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Effect of Referral Strategies on Access to Cardiac Rehabilitation Among Women

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Abstract

Background—Despite its proven benefits and need, women's access to cardiac rehabilitation (CR) is suboptimal. Referral strategies, such as systematic referral, have been advocated to improve access to CR. This study examined sex differences in CR referral and enrollment by referral strategies; and the impact of referral strategies for referral and enrollment concordance among women.

Design—Prospective cohort study.

Methods—This prospective study included 2635 coronary artery disease inpatients from 11 Ontario hospitals that utilized 1 of 4 referral strategies. Participants completed a sociodemographic survey, and clinical data were extracted from charts. One year later, 1809 participants (452 [25%] women) completed a mailed survey that assessed CR utilization. Referral strategies were compared among women using generalized estimating equations to control for effect of hospital.

Results—Overall, significantly more men than women were referred (67.2% and 57.8% respectively, p<.001), and enrolled in CR (58.6% and 49.3% respectively, p=.001). Of the retained women, combined systematic and liaison-facilitated referral resulted in significantly greater CR referral (Odds Ratio [OR]=10.3, 95% Confidence Interval [CI] = 4.11–25.58) and enrollment (OR=6.6, 95% CI = 4.34–9.92) among women when compared to usual referral. Conversely, concordance between referral and enrollment was greatest following usual referral (K=.85), and decreased with referral intensity.

Conclusions—While a lower proportion of referred patients enroll, systematic and liaison-facilitated inpatient referral strategies result in the greatest CR enrolment rates among women. Such strategies have the potential to improve access among women, and reduce "cherry picking" of patients for referral.

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Keywords

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Introduction

Cardiovascular diseases are the leading causes of morbidity and mortality for women globally,[1,2] Secondary prevention measures, such as cardiac rehabilitation (CR), can effectively reduce this burden.[3,4] CR participation is associated with a reduction in morbidity and mortality, and an improvement in functional status and quality of life.[5] Many of these benefits have also been established among women.[6, 7]

Only approximately 15–30% of eligible patients participate in CR, with the rate among women being even lower at approximately 11–20%.[8] In fact, the percentage of women in CR is 20% lower than what would be expected based on coronary morbidity data.[1,9] Thus, despite its proven benefits and need, women are significantly less likely to participate in and complete CR. This is disconcerting given that CR is recommended as a Class I, Level A recommendation in clinical practice guidelines[3,4,10,11] including women-specific guidelines.[7]

While the barriers to CR access are multi-factorial,[12–17] arguably the chief reason CR utilization is so low is referral failure.[11,14,18–20] Research shows that women are less likely to be referred to CR than men.[15,21,22]

To address this care gap, strategies to promote CR referral have been advocated.[23, 24] These strategies include systematic referral through discharge order sets or electronic referral systems, and a patient-healthcare provider (liaison-facilitated) bedside discussion regarding CR prior to patient discharge. A systematic review,[25] and a more recent multi-site cohort study[26] have demonstrated that a combined systematic and liaison-facilitated referral strategy significantly increased CR referral and utilization, up to approximately 85% and 70% respectively.

With the demonstrated effects of referral strategies established, this study sought to test whether systematic strategies can also reduce inequities in access. To date, no studies have examined whether sex differences in access persist in the context of systematic referral, and if systematic referral strategies would result in significantly more women being referred and enrolled in CR. The objectives of the study were to examine: (1) sex differences in CR referral and enrollment by referral strategy, (2) differences in CR referral and enrollment rates by referral strategy among women, and (3) the concordance between referral and enrollment by CR referral strategy among women.

Methods

Design and Procedure

This study presents analysis of a pre-specified secondary objective from the Cardiac Rehabilitation care Continuity through Automatic Referral Evaluation (CRCARE) study. Detailed methods are presented elsewhere.[27] In brief, the study design was prospective and observational, assessing comparative effectiveness across the following 4 CR referral strategies: (1) systematic referral using electronic patient records or standard discharge orders as an automatic prompt before hospital discharge, (2) liaison-facilitated referral whereby the referral is facilitated through a personal discussion with a healthcare professional (i.e., nurse or physiotherapist) and/or peer graduate (at the bedside or in some cases by phone shortly after discharge), (3) a combination of both systematic and liaison-facilitated referral, (4) or standard (usual) referral care at the discretion of providers. Based on the available literature, the principal investigator developed an initial taxonomy of referral strategies for discussion at the investigator meeting. The categories were revised based on input, and circulated to the investigators and designated clinical site leads for review via email post-meeting. After a few minor changes, site leads were asked to categorize the referral strategies implemented in their own units. These were then verified independently by the study coordinator.

Ethics approval for human research was obtained from all participating hospitals, which included 11 acute care hospitals in Ontario, Canada. Of these, seven (63.6%) were tertiary care facilities (i.e., onsite catheterization laboratory and revascularization), five (45.4%) were academic hospitals, four (36.4%) were regional hospitals, and two (18.2%) were community hospitals (not mutually exclusive). There was a local clinic-based CR program located within a 30-minute drive-time at each of the 11 hospital sites, which is suggested as the accessibility threshold for CR[28] Canada has a universal healthcare system, therefore CR services are covered through provincial health insurance in this jurisdiction.

Between 2006 and 2008, medically-stable cardiac inpatients from each site on general cardiology, cardiac surgery and catheterization units were approached by a site recruiter. Upon informed patient consent, medical chart data were extracted and each participant filled out a sociodemographic survey. One-year later, participants were mailed a follow-up survey assessing self-reported CR referral and enrollment.

Participants

Of the 5767 inpatients initially approached, 2635 consented to participate [1928 (73.2%) men and 707 (26.8%) women], and 1449 were ineligible (61.0% response rate). The inclusion and exclusion criteria are described elsewhere.[27] Supplemental Figure S1 displays a participant recruitment flow diagram.

Measures

Sociodemographic characteristics—Self-reported sociodemographic variables assessed in the survey provided to inpatients included: marital status, education level, ethnocultural background, and work status. These variables were dichotomized as follows:

marital status (married: yes/no), education level (some post-secondary: yes/no), ethnocultural background (white: yes/no), work status (retired: yes/no). Patients were asked at time of recruitment whether they lived within a 30 minute drive of a hospital, and were coded as rural if they responded “no”. Sociodemographic data obtained from the medical chart included date of birth and sex.

Clinical Characteristics—The nature of cardiac condition or procedure (i.e., myocardial infarction, PCI, CABG) as well as presence of CVD risk factors (i.e., hypertension, dyslipidemia and diabetes,), were obtained from the medical chart.

Other CVD risk factors including family history of heart disease, body mass index and smoking status were self-reported. Participants also self-reported if they had other comorbid conditions (e.g., muscle/joint/bone problems; respiratory or pulmonary disease; kidney disease, neurological disorders; mental or emotional problems, or cancer) on the in-hospital survey. These comorbid conditions were summed and presented as a mean. Finally, the Beck Depression Inventory-II (BDI-II) was also administered in the initial survey to assess depressive symptoms.[29]

CR Referral Strategies—Prior to study initiation, meetings with the clinical staff from all inpatient units were held to understand and quantify the process of CR referral on each ward. An investigator meeting was also held to finalize and verify the following 4 referral strategies: (1) systematic, (2) liaison-facilitated, (3) a combination of both, or (4) “usual” referral at the discretion of a healthcare provider.

Dependent Variables

Cardiac rehabilitation access—Participants self-reported whether or not they were referred to CR (yes/no), and whether they attended at least one CR class (i.e., enrollment; yes/no).

Statistical Analyses

In the initial stages of analysis, a test of differences in sociodemographic and clinical characteristics by sex, and among retained versus non-retained women was performed using t-tests and Pearson’s chi-square as appropriate (Table 1). Supplemental Table S1 displays women’s characteristics compared by referral strategy.

For objective 1, descriptive examinations of CR referral and enrollment rates by referral strategy and by sex were performed. Chi-square tests were computed to test the first objective, namely whether there were sex differences in CR referral and enrollment for each referral strategy.

To test the second objective, Pearson chi-square tests were used to examine if there were differences in referral and enrollment rates among women based on the type of referral strategy. To counteract the problem of multiple comparisons which can inflate the familywise error rate, a Bonferroni correction was used, where a p-value of 0.006 was applied (p=.05/8) to denote statistically significant differences.

Two generalized estimating equations (GEE) using a binary logistic model were computed to take into consideration the nested nature of patients within hospitals, to test for differences in CR referral and enrollment by referral strategy among women. The models were adjusted for sociodemographic and clinical variables identified to significantly differ by referral strategy among women.

To test the third objective, Cohen's kappa was computed to ascertain the degree of concordance between referral and enrollment among women patients by referral strategy. A *p*-value of <0.05 was considered statistically significant for all tests. SPSS Version 19.0 was used for all analyses.

Results

Respondent Characteristics

Of the 2635 consenting participants accrued, 1809 (452 [25%] women) participants completed the one-year assessment (see Supplemental Figure 1). Differences in patient characteristics between those retained versus lost-to-follow-up are shown elsewhere.[27] However, women were significantly less likely to be retained than men (p <0.01). Thus, differences in patient characteristics between women retained versus lost-to-follow-up are shown in Table 1.

Table 1 also displays inpatient sociodemographic and clinical characteristics by sex. Women were significantly less likely to be married, have a higher education, while they were more likely to be older, retired, live alone, in a rural context when compared to men. Women were also significantly less likely to have dyslipidemia, or have undergone CABG, but more likely to have a greater body mass index (BMI), greater depressive symptoms, and more comorbidities when compared to men. Table 2 displays the sociodemographic and clinical characteristics of women by referral strategy, among those retained at the 1-year follow-up.

Sex Differences in CR Referral and Enrollment by Referral Strategy

Of the1809 participants that completed the follow-up survey, 1156 (63.9%) participants were referred (900 men and 256 women) to 1 of 52 CR programs in the province of Ontario (includes private and community-operated programs), and 978 (54.1%) enrolled in CR. Significantly more men (67.2%) than women (57.8%) were referred (p<.001), and enrolled in CR (58.6% and 49.3% respectively, p=.001). However, when considering only those patients who were referred (n=1156), this sex difference did not persist (767 [85%] men and 211 [82%] women enrolled; p=.37).

Next, the data were split referral strategy (N=1809). Men were significantly more likely to be referred to CR than women when using the liaison-facilitated strategy (63.5% and 48.6% respectively, p<0.01). There were no significant sex differences in rates of referral following systematic referral (70.5% and 68.6% respectively, p=.70), or the combined approach (85.6% and 84.2% respectively, p=.73). Similarly, significantly more men than women enrolled in CR under the liaison-facilitated referral strategy (54.8% and 41.3%, p<.01). There were no enrollment differences between men and women with systematic referral

(61.0% and 59.5% respectively, p=.77), or the combined approach (74.9% and 70.0% respectively, p=.34).

Referral and Enrollment in CR by Referral Strategy Among Women

As shown in Table 2, among women, there was a significant difference in referral (chi-square= 66.9, p<0.001) and enrollment (chi-square= 41.7, p<0.001) by CR referral strategy. With regard to referral, rates were significantly greater following the combined systematic and liaison-facilitated (84.2%) compared to the liaison-facilitated (48.6%, p<0.001) and usual referral (29.1%, p<0.001) strategies. The systematic referral strategy (68.6%) resulted in greater referral rates compared to the liaison-facilitated (p=0.003) and usual strategies (p<0.001). With regard to enrollment, rates were significantly greater following the combined systematic and liaison-facilitated (70.0%) compared to liaison-facilitated (41.3%, p<0.001) and usual referral (26.2%, p<0.001) strategies. The systematic referral strategy (59.5%) resulted in greater referral rates compared to usual referral (p<0.001).

Next, two generalized estimating equations (GEEs) were computed, while adjusting for the significant differences identified through bivariate analyses in Table 2 (i.e., ethnicity, myocardial infarction, having had a PCI or CABG, BMI and smoking status) to test for differences in each of CR referral and enrollment by referral strategy among women. The results are shown in Table 3. With regard to the former, systematic CR referral combined with a liaison-facilitated strategy resulted in 10 times greater referral compared to usual referral, systematic referral alone resulted in 6 and a half times greater referral compared to usual referral and a liaison-facilitated strategy resulted in three times as many women being referred to CR. In addition to referral strategy, having CABG surgery was related to greater CR referral.

With regard to enrollment, the combined systematic referral and liaison-facilitated strategy resulted in 6 and a half times greater enrollment among women compared to usual referral, systematic referral alone resulted in 5 times greater referral compared to usual referral and the liaison-facilitated strategy alone resulted in twice as many patients being referred to CR. In addition, having had a PCI or CABG were related to greater enrollment.

Finally, table 2 also displays the concordance between participant referral and enrollment by referral strategy. The greatest concordance was found following a usual referral strategy, such that 85% of referred women patients enrolled in CR. There appeared to be a linear relationship between referral strategy intensity and concordance, such that the greater the referral intensity and rates, the lower the concordance with enrollment.

Discussion

Results of this study confirm the beneficial effects of innovative referral strategies in increasing patient access to CR, but also demonstrate these effects similarly extend to women cardiac patients. To our knowledge, this is the first study to show that referral strategies have the potential to overcome sex bias in CR access. The findings herein demonstrate that systematic approaches are related to high rates of CR referral and enrollment for men and women patients, with a combined systematic and liaison-facilitated

approach being the most effective. These results corroborate recent findings demonstrating that systematic referral strategies may address other disparities in CR access, namely socioeconomic disparities.[30] Given our previous work demonstrating high rates of program participation regardless of referral strategy,[27] broad application of systematic and liaison-facilitated inpatient referral could result in over ten times more women patients accessing the proven benefits of CR.

The sex difference in CR referral and enrollment following liaison-facilitated referral alone was surprising. It has long been established that healthcare provider endorsement is a strong predictor of patient enrollment.[9, 31] When considered in conjunction with the concordance data between CR referral and patient enrollment by referral strategy, results suggest that healthcare providers may be inadvertently referring and endorsing CR more strongly among men than women cardiac inpatients. This so-called “cherry picking” seems to be related in a linear way to the intensity of the CR strategy in the inpatient setting. So, in the case of usual and liaison-facilitated strategies, patients who seem motivated and willing to attend or who ask about CR in the inpatient setting would be referred. In the case of systematic strategies, every indicated patient is appropriately referred as per evidence-based guidelines. While some of these patients may not be interested or willing to attend, leading to lower concordance between referral and enrollment, nevertheless the rates of referral and enrollment overall are significantly higher than what is observed following non-systematic referral approaches. Interestingly, a similar concordance pattern was observed among men and for the overall sample, although the kappa was somewhat lower for usual referral (it was consistent with the concordance for liaison-facilitated referral; data not shown). The implications from these findings are that inpatient providers need to be informed that while their efforts to refer patients are admirable and effective in ensuring enrollment in over three quarters of referred patients, they do need to refer all patients equitably. This guidance should extend even those who they perceive may not attend, as ultimately over half of systematically referred patients will enroll if they have a bedside CR discussion.

An alternative explanation for this finding could be that the manner in which CR is described and communicated by the CR liaison to the patient may be more compelling to men than women cardiac patients. Further research is needed to test whether these findings are robust, and perhaps to test referral tools that are motivating to women and men.

Caution is warranted when interpreting these results, chiefly due to design and loss to follow-up. This was a quasi-experimental study. For ethical reasons, participants could not be randomized to acute care site, nor could we randomize referral strategy within units due to the potential for contamination. Consequently, there were significant differences in sociodemographic and clinical characteristics of patients by referral strategy and by sex which may have biased results. The second main limitation pertains to generalizability. Bias was observed in sample selection and retention. For instance, there is the potential for bias due to the high rate of loss to follow-up, especially among women. Additionally, there were several sociodemographic and clinical differences between the women that were retained and those lost to follow-up, therefore caution is warranted when interpreting the results. Another limitation was that this study was undertaken within the context of government funding for CR services, albeit limited. The third limitation pertains to measurement.

Although self-reported CR referral and enrollment was not verified, there is evidence that supports the “almost-perfect” congruence between self-report and CR site-report data.[32] However, the potential for social desirability biases in participant responses cannot be ruled out. The final limitation pertains to a potential Hawthorne effect. The study was presented to participants as investigating secondary prevention generally, nevertheless the rates of CR utilization herein may be somewhat inflated. However, given that this was a controlled study, this potential source of bias cannot explain the observed differences by referral strategy.

In conclusion, systematic referral strategies can result in a greater proportion of women being referred and enrolled in CR. The systematic, liaison-facilitated approach to inpatient referral can ensure ten times more women are referred to CR, and achieve 6.5 times greater enrollment than what is observed in current practice. Healthcare providers should be encouraged to discuss CR with all eligible women inpatients in a gender-sensitive manner to promote optimal access, and ultimately optimal outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Inpatient Sociodemographic and Clinical Characteristics by Sex

Characteristic	Men Retained (n=1357)	Women		Total (N=1809)	p†
		Retained (n=452)	Not Retained (n=255)		
Sociodemographic					
Age, mean (SD)	64.9 (10.0)	66.9 (11.5)	68.1 (13.4)***	65.4 (10.4)	<0.01
White ethnocultural background, n (%)	1094 (83.6)	352 (83.0)	185 (80.1)	1446 (83.4)	0.79
Married, n (%)	1134 (84.4)	258 (57.8)	114 (30.6)**	1392 (77.8)	<0.001
Education level (high school or more), n (%)	1002 (76.1)	310 (70.9)	148 (60.4)**	1312 (74.8)	0.03
Live Alone, n (%)	162 (12.3)	120 (28.2)	84 (35.4)	282 (16.2)	<0.001
Retired, n (%)	658 (50.0)	247 (58.4)	134 (57.8)	905 (52.0)	<0.01
Rural living, n (%)	206 (15.2)	107 (23.7)	81 (31.8)*	313 (17.3)	<0.001
Clinical					
Index cardiac condition/procedure, n (%)					
MI	388 (28.7)	114 (25.6)	91 (37.0)**	502 (28.0)	0.21
PCI	448 (33.2)	154 (34.5)	60 (24.2)**	602 (33.5)	0.62
CABG	596 (44.1)	147 (32.9)	65 (26.4)	743 (41.3)	<0.001
Diabetes, n (%)	378 (30.6)	139 (34.0)	106 (48.6)***	517 (31.5)	0.21
Hypertension, n (%)	920 (73.1)	319 (77.1)	176 (78.6)	1239 (74.1)	0.11
Dyslipidemia, n (%)	985 (83.1)	299 (78.3)	142 (78.5)	1284 (81.9)	0.04
BMI, mean (SD)	28.7 (5.0)	30.1 (6.5)	29.8 (7.1)	28.9 (4.9)	<0.001
Smoker, n (%)	84 (6.4)	27 (6.4)	18 (7.7)	111 (6.4)	1.00
Number of comorbidities present, mean (SD)	1.5 (1.4)	2.5 (1.9)	2.7 (1.8)*	1.8 (1.6)	<0.001
Depressive symptoms, BDI-II, mean (SD)	8.6 (7.3)	10.8 (9.0)	13.6 (10.4)***	9.1 (7.8)	<0.001

MI, myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; BMI, body mass index; CVD, cardiovascular disease; BDI, Beck Depression Inventory

*tests for significant differences between retained and non-retained women; *p<.05, **p<.01, ***p<.001.

†tests for significant differences between retained men and women

Table 2

CR referral and enrollment rates by strategy among women cardiac outpatients

CR Referral strategy	Referred (256 [57.8%])	Enrolled (211 [49.3%])	Cohen's Kappa
Usual (2 wards), n=88	25 (29.1)‡‡	22 (26.2)‡	.85
Liaison-facilitated only (6 wards) n=148	70 (48.6)‡	57 (41.3)	.76
Systematic only (3 wards), n=119	81 (68.6)**†	69 (59.5)**	.68
Combined systematic and liaison-facilitated (5 wards), n=97	80 (84.2)**†	63 (70.0)**†	.52

Denotes significant difference from usual referral (, $p < 0.006$; **, $p < 0.001$).

†Denotes significant difference from liaison referral (†, $p < 0.006$; ††, $p < 0.001$).

‡Denotes significant difference from systematic referral (‡, $p < 0.006$; ‡‡, $p < 0.001$).

Table 3

GEE: adjusted model examining effects of referral strategies on CR enrollment in women.

Variable	Wald Chi-square	OR	95% CI	p value
CR Referral				
Referral Strategy				
Usual (reference)	-	-	-	-
Systematic	10.37	6.57	2.09 – 20.68	0.001
Liaison-facilitated	8.16	2.85	1.39 – 5.84	0.004
Combined	24.95	10.26	4.11 – 25.58	<0.001
Ethnicity (non-white)	1.56	0.75	0.48 – 1.18	0.21
BMI	0.03	1.00	0.97 – 1.0	0.86
MI	2.07	1.69	0.83 – 3.47	0.15
PCI	2.91	2.11	0.89 – 4.97	0.88
CABG	10.07	3.41	1.60 – 7.27	0.002
Current Smoker	1.14	1.51	0.71 – 3.20	0.29
CR Enrollment				
Referral Strategy				
Usual (reference)	-	-	-	-
Systematic	98.98	5.30	3.81 – 7.36	<0.001
Liaison-facilitated	26.20	2.42	1.73 – 3.40	<0.001
Combined	79.58	6.56	4.34 – 9.92	<0.001
Ethnicity (non-white)	0.99	0.77	0.46 – 1.29	0.32
BMI	0.32	0.99	0.96 – 1.02	0.57
MI	0.33	1.15	0.71 – 1.86	0.57
PCI	8.84	1.81	1.22 – 2.69	0.003
CABG	10.45	2.03	1.32 – 3.12	0.001
Current Smoker	0.01	0.95	0.40 – 2.29	0.92

CR, cardiac rehabilitation; BMI, body mass index; MI, myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass graft; OR, odds ratio