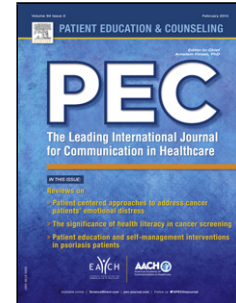# Accepted Manuscript

The Evaluation of a Brief Motivational Intervention to Promote Intention to Participate in

Cardiac Rehabilitation: A Randomized Controlled Trial

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Highlights

- Cardiac rehabilitation (CR) reduces cardiovascular mortality but is underutilized.

- Motivational interviewing is a counseling style to enhance treatment adherence.

- Motivational interviewing increased patients' intention to attend CR.

- Motivational interviewing reduced exercise concerns and increased CR adherence.

- Patient-centered counseling shows promise to support patients' transition to CR.

Abstract

Objectives: Cardiac rehabilitation (CR) is an effective treatment for cardiovascular disease, yet many referred patients do not participate. Motivational interviewing could be beneficial in this context, but efficacy with prospective CR patients has not been examined. This study investigated the impact of motivational interviewing on intention to participate in CR. *Methods:* Individuals recovering from acute coronary syndrome (n=96) were randomized to motivational interviewing or usual care, following CR referral but before CR enrollment. The primary outcome was intention to attend CR. Secondary outcomes included CR beliefs, barriers, self-efficacy, illness perception, social support, intervention acceptability, and CR participation. *Results:* Compared to those in usual care, patients who received the motivational intervention reported higher intention to attend CR (p=.001), viewed CR as more necessary (p=.036), had fewer concerns about exercise (p=.011), and attended more exercise sessions (p=.008). There was an indirect effect of the intervention on CR enrollment (b=0.45, 95% CI 0.04-1.18) and CR adherence (b=2.59, 95% CI 0.95-5.03) via higher levels of intention. Overall, patients reported high intention to attend CR ($M = 6.20/7.00$, $SD = 1.67$), most (85%) enrolled, and they attended an average of 65% of scheduled CR sessions. *Conclusion:* A single collaborative conversation about CR can increase both intention to attend CR and actual program adherence. *Practice*

Implications: The findings will inform future efforts to optimize behavioral interventions to enhance CR participation.

Keywords: cardiac rehabilitation, motivational interviewing, enrollment, adherence, intention, randomized controlled trial

1. Introduction

Cardiovascular disease (CVD), to which acute coronary syndrome (ACS; myocardial infarction, unstable angina) is a major contributor[1], represents the leading cause of global mortality[2]. CVD is also responsible for reduced quality of life and substantial annual healthcare costs[3,4]. Cardiac rehabilitation (CR) is an empirically supported treatment to address risk factors and reduce mortality associated with CVD, and ACS in particular[5,6]. There is clear evidence of improved morbidity, survival, psychological distress, and cost-effectiveness resulting from CR[7–10], but its therapeutic benefits and full population impact are limited by broad underutilization in the USA, Canada, and other countries[11–14].

Patients must enroll in CR, then adhere to prescribed exercise sessions, to achieve the full benefits of the program[11]. Between 14-81% of patients referred to CR do not enroll[14] and sustained adherence remains suboptimal with the average patient attending only 67% of prescribed sessions[15]. While reasons for CR underutilization are multifaceted, a key barrier for some patients is their ambivalence toward CR[16]. Specific issues that can contribute to patient ambivalence include concerns about scheduling, transportation, exercise safety, and lack of perceived need[16–18]. Although physician recommendation is vital to enhancing CR

enrollment[18], a didactic approach that involves telling patients why CR is important may be insufficient as it ignores their level of intention and individualized barriers to attending CR.

In contrast to an expert-advice approach, motivational interviewing is a "person-centered counseling style for addressing the common problem of ambivalence about change[19]" that may be well-suited to increase intention to attend CR. It involves evoking and exploring patients' reasons for change, collaboratively problem-solving barriers, supporting autonomy, and strategically responding to patients' statements about change in an environment of non-judgmental acceptance and compassion[19]. Growing clinical attention has been paid to the use of motivational interviewing to reduce cardiovascular risk, but empirical support remains equivocal[20–22]. Whereas motivational interviewing demonstrates favorable effects on smoking cessation, mood, and quality of life in CVD patients[20], it has not been evaluated as a means to promote CR enrollment. Interventions to encourage CR enrollment generally involve education about CR and its benefits, and assistance with coordinating the referral[23], but are limited by lack of attention to patients' level of intention to attend and issues of intervention fidelity.

Experts in behavioral intervention development advocate for more early-phase research investigating how, not merely if, interventions work[24–26]. Like the process of drug development, researchers studying behavioral interventions should examine the impact on purported precursors to behavior before studying behavioral endpoints in efficacy trials[24]. This approach may optimize efficacy and prevent premature abandonment of interventions that initially fail to impact behavioral or biomedical outcomes. Applied to CR, it is logical to first characterize whether behavior change interventions can alter pertinent motivational constructs, before targeting CR enrollment and adherence as primary outcomes. The primary aim of the

present study was to examine the impact of a brief motivational interviewing intervention to increase *intention*—a precursor to behavior change in motivation theories[27,28] and research on CR adherence[29]. We hypothesized that participants randomized to the motivational intervention, delivered after CR referral but before CR enrollment, would report greater intention to attend CR relative to participants in usual care.

2. Methods

2.1 Design and Procedure

The UPBeAT-CR Study utilized an unblinded, parallel RCT (clinicaltrials.gov #NCT02721758) and was approved by the University of Calgary research ethics board. Eligible patients were informed they would be randomly assigned to one of two groups aimed at better understanding barriers to CR participation: an "interview" or "no-interview" group. All patients completed the study (and potentially the intervention) following a CR referral and initial orientation appointment, but before enrollment in a 12-week exercise program. After providing written informed consent, patients completed baseline questionnaires, then were randomly assigned to the motivational intervention (interview) or usual care (no-interview) using blocked randomization with a 1:1 allocation ratio (Figure 1). Randomization was completed using a random number generator. Allocation was concealed using sealed envelopes prepared by an assistant otherwise uninvolved with the study.

After randomization, patients participated in the motivational intervention and/or received instruction on outcome questionnaires assessing intention and secondary outcomes. The questionnaire package instruction was "to provide your views about exercise and cardiac rehabilitation, your views about your heart disease, and your level of social support." Patients completed the questionnaires at home ≥1 day after the research appointment but prior to their

first scheduled exercise appointment. Completed questionnaires were submitted in-person, mailed back using a prepaid envelope, or completed online (www.qualtrics.com). CR enrollment/adherence were determined by chart review. Recruitment and follow-up occurred between 06/2015-04/2016.

2.2 Participants

Participants included adults with established CVD who: 1) were referred to and eligible for a centralized CR program in Calgary, Canada; 2) were <1-month post-ACS and received medical management and/or angioplasty; 3) were English-speaking, 4) had no hearing impairment that would interfere with study participation; 5) attended an initial CR orientation; 6) had no severe cognitive impairment (screened by CR nurse as part of standard care); 7) lived within 100-km of the CR clinic; 8) were medically cleared for CR exercise; and 9) reported the ability to complete the study (meet with the researcher, complete questionnaires) before their first scheduled exercise session. Attendance at the initial CR orientation appointment ensured patients had basic information about the program and were medically cleared to exercise based on an exercise stress test.

All ACS patients admitted to coronary care units or cardiology wards within Calgary are automatically referred to the CR Early Cardiac Access Clinic[30], screened for eligibility by a program nurse, and scheduled for an orientation appointment within seven days of hospital discharge. Patients are informed the orientation appointment is standard medical follow-up after hospital discharge (~85% of referred patients attend). At the orientation appointment, patients are invited to attend a two-part cardiac education class followed by the core CR program which consists of 24 twice-weekly supervised exercise sessions offered in center- and home-based

formats. Patients who provided permission to be contacted about the study met with the

researcher at the end of the orientation appointment (if feasible) or were telephoned within two

days. Interested, eligible patients scheduled a time to complete the informed consent form,

baseline questionnaires, and potentially complete the motivational intervention.

2.3 Usual Care

Usual care included an invitation to participate in the CR program and basic education

about CR. In this setting, usual care represents state-of-the-art, guideline-adherent practice[31]

that is consistently delivered to ACS patients in the region, suggesting usual care is a stringent

comparator[32]. Patients randomized to usual care met with the researcher, completed

questionnaires assessing baseline socio-demographic information, learned about their

randomization, then received instructions for the follow-up questionnaires. The researcher did

not provide advice/information about CR or about overcoming barriers. Usual care is considered

an appropriate control condition in early intervention development[32].

2.4 Intervention

The intervention was designed based on a review of literature on CR utilization and

CR/exercise adherence interventions[33] as well as formative qualitative research conducted

within our CR setting that examined decision-making about CR among patients who had been

referred but had not yet started the CR program[16].

We selected motivational interviewing as an appropriate modality to address the

experience of ambivalence observed in this population, to tailor the intervention to each patient's

level of intention, and to address individualized barriers to CR attendance. We postulated that

motivational interviewing would intervene via intentions, a precursor to behavior change[27,28] and a purported mechanism of motivational interviewing[34].

Patients received usual care plus a single 30-60-minute intervention. The intervention was based on [19] and included: 1) developing rapport; 2) clarifying and building importance (providing education as-needed, tying CR participation to personal goals/values); 3) building confidence and collaboratively problem-solving CR barriers, and; 4) summarizing the session. Patients could complete the intervention at the CR center, at a university-based office, or as a home visit, and could opt to have their partner present. The interventionist was a clinical psychology PhD-candidate with 200 hours of supervised experience with motivational interviewing in a CVD population, and attended a two-day advanced workshop through the Motivational Interviewing Network of Trainers. A manualized protocol was followed. The interventionist adopted a spirit of acceptance, collaboration, compassion, and evocation, and strategically responded to change/sustain talk[19].

The sessions were audio-recoded and reviewed for fidelity during regular supervision with a clinical health psychologist (T.S.C.) with expertise in motivational interviewing.

2.5 Measures

Baseline questionnaires assessed descriptive information including marital status, employment, education, income, ethnic identity, travel time to CR, perceived strength of the physician's recommendation to attend CR (1=did not recommend, 5=strong recommendation[36]), and depressed mood (Center for Epidemiologic Studies Depression Scale; CESD-10[37]). Cardiac diagnosis, age, time since event, and baseline cardiovascular risk factors were gathered using chart review. After randomization and/or completion of the motivational interview, patients completed the following primary and secondary outcome measures.

Intention to Attend CR was measured using the average of two seven-point Likert items: "I intend to attend scheduled exercise classes during CR" (1=strongly disagree, 7=strongly agree) and "My goal during CR is to attend" (1=no exercise classes, 7=all exercise classes) [38,39]. This measure is associated with higher CR enrollment, higher CR adherence, more positive attitudes toward exercise, and greater perceived control over attending CR[38,39,29].

The *Beliefs About CR Scales* (BACR) measured patient views about CR[40]. The BACR comprises 13 items rated on a five-point scale, separated into four subscales; higher scores on Perceived Necessity reflect more favorable beliefs about CR, whereas higher scores on Concerns about Exercise, Practical Barriers, and Perceived Suitability reflect less favorable beliefs. BACR subscales have been demonstrated to account for 65% of variance in CR adherence[40].

The *Cardiac Rehabilitation Barriers Scale* (CRBS) assessed the degree to which various patient-, provider-, and healthcare-related obstacles interfere with CR attendance[17]. The average of 21 items was used to calculate a total CR barriers score, with higher scores indicating greater perceived barriers to CR attendance. The CRBS has demonstrated criterion validity, convergent validity, and acceptable test-retest reliability[17].

The *Multidimensional Self-Efficacy for Exercise Scale* (MSES) assessed patients' confidence in completing exercise tasks correctly, engaging in exercise despite challenges, and scheduling regular exercise[41]. The nine MSES items were averaged to provide a total score (0=not at all confident, 100=completely confident). The MSES has demonstrated a stable factor structure and concurrent validity with exercise tolerance in CR patients[42,43].

The *Brief Illness Perception Questionnaire* (BIPQ) measured the degree to which patients view their disease as severe or threatening[44]. It consists of eight items rated on a 10-

point scale which assess cognitive-emotional representations of illness. The BIPQ has

demonstrated test-retest reliability and predictive validity with CR adherence[44].

The *Enhancing Recovery in Coronary Heart Disease Social Support Inventory* (ESSI)

examined perceived social support[45]. All outcome measures in this dataset had adequate-to-

excellent internal consistencies (Cronbach-α range 0.65-0.96).

CR Enrollment was defined as attending at least one CR exercise session, coded

1=enrolled and 0=did not enroll. *CR Adherence* was defined as the number of exercise sessions

attended of 24 scheduled sessions. Patients who participated in home-based CR were included in

analyses of enrollment, but excluded from analyses of adherence because they were expected to

attend only one center-based exercise session. Enrollment and adherence were determined by

chart review of exercise attendance logs and check-in sheets completed by clinic staff during

each exercise session.

An *Intervention Acceptability* survey adapted from[46] asked patients to rate the

intervention usefulness, comfort level, and degree to which the intervention influenced their

decision about CR participation (1=not at all, 4=a great deal). The 16-item *Client Evaluation of

Motivational Interviewing* (CEMI[35]) was used to index fidelity (Cronbach's *α*=0.70).

2.6 Data Analysis

2.6.1 Primary and Secondary Outcomes

Between-subjects ANCOVAs were performed to examine the impact of the intervention

on each continuous dependent variable. Logistic regression was used to examine the impact of

the intervention on CR enrollment. In all ANCOVA and logistic regression analyses, group

(intervention, control) was the independent variable. Age, sex, CR recommendation strength, and

depressed mood were used as covariates selected a priori based on variables consistently

associated with CR participation[47–49]. Effect size magnitude was estimated using conventions

for partial eta-squared (0.01=small, 0.06=medium, 0.14=large) and for odds ratio (OR;

1.5=small, 3.5=medium, 9.0=large)[50,51]. Analyses were performed on the per-protocol sample

in SPSS 24.0 (IBM 2016, Armonk, NY) using a two-sided alternative hypothesis at 5% critical

significance. Owing to the preliminary nature of this study, p-values were unadjusted for

multiple comparisons. See Electronic Supplementary Material 1 for details of data

management/cleaning.

2.6.2 Exploratory Analyses

After examining primary and secondary outcomes outlined above, two sets of exploratory

analyses were conducted to clarify intervention mechanisms. First, correlations between CR

participation and motivational constructs (i.e., intention, CR beliefs, barriers, exercise self-

efficacy, social support, illness perception) were examined. Second, mediation analyses were

conducted using PROCESS[52] to explore the indirect effect of the intervention on CR

participation via motivational variables. Two parallel mediation models were tested with CR

enrollment and adherence as dependent variables, respectively (Figure 2). Group (intervention,

control) was the independent variable. Motivational constructs impacted by the intervention,

based on results from the primary/secondary ANCOVAs, were simultaneously entered as

potential mediators. Mediation models were analyzed using 5,000 bias-corrected bootstrap

samples. A variable was deemed a mediator if the 95% CI surrounding the indirect effect did not

include zero[52]. In the model examining CR enrollment (Panel I, Figure 2), b-coefficients were

converted to ORs by exponentiating point-estimates and confidence intervals.

2.6.3 Sample Size

No prior intervention studies for CR enrollment have examined the primary outcome

(intention to attend CR). As such, required sample size was estimated from related literature. An

RCT testing brief motivational interviewing showed large effects on intention in the domain of

substance use (d=0.86, which corresponds to f=0.43)[53]. In a trial conducted in a CR program

with similar referral practices and enrollment rates to our program[39], a theory-based invitation

to CR resulted in a 10% increase in enrollment (d=0.59, which corresponds to f=0.30) compared

to usual care[39]; we anticipated the current intervention would improve intention by at least this

magnitude. Using these f-values as guides, setting power at 80%, alpha=.05, using two-tailed

hypothesis-testing and four covariates, the total required sample size estimate was 45-90

(G*Power-3.1, Heinrich-Heine-University). Considering feasibility and potential attrition, we

aimed to recruit 50 patients per group.

3. Results

3.1 Sample Characteristics

Recruitment details are outlined in Figure 1. A total of 96 patients comprised the final

sample (Table 1). They tended to be male, White, in a relationship, and were referred to CR

following myocardial infarction. On average, patients were 59 years old (range 34-80), received

a strong recommendation to attend CR, reported non-depressed mood, and were overweight with

moderate cardiorespiratory fitness.

3.2 Intervention Characteristics

The average motivational intervention lasted 43.35 minutes (SD=10.10). Average

acceptability ratings were relatively high, ranging from 2.4-3.7/4 (Electronic Supplementary

Material 4). One intervention participant was excluded because external interruptions detracted

from the ability to engage in conversation, and he was unable to reschedule before his first

scheduled exercise appointment. Participants tended to discuss topics such as their personal

reasons for wanting to join CR (e.g., return to work, prevent recurrence), barriers to attendance

(e.g., scheduling, transportation), and questions about the program's content/structure. Ten

patients (21.3%) opted to have their partner present. Most (*n*=28;60%) completed the

intervention before the cardiac education classes. Average CEMI (*M*=51.93, *SD*=4.85)

corresponded to 81% of the total possible score. There were no associations between trial

outcomes and CEMI scores, intervention timing, location, or duration (Electronic Supplementary

Material 5).

3.3 Intention to Attend CR

The average intention rating was 6.20 (*SD*=1.67). When examining the effect of the

intervention on intention to attend CR (Table 2), group membership accounted for 11.0% of

variance, which corresponds to a medium-to-large effect. Patients who received the intervention

reported greater intention compared to controls.

CR recommendation strength showed a positive association with intention to attend CR

(*b*=0.60, *SE*=.187, *p*=.002), whereas remaining covariates did not significantly predict intention

(data not shown).

3.4 Secondary Outcomes

Overall, 85% of patients enrolled in CR and attended an average 15.67 of 24 scheduled

sessions (*SD* = 8.77). The intervention was associated with more favorable beliefs about CR,

including greater perceived necessity and fewer concerns about exercise (Table 2). Results from

hierarchical logistic regression indicated the combination of age, sex, depressed mood, and

recommendation strength as covariates predicted CR enrollment, χ^2=11.11 (*df*=4, *n*=96), *p*=.025.

Goodness-of-fit did not improve with the addition of group membership (intervention, control) in

Block 2, χ^2(df=1, n=96)=3.41, p=.065.

A total of 92% of patients in the intervention versus 80% in usual care enrolled in CR.

Though this difference did not achieve statistical significance, the OR of 3.69 corresponds to a

medium effect. The pattern of results was similar with intention-to-treat or exclusion of

covariates, except the effect on perceived necessity became non-significant (Electronic

Supplementary Material 2-3). Patients who received the intervention attended an average of five

more exercise sessions than controls.

3.5 Exploratory Results

3.5.1 Associations between Motivational Variables and CR Participation

Higher intention, perceived necessity, and exercise self-efficacy, as well as lower concern

about exercise, practical barriers, and total CR barriers were associated with higher CR

enrollment (Table 3). Greater intention to attend CR, greater perceived necessity, and greater

exercise self-efficacy, as well as lower concern about exercise, lower practical barriers, and

lower total CR barriers were also associated with higher CR adherence.

3.5.2 Indirect Effects on CR Participation

After demonstrating that intention, perceived necessity, and exercise concerns were

impacted by the intervention, these variables were simultaneously entered as potential mediators

to explain the relationship between the intervention and CR participation (Figure 1). There was

an indirect effect of the motivational intervention on CR enrollment (95% CI 0.04-1.18) and CR

adherence (95% CI 0.95-5.03) via higher intention. Every one-point increase in intention

corresponded to a 52% increase in the odds of enrollment (95% CI 1.08-2.14) and to 2.53 more

CR sessions attended. The intervention also showed an indirect effect on CR adherence via lower exercise concerns (95% CI 0.16-2.92).

4. Discussion and Conclusion

4.1 Discussion

This trial examined the preliminary efficacy of motivational interviewing for promoting intention to attend CR among patients recovering from a recent ACS event who had attended a CR orientation appointment. As hypothesized, the intervention was associated with greater intention to attend CR, more favorable beliefs about the program, and better adherence to scheduled exercise sessions. Further, there was an indirect effect on CR enrollment and adherence via heightened intention to attend CR. The application of motivational interviewing as a prelude to CR is a promising strategy to facilitate recovery following an ACS event. Consistent with recommendations for behavioral intervention development[24,26], more research is required to optimize the intervention and test the impact on enrollment and adherence in a more heterogeneous sample of cardiac patients eligible for CR.

The findings suggest a collaborative discussion about the benefits of and barriers to CR, delivered before patients start the program, may have lasting behavioral effects. Patients who received the intervention attended 75% of their scheduled exercise sessions compared to 54% attendance in usual care. Prior research shows a dose-response inverse relationship between CR adherence and all-cause mortality[10], with each additional exercise session associated with a 1% decrease in five-year mortality[54]. The CR adherence rate among intervention participants exceeds the 67% cut-off which meaningfully predicts reductions in mortality and re-hospitalization[10]. Findings are also consistent with research showing brief motivational

interviewing can increase attendance when delivered as a precursor to other rehabilitative programs[55,56].

The motivational intervention was associated with a non-significant increase in the odds of enrolling in CR. Existing data from the Calgary CR program and others show that patients who are referred to, but do not enroll in, CR have more hospitalizations and higher mortality than CR completers[10,54]. The intervention's impact on sustained program adherence suggests that efforts to promote CR uptake may inadvertently improve program engagement. This finding is not entirely surprising given that talking to patients about the barriers/benefits to attending *at least one* CR appointment (i.e. enrollment) cannot occur without also talking about benefits/barriers to attending *more than one* CR appointment (i.e. adherence). It is possible the intervention has a greater effect on adherence than enrollment, or a ceiling effect may limit effects on enrollment because participants had already attended an orientation appointment. Future trials powered on CR enrollment or adherence as primary outcomes are required to replicate and extend these results, and to clarify mechanisms underlying initial exercise adoption versus sustained exercise participation in the context of CR.

This study helped elucidate processes that may underlie patients' decision-making about whether to initiate and continue with CR. Specifically, the brief motivational intervention showed a medium-to-large effect on intention to attend CR, which is similar in magnitude to effects of motivational interviewing on intention formation in other behavior change contexts[34,57]. Intention to attend CR also predicted higher adherence, consistent with prior research[38]. Specifically, the intervention contributed to a one-point increase in intention (on a seven-point scale) which, in turn, was associated with 2-3 more exercise sessions attended.

Adding follow-up motivational sessions focused on action-planning and exercise instruction

could further enhance intention, self-efficacy, and physical activity[58].

On average, patients who received the intervention reported a greater personal need for

CR, a more coherent understanding of their CR goals, and less concern about participating in the

exercise component of the program. The intervention did not improve total CR barriers, practical

barriers, or exercise self-efficacy, even though these variables predicted whether patients

enrolled in and adhered to CR. It is unclear why the intervention successfully alleviated BACR-

assessed exercise concerns but did not improve exercise self-efficacy or CR barriers. The

intervention seems to have addressed concerns about CR-specific exercise sessions (assessed by

the BACR) rather than confidence about exercise participation in general. The BACR was

specifically designed for administration among prospective CR patients, so may have better

captured their concerns and perceptions compared to other measures. The findings suggest

intention, perceived necessity, exercise concerns, CR barriers, and exercise-self efficacy should

be retained as targets in future behavioral interventions to promote CR participation.

It remains uncertain whether results will generalize to other CR settings, because this was

a single-center trial and there is large variability between programs in terms of structure, referral

practices, and accessibility[14]. The CR program examined in this study has a higher enrollment

rate (80% in usual care) than documented elsewhere (typically below 70%[11,14,23]). This is

potentially due to our existing healthcare-system processes to support CR utilization including

automatic referrals, fee assistance, short wait-times, and a home-based CR option[59]. The high

enrollment rate may also reflect the nature of this sample, in that the average patient was White,

male, married, and socioeconomically advantaged. The study is further limited by potential

selection bias because we included patients who had already attended an orientation appointment

at the CR center. Characteristics of the 15-20% of referred patients who do not attend the

orientation appointment remain uncertain. For generalizability and impact, it may have been

preferable to include patients who did not attend the initial orientation. The favorable

intervention outcomes, despite a potential ceiling, suggests the importance of enhancing

participation in even well-utilized CR programs.

Another limitation is that this trial was unblinded, though potential bias was mitigated

through allocation concealment, data entry by a research assistant uninvolved in intervention

delivery, assessment of objective CR participation, and the use of an intervention manual. To

dampen expectancy and social desirability effects, patients were not informed about the

intervention rationale until after discharge from CR and were encouraged to provide honest

responses on the questionnaires. For proof-of-concept, it would have also been ideal to clarify

within-person effects by measuring intention and other motivational variables pre- and post-

intervention[24]. Further, it will be crucial to establish the ideal frequency, duration, provider

characteristics, and candidates for the intervention, and to explore whether the intervention can

be successfully delivered using telehealth formats. Finally, the exploratory mediation results and

the impact of the intervention on secondary outcomes need to be replicated.

4.2 Conclusion and Practice Implications

This trial is the first to apply a motivational interviewing style with prospective CR

patients, and shows that a single collaborative conversation about CR can increase intention to

attend CR and actual program participation. Spending time with patients after they receive basic

information about CR, exploring their own reasons for potentially wanting to join the program,

and collaboratively problem-solving barriers may positively influence their willingness to attend

this highly effective treatment program. Strategic efforts to resolve patients' ambivalence about

CR and increase CR adherence have the potential to reduce healthcare costs and save lives.

Policy and Ethics

Informed consent was obtained from all participants in accordance with the Declaration

of Helsinki. All personal identifiers have been removed so that patients described are not

identifiable.

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Table 1

Sample Characteristics

	All Patients (*n*=96)		Intervention (*n*=47)		Usual Care (*n*=49)	
	n	*%*	*n*	*%*	*n*	*%*
Male	78	81.3	41	87.2	37	75.5
Ethnic Identity						
White	84	87.5	42	89.4	42	85.7
Hispanic	4	4.2	3	6.4	1	2.0

Asian	4	4.2	2	4.3	2	4.1
Aboriginal	3	3.1	0	0.0	3	6.1
Foreign-Born	14	14.6	7	14.9	7	14.3
Employment Status						
Employed/Sick Leave	62	64.6	27	57.4	35	71.4
Retired	30	31.3	18	38.3	12	24.5
Homemaker	3	3.1	1	2.1	2	4.1
Unemployed	1	1.0	1	2.1	0	0.0
Marital Status						
Married/Common-law	74	77.1	36	76.6	38	77.6
Separated or Divorced	9	9.4	3	6.4	6	12.2
Single	8	8.3	6	12.8	2	4.1
Widowed	5	5.2	2	4.3	3	6.1
Highest Education						
< High School	13	13.5	7	14.9	6	12.2
High School Diploma	19	19.8	12	25.5	7	14.3
College/Trade Certificate	29	30.2	12	25.5	17	34.7
Bachelor's Degree	17	17.7	11	23.4	6	12.2
Degree Above Bachelor's	17	17.7	4	8.5	13	26.5
Family Income, *$CDN*						
<10,000-20,000	6	6.3	2	4.3	4	8.1
20,001-60,000	25	26.0	16	34.0	9	18.4
60,001-100,000	25	26.0	13	27.7	12	24.5
>100,000	38	39.6	16	34.0	22	44.9
Type of ACS Event						
STEMI	36	37.5	17	36.2	19	38.8
NSTEMI	27	28.1	13	27.7	14	28.6
Angina	32	33.3	17	36.2	15	30.6
Unspecified	1	1.0	0	0.0	1	2.0
Home Program	15	15.6%	6	12.8%	9	18.4%

	M	*SD*	*M*	*SD*	*M*	*SD*
Age, *Years*	59.79	10.66	59.78	11.23	59.80	10.21
Time Since Event, *Days*	19.13	12.53	18.72	8.21	19.51	15.68
Distance to CR, *Minutes*	29.29	15.93	28.98	14.09	29.58	17.66
CR Recommendation,*1-5 Scale*	4.43	0.84	4.45	0.80	4.40	0.88
Depression Symptoms, *CESD-10*	7.19	5.41	7.91	5.76	6.50	5.01
Total cholesterol, *mmol/L*	4.48	1.17	4.59	1.13	4.36	1.21
HDL, *mmol/L*	1.06	0.30	1.05	0.24	1.07	0.36

(continued)

	M	*SD*	*M*	*SD*	*M*	*SD*
LDL, *mmol/L*	2.61	1.03	2.71	0.98	2.51	1.09
Triglycerides, *mmol/L*	1.77	0.96	1.83	0.97	1.71	0.96
Systolic BP, *mmHg*	112.65	14.02	113.87	14.59	111.47	13.50
Diastolic BP, *mmHg*	69.38	8.48	69.15	8.88	69.59	8.17
Body Mass Index, *kg/m²*	29.25	4.88	29.00	4.96	29.48	4.85
Cardiorespiratory Fitness, *METs*	7.38	2.14	7.49	2.15	7.28	2.15

Note. $CDN=Canadian dollars, STEMI=ST segment elevation myocardial infarction, NSTEMI=non-ST

segment elevation myocardial infarction, ACS=acute coronary syndrome, <u>BP = blood pressure</u>, CR=cardiac

rehabilitation, CESD-10=Center for Epidemiologic Studies 10-Item Depression Scale, HDL=high-density

lipoprotein, LDL=low-density lipoprotein, METs=metabolic equivalents.

Table 2

The Impact of a Brief Motivational Intervention on Primary and Secondary Outcomes

Dependent Variable	Intervention (n=47)	Control (n=49)	F	p	Partial η^2
	Estimated Marginal Means, M (*SE*)				
Intention (0-7 Scale)	6.74 (0.22)	5.69 (0.22)	11.07	.001	.110
Perceived Necessity (BACR)	21.72 (0.44)	20.41 (0.43)	4.54	.036	.048
Concerns about Exercise (BACR)	5.12 (0.37)	6.49 (0.37)	6.70	.011	.069
Practical Barriers (BACR)	5.26 (0.41)	5.50 (0.40)	0.17	.681	.002
Perceived Suitability (BACR)	3.05 (0.23)	3.20 (0.22)	0.20	.654	.002
Total CR Barriers (CRBS)	1.65 (0.08)	1.81 (0.08)	1.84	.178	.020
Exercise Self-Efficacy (MSES)	80.49 (1.74)	77.67 (1.71)	1.31	.256	.014
Illness Perception (BIPQ)	35.00 (1.75)	34.98 (1.71)	<0.01	.993	<.001
Social Support (ESSI)	27.23 (0.80)	27.12 (0.79)	0.01	.922	<.001
CR Adherence (# Sessions) [a]	18.15 (1.29)	13.12 (1.31)	7.31	.008	.089
	Enrolled in CR, n (%)		Wald χ^2	p	Adjusted OR (95% CI)
CR Enrollment	43 (91.5)	39 (79.6)	3.41	.065	3.69 (0.92, 14.77)

Note. BACR=Beliefs About Cardiac Rehabilitation Scale, CRBS=Cardiac Rehabilitation Barriers Scale, MSES=Multidimensional Self-Efficacy for Exercise Scale, BIPQ=Brief Illness Perception Questionnaire, ESSI=ENRICHD Social Support Inventory,

CR=cardiac rehabilitation, OR=odds ratio, CI=confidence interval. Adjusted for covariates (age, sex, CESD-10 score, and CR recommendation strength).

[a] n=81 (excluded 15 home-based program participants from analysis)

Table 3

Correlations between Actual CR Participation and Intention, Beliefs, Barriers, Exercise Self-Efficacy, Illness Perception, and Social Support

Motivational Variables	CR Participation	
	Enrollment[a] *(n=96)*	Adherence[b] *(n=81)*
Intention (0-7 Scale)	0.44***	0.51***
Perceived Necessity (BACR)	0.31**	0.33**
Concerns about Exercise (BACR)	-0.29**	-0.32**
Practical Barriers (BACR)	-0.28**	-0.38***
Perceived Suitability (BACR)	-0.11	-0.09
Total CR Barriers (CRBS)	-0.44***	-0.53***
Exercise Self-Efficacy (MSES)	0.37***	0.41***
Illness Perception (BIPQ)	0.10	0.19
Social Support (ESSI)	0.06	-0.01

*$p < .05$,** $p < .01$, ***$p < .001$

Note. BACR=Beliefs About Cardiac Rehabilitation Scale, CRBS=Cardiac Rehabilitation Barriers Scale, MSES=Multidimensional Self-Efficacy for Exercise Scale, BIPQ=Brief Illness Perception Questionnaire, ESSI=ENRICHD Social Support Inventory, CR=cardiac rehabilitation

[a]Values represent point-biserial correlation coefficients.

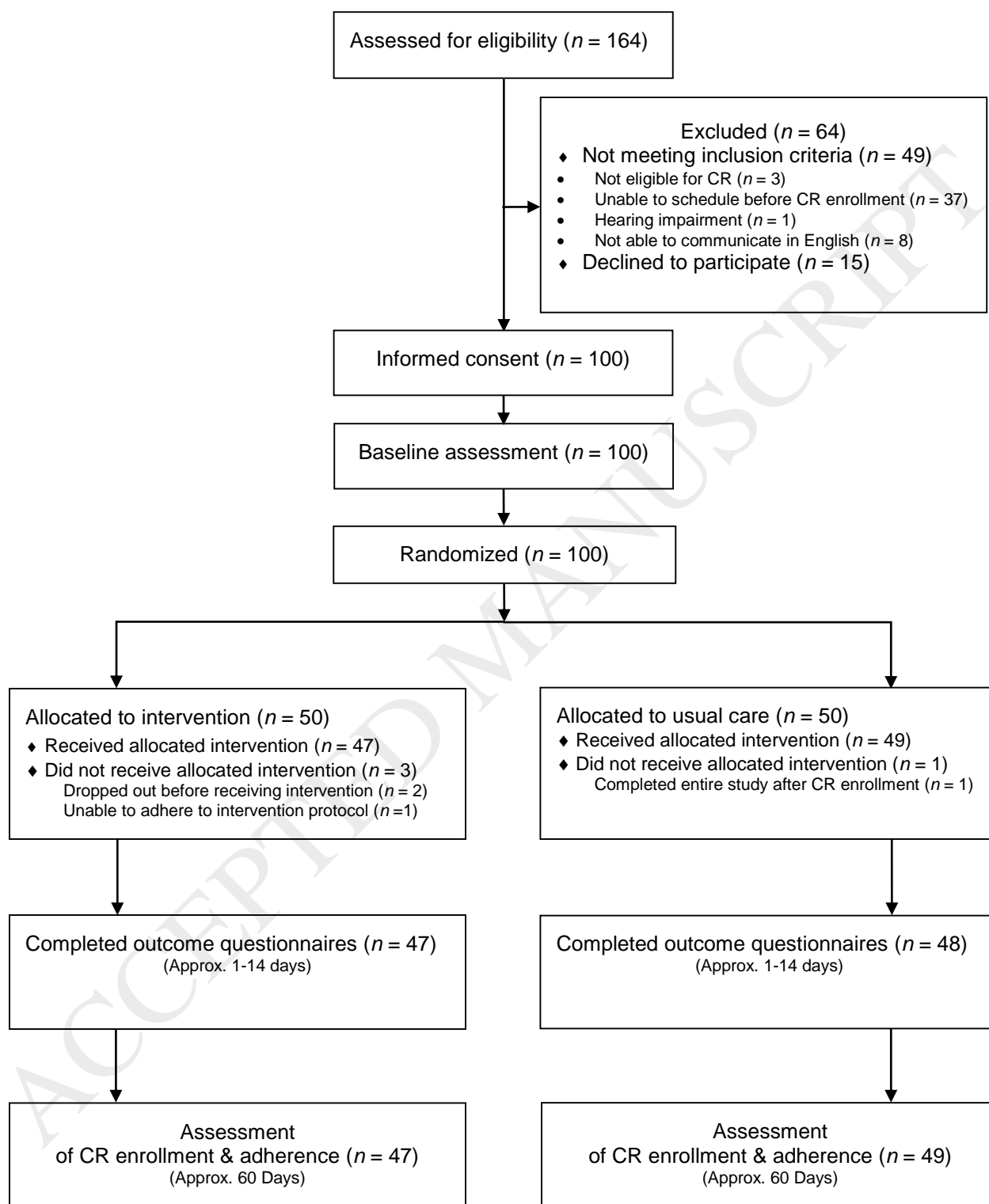[b]Excluded 15 home-based CR program participants from analysis.

Figure 1. CONSORT flowchart of UPBeAT-CR study design and recruitment results
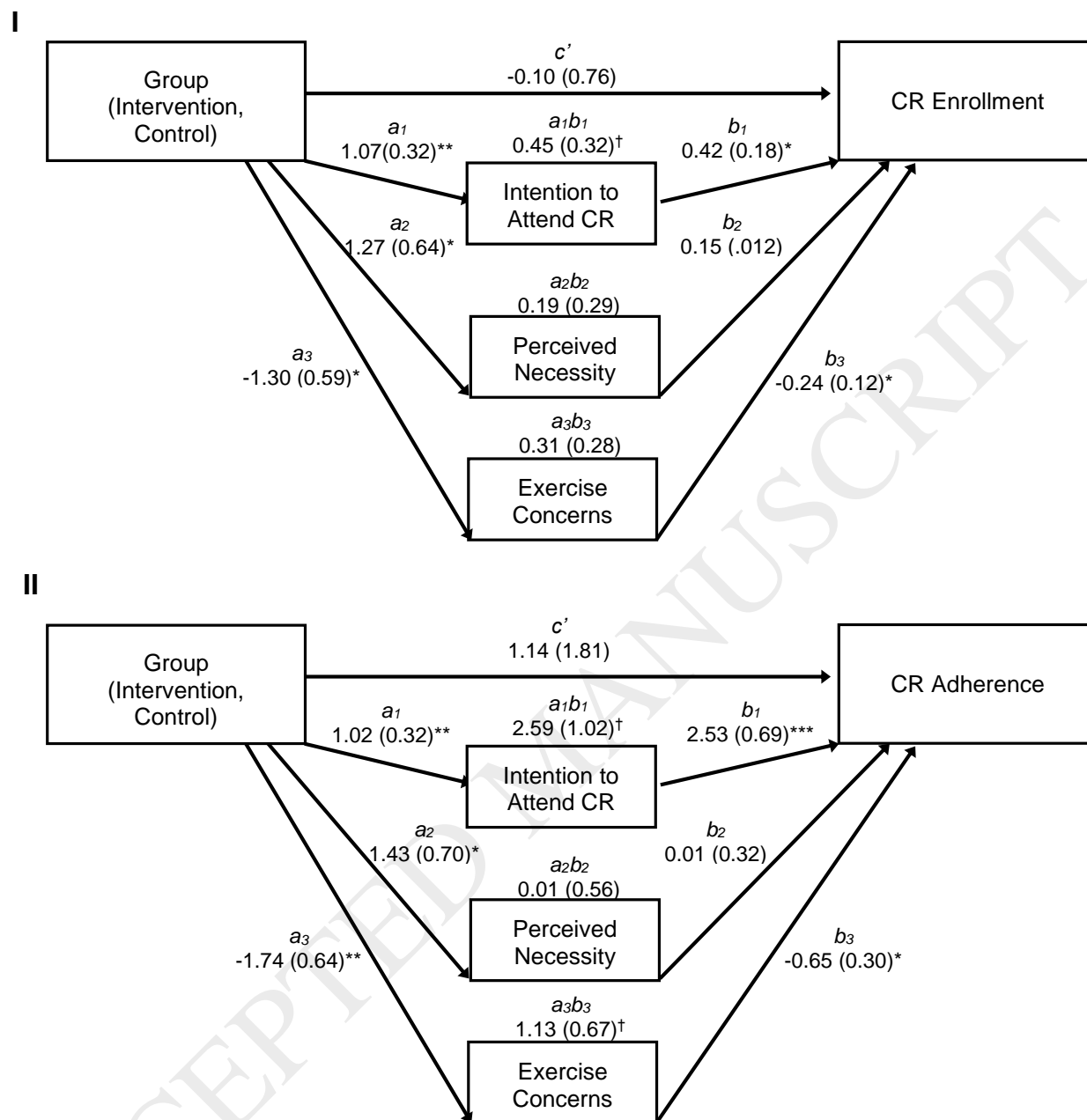
I

II

Figure 2. Results from mediation analysis. A brief motivational intervention showed an indirect effect on CR enrollment (Panel I; *n*=96) and CR adherence (Panel II; *n*=81) via intention to attend CR. Path values are unstandardized regression coefficients with *SE* in parentheses. Path *c'* represents the direct effect of the intervention on CR participation. Path a_1b_1 represents the indirect effect through intention to attend CR. Path a_2b_2 represents the indirect effect through perceived necessity. Path a_3b_3 represents the indirect effect through concerns about exercise. The addition of covariates (age, sex, CESD-10, strength of CR recommendation) did not change the strength/nature of the indirect effect on CR adherence via intention and exercise concerns; the indirect effect on CR enrollment via intention was no longer significant when covariates were added to the mediation model (not shown).

*p ≤ .05, **p < .01, ***p < .001
†Significant indirect effect (indicated by 95% confidence interval that does not contain zero).