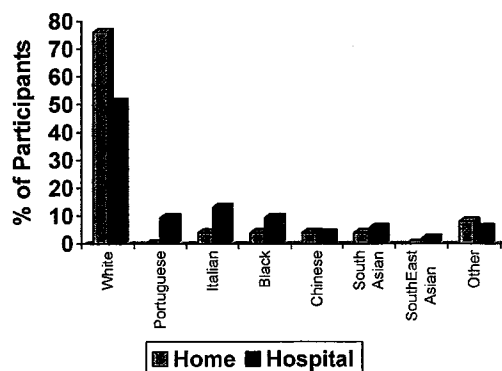
### Characteristics of Home-based Versus Hospital-based Participants

Demographic characteristics of CR participants from both programs are presented in Table 2. Participants who chose

the home-based program were significantly more likely to be White, have higher family income, and be employed outside of the home. With regard to self-reported ethnocultural background, participants from Portuguese, Italian, Black, and South/East Asian communities were more likely to choose the hospital-based program (Figure 1).

### Patient Preferences for Home-based Versus Hospital-based Programs

When asked what issues factored in their decision to choose a home- or hospital-based program, participants most frequently responded travel time or travel distance ( $n = 19$ ; 30.2%), monitoring during exercise ( $n = 10$ ; 15.9%), perceived health benefits ( $n = 7$ ; 11.1%), the social nature of the program ( $n = 6$ ; 9.5%), and the facilities available ( $n = 5$ ; 7.9%)\*. Participants were also asked to list the benefits and drawbacks of their chosen program. Hospital-based participants most frequently reported benefits to be monitoring ( $n = 16$ ; 57.1%), social support ( $n = 6$ ; 21.4%), facilities ( $n = 2$ ; 7.1%), and motivation for participation ( $n = 2$ ; 7.1%). Travel time and distance to the CR site were the greatest drawbacks of the hospital-based program ( $n = 8$ ; 66.7%). The home-based participants most frequently reported reduced travel time/travel distance ( $n = 9$ ; 81.8%) as a benefit, and lack of monitoring ( $n = 6$ ; 66.7%), lack of motivation ( $n = 2$ ; 22.2%), and lack of social support ( $n = 1$ ; 11.1%) as drawbacks.



**Figure 1.** Preference for home-based versus hospital-based CR based on self-reported ethnocultural background.

\*Some responses were coded as "other" and are not listed in the interests to brevity.

Participants in both home- and hospital-based CR were instructed to exercise at home (between on-site sessions in the latter case). Participant responses to the investigator-generated home exercise barrier items were factor analyzed. Principal components analysis with varimax rotation was conducted on the 14 Likert-type items. Upon examination of the scree plot and the rotated component matrix, 3 factors were extracted. Table 3 presents the resulting solution. Factor loadings of 0.40 or greater were interpreted and utilized to compute Cronbach alpha reliability for each factor. The first factor appeared to reflect denial or minimization of the seriousness of their cardiovascular disease. The second factor appeared to reflect time constraints. The third factor appeared to reflect medical or social barriers to home exercise adherence. There were significant differences in the first 2 factor scores based on patient preference for type of CR program. Specifically, home-based participants reported significantly greater denial of the seriousness of the heart condition ( $t = 2.20$ ,  $P = .03$ ), and significantly greater time constraints ( $t = 2.12$ ,  $P = .04$ ), than did hospital-based participants.

A hierarchical logistic regression predicting patient preference for home- or hospital-based CR was conducted. Variables entered into the model were those hypothesized in the literature to relate to patient preferences (ie, sex, age, and travel time to the CR program), and those variables, which distinguished between home- and hospital-based participants in the bivariate

analyses (ie, ethnocultural background, work status, and the first 2 factor scores from the exercise barriers). Family income was not included in the model because of its close relationship to work status (ie, those with lower family income were more often retired). The overall model was highly significant,  $\chi^2(7) = 26.56$ ,  $P < .001$ , and accounted for 45.6% of the variance in patient preferences (see Table 4). The Wald parameters reveal significant differences in patient preferences based on work status, time constraints, and a trend for ethnocultural background, suggesting that participants who work outside the home perceive greater time constraints. Furthermore, patients who are White may be more likely to prefer a home-based CR program.

## DISCUSSION

Contrary to previous literature and professional speculation,<sup>18,20</sup> there were no significant differences in preferences for CR program based on sex, travel time to site, or age. However, differences in preferences based on work status, time constraints, and, potentially, ethnocultural background were demonstrated. Patients who worked full- or part-time and who perceived time constraints including family responsibilities were more likely to choose home-based CR. The flexible nature of the home-based program enabled patients who worked outside the home to incorporate physical activity at times when perhaps CR programs did not provide

**Table 3 • PRINCIPAL COMPONENTS ANALYSIS OF INVESTIGATOR-GENERATED HOME EXERCISE BARRIERS**

Variable	Factor 1: Denial/ Minimization	Factor 2: Time Constraints	Factor 3: Medical and Social Barriers
I found it difficult to adhere to my home exercise routine because...			
I don't need CR	0.858	0.040	0.200
My heart condition is not that serious	0.839	0.163	0.068
I am confident I can manage my heart problem on my own	0.675	0.015	0.303
Of work responsibilities	0.634	0.551	-0.166
Many people with heart conditions don't go to CR and they are fine	0.552	0.075	0.506
It is difficult to fit exercise into my daily life	0.085	0.826	0.225
I don't have enough time	0.324	0.815	0.081
Of family responsibilities	0.062	0.779	0.243
I am not sure how to exercise properly	-0.075	0.557	0.447
It won't improve my health	0.165	0.098	0.801
My doctor doesn't encourage me to exercise	0.175	0.175	0.710
My family doesn't support my exercise regimen	0.247	0.309	0.651
I am afraid to exercise	-0.020	0.469	0.563
Other health problems prevent me from exercising	0.464	0.107	0.510
Eigenvalue	5.46	1.96	1.49
% of variance	39.01	13.96	10.67
Cronbach $\alpha$	.82	.80	.79

**Table 4 • UNIVARIATE ANALYSIS OF VARIANCE PREDICTING PREFERENCE FOR HOME-BASED VERSUS HOSPITAL-BASED CR**

Variable	B	SE	Wald	df	P	Odds Ratio	95% CI
Ethnocultural background	-1.47	0.80	3.38	1	.066	0.23	0.5-1.10
Employment status	-2.38	0.82	8.47	1	.004	0.09	0.02-0.46
Number of minutes to travel to CR site 1 way	0.02	0.01	1.14	1	.287	1.02	0.99-1.04
Age	0.01	0.04	0.11	1	.737	1.01	0.94-1.09
Sex	-0.85	0.82	1.08	1	.299	0.43	0.09-2.12
Factor 1-Denial/minimization	0.70	0.48	2.09	1	.148	2.00	0.78-5.15
Factor 2-Time constraints	-1.17	0.52	5.07	1	.024	0.311	0.11-0.86

services (ie, evenings and weekends), or to reach physical activity goals through cumulative shorter bouts of physical activity throughout the day.

The CR program was located in a multicultural community and offered services in several languages. The supportive environment of the hospital-based CR program, particularly where participants can meet other cardiac patients of similar cultural and linguistic background, was shown to be appealing to cardiac patients who were Portuguese, Italian, Black, or South/East Asian. Moreover, the monitoring during exercise could also be reassuring among these subgroups. Considering the failure of the CR referral process for ethnocultural minorities as well as poor rates of participation,<sup>28,29</sup> these preferences for hospital-based programs should be further explored to increase participation by these potentially high-risk subgroups.<sup>30-32</sup>

It is unclear why we did not show significant differences in patient preferences based on age, sex, or travel time. The travel issue could be accounted for by the urban nature of the sample, considering public transportation is widely available. We had few women in the sample, and we found minimal gender-related preferences. The literature would suggest that women prefer home-based programs because they perceive hospital-based programs as male-oriented, and may have concerns about exercising in front of others.<sup>33</sup> However, Dalal similarly reported no gender differences in preferences for home- or hospital-based CR in his sample from the United Kingdom.<sup>23</sup> However, patients older than 60 years did show significant preferences for home-based over hospital-based CR. There has been relatively little investigation in this area and, therefore, future controlled studies are required to determine whether work- and time-related factors are more pertinent to preferences for home-based CR than are age and sex.

Caution is warranted when interpreting these findings. The sample size was small, participants were not randomized to CR programs, nor were they followed prospectively. Moreover, findings are specific to the CR delivery model offered at this single hospital site, within a universal healthcare system. However, there were min-

imal differences noted between participants and nonparticipants, suggesting that our findings are fairly generalizable within this health system and model of care. Another limitation relates to the timing of discussion regarding CR format, such that a few participants were unaware that they had been offered the choice to attend a home-based program. This was likely due to heightened anxiety experienced acutely postevent or procedure, which often precludes information retention. Future research is warranted to replicate these findings, in particular, a prospective multisite controlled trial is needed, with a larger sample of home-based participants.

In conclusion, time-constrained, working cardiac patients were most likely to prefer home-based programs, yet patient preferences did not differ on the basis of age or sex. Future research is needed to explore the preference among non-White cardiac patients for the social support, monitoring, and health information afforded by hospital-based programs. Based on these initial findings, more research and policy discussion related to the format and delivery of home-based CR are essential. Further efforts at stratification of cardiac patients to tailored programs based on not only cardiac risk, but also program preferences, may ultimately result in greater adherence and improved health outcomes.

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