2017

Design and Evaluation of a Brief Motivational Intervention to Promote Enrolment in Outpatient Cardiac Rehabilitation: A Mixed-Methods Feasibility Study

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Design and Evaluation of a Brief Motivational Intervention to Promote Enrolment in Outpatient Cardiac Rehabilitation: A Mixed-Methods Feasibility Study

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN CLINICAL PSYCHOLOGY
CALGARY, ALBERTA
MAY, 2017

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Abstract

Objective
Patients who are referred to exercise-based cardiac rehabilitation (CR) following an acute coronary syndrome (ACS) event stand to benefit from a range of positive CR-related outcomes, including reduced morbidity and mortality. Yet, only 19-34% of eligible patients participate in CR in the United States and Canada. Motivational interviewing could be useful for encouraging CR enrolment, but empirical support does not exist. Research that examines patients’ decision-making about CR enrolment is needed to inform effective motivational intervention in this context.

Methods
A two-part study was conducted to design and evaluate a brief motivational intervention to enhance intention to attend a 12-week CR program. Part 1 involved a qualitative examination of decision-making about CR enrolment using semi-structured interviews with ACS patients following CR referral but prior to enrolment (n = 14). A brief motivational intervention was subsequently designed to target obstacles to CR identified by patients in Part 1. Part 2 involved a two-group randomized controlled trial to examine preliminary efficacy and mechanisms of the intervention, using a usual care control group (n = 96). The primary outcome was intention to attend CR. Secondary outcomes included CR beliefs, CR barriers, self-efficacy, illness perception, social support, CR enrolment/adherence, and intervention acceptability.

Results
Thematic analysis of qualitative data in Part 1 suggested the intervention should aim to bolster anticipated benefits of CR; assist patients in overcoming concerns about exercise, transportation, finances, and scheduling; and address contextual variables such as emotional distress and
knowledge gaps. Randomization to the motivational intervention was associated with greater intention to attend CR ($p = .001$), greater perceived necessity of CR ($p = .036$), lower exercise concerns ($p = .011$), and higher CR adherence ($p = .008$), compared to usual care.

**Conclusions**

Results provide preliminary evidence for the efficacy of a brief motivational intervention to enhance intention to attend CR. Implementing strategies that enhance the perceived necessity of CR and reduce exercise concerns may help improve adherence to CR following an ACS event. This body of work will help optimize efforts to promote participation in an under-utilized, cost-effective program that significantly improves ACS outcomes.
Preface

While conducting research for this dissertation, the following three manuscripts have been prepared for publication (see Appendix A for written permissions from journal and co-authors). C. Rouleau did the majority of the writing and was the primary contributor to the research and all papers included in this thesis. All authors provided critical reviews of the manuscripts and contributed intellectual content.

Chapter 2 presents an accepted manuscript of an article published by Taylor & Francis in Disability and Rehabilitation on November 13, 2016:


Chapter 3 and Chapter 4 present manuscripts that were prepared to be submitted to a peer-reviewed journal:


Acknowledgements

This dissertation would not have been possible without the support I received from a full team of supervisors, colleagues, friends, and family. Foremost, Dr. Tavis Campbell has been an inspirational supervisor throughout my graduate training. He has modeled what it takes to be a conscientious clinical scientist and has coached me to be a thoughtful researcher and clinician.

To my supervisory committee and manuscript co-authors, your moral support, technical guidance, and intellectual contributions have been invaluable to the success of this project.

Thank you to Tamara Williamson, Meaghan Donihee, Camila Maturana Palacios, and Crystal Hare for your assistance with interview transcription and data management, and to Trina Hauer and the team at TotalCardiology Rehabilitation for your assistance with patient recruitment and seamlessly integrating this study into the clinic. Thank you to Dr. Jillian Johnson, Ena Vukatana, Kristin Horsley, and Kirsti Toivonen for reviewing manuscript drafts. I am also grateful for the funding I received to help conduct this research, including the Canadian Institutes of Health Research Doctoral Research Award and the Alberta Innovates Health Solutions Graduate Studentship. My sincere appreciation to the 114 individuals who participated in this research project cannot be understated. I thank these patients for taking the time to share their experiences and insights amidst an often distressing time in their lives. Finally, I would like to thank my husband, family, and close friends for endless patience, love, and encouragement.
To my grandfather, who tragically passed away while I was preparing this dissertation. He was a boxing coach for more than 50 years and advocated for physical exercise as a way to enrich the body and mind, a philosophy which represents the cornerstone of cardiac rehabilitation. I know he would be proud of this final product, and of the hard work it took to arrive here.

*Grandpa, you will be forever missed – this work is dedicated to you.*
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<tr>
<td>ACS</td>
<td>Acute Coronary Syndrome</td>
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<tr>
<td>ANCOVA</td>
<td>Analysis of Covariance</td>
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<td>BACR</td>
<td>Beliefs About Cardiac Rehabilitation Scales</td>
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<tr>
<td>BIPQ</td>
<td>Brief Illness Perception Questionnaire</td>
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<tr>
<td>CAD</td>
<td>Coronary Artery Disease</td>
</tr>
<tr>
<td>CESD-10</td>
<td>Center for Epidemiologic Studies Depression Scale 10</td>
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<tr>
<td>CI</td>
<td>Confidence Interval</td>
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<tr>
<td>CONSORT</td>
<td>Consolidated Standards of Reporting Trials</td>
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<tr>
<td>CR</td>
<td>Cardiac Rehabilitation</td>
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<td>CRBS</td>
<td>Cardiac Rehabilitation Barriers Scale</td>
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<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
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<tr>
<td>ENRICHDD</td>
<td>Enhancing Recovery in Coronary Heart Disease</td>
</tr>
<tr>
<td>ESSI</td>
<td>Enhancing Recovery in Coronary Heart Disease Social Support Inventory</td>
</tr>
<tr>
<td>HAPA</td>
<td>Health Action Process Approach</td>
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<tr>
<td>HR</td>
<td>Hazard Ratio</td>
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<tr>
<td>MCAR</td>
<td>Missing Completely At Random</td>
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<tr>
<td>MET</td>
<td>Metabolic Equivalent</td>
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<tr>
<td>MINT</td>
<td>Motivational Interviewing Network of Trainers</td>
</tr>
<tr>
<td>MSES</td>
<td>Multidimensional Self-Efficacy for Exercise Scale</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institutes of Health</td>
</tr>
<tr>
<td>OR</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>ORBIT</td>
<td>Obesity-Related Behavioural Intervention Trials</td>
</tr>
<tr>
<td>RATS</td>
<td>Relevance, Appropriateness, Transparency, Soundness</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomized Controlled Trial</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
<tr>
<td>TTM</td>
<td>Transtheoretical Model</td>
</tr>
<tr>
<td>UPBeAT-CR</td>
<td>Understanding and Promoting Health Behaviour Change Amid Transition to Cardiac Rehabilitation</td>
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CHAPTER ONE: Introduction
Prevalence and Burden of Cardiovascular Disease (CVD)

Cardiovascular disease (CVD), to which coronary artery disease (CAD) is a major contributor, represents the leading cause of global mortality (World Health Organization, 2016). CVD is also responsible for 25% of all Canadian deaths and 22 billion dollars in annual healthcare costs (Public Health Agency of Canada, 2009; Statistics Canada, 2015). Acute coronary syndrome (ACS; which includes myocardial infarction and unstable angina) is a common manifestation of CAD and accounts for half of CVD mortality (Kolansky, 2009; Overbaugh, 2009). Approximately 3-13% of ACS patients die while hospitalized and 12-27% die within 10 months following the index event (Nikus et al., 2007; Wang et al., 2015). Over the past 60 years, advances in the medical management of ACS through coronary care units, cardiac catheterization, percutaneous coronary intervention, and pharmacological therapies have led to significant increases in survival from the event (Botkin et al., 2006; Fitchett et al., 2011b; Kolansky, 2009; Koneru, Weathers, & Lesch, 2008; Smolina, Wright, Rayner, & Goldacre, 2012). In-hospital mortality following acute myocardial infarction was reduced by 23% in the 16-year period from 1990 and 2006 alone (in the United States; Arora, Brindis, & Cannon, 2011). Nonetheless, a growing number of patients are surviving initial ACS but remain at risk for premature mortality, recurrent cardiac events, and reduced quality of life (Smolina et al., 2012).

Risk factors for the development of and adverse outcome from CAD are well-established. For instance, data from the INTERHEART case-control study, conducted with nearly 30,000 adults across 52 countries, demonstrated that more than 90% of initial myocardial infarction risk is attributable to nine modifiable factors including abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, low consumption of fruits and vegetables, alcohol use, and inadequate physical activity (Yusuf et al., 2004). In patients with existing CAD,
risk factors such as smoking, abnormal lipids, and depression are also implicated in adverse outcomes including recurrent cardiac events, in-hospital mortality, and short-term complications (Juárez-Herrera & Jerjes-Sánchez, 2013; Wang et al., 2015; Zengin et al., 2015). Modifying risk factors following an ACS event is therefore a critical treatment objective (Fitchett et al., 2011a; Fitchett et al., 2011b).

Despite its importance, risk factor modification represents a challenge to patients who might be struggling to manage complex behaviour change regimes, persistent physical symptoms, and the psychosocial impact of surviving a potentially life-threatening cardiac event. Poor adherence to risk reduction behaviours is commonplace in ACS patients (Kotseva et al., 2016; Tang, Patao, Chuang, & Wong, 2013; Wang et al., 2015). A multi-site Canadian health registry review demonstrated that 85% of patients hospitalized for ACS ($n = 13,686$) had at least one modifiable CAD risk factor including smoking, diabetes, hypertension, or dyslipidemia (Wang et al., 2015). In the United States, data from 759 CAD patients in the National Health and Nutrition Examination Survey showed that a small proportion of them meet minimal targets for physical activity (17%), sodium intake (7%), weight management (21%), and adherence to cardioprotective medications (24%). Importantly, only 14% reported meeting all four goals of not smoking, and of having normotensive blood pressure, optimal lipids, and desirable levels of glycated hemoglobin (Tang et al., 2013). The high prevalence of CAD, paired with the modifiability of its risk factors, underlines the importance of assisting patients with health behaviour change in the months and years following a cardiac event.

**Cardiac Rehabilitation (CR)**

CR is an empirically supported treatment program to address risk factors and disease burden associated with CVD, and CAD in particular (Oldridge, 2012). According to the
Canadian Association of Cardiovascular Prevention and Rehabilitation, CR is defined as “the enhancement and maintenance of cardiovascular health through individualized programs designed to optimize physical, psychological, social, vocational, and emotional status...[and] risk factor identification and modification in an effort to prevent disease progression and the recurrence of cardiac events” (Stone, 2009, p. 1). CR programs utilize a multidisciplinary healthcare team to offer a combination of structured exercise classes, medical assessments, medication management, as well as support with broad-based lifestyle change such as smoking cessation, nutritional counseling, and stress management (Ades et al., 2017; Grace, Bennett, Ardern, & Clark, 2014; Stone, 2009). Although CR is available to a wide variety of CVD patients including those with chronic stable heart failure, and/or after coronary artery bypass graft surgery, heart valve surgery, cardiac transplant, and ventricular assist device implantation, it is most often known for and accessed by CAD patients following an ACS event (Grace et al., 2011; Stone, 2009). CR is commonly referred to as a secondary prevention program (Grace, Turk-Adawi, Pio, & Alter, 2016; Piepoli et al., 2010), though it functions along the secondary-tertiary prevention continuum by managing risk factors in CAD patients with early disease as well as mitigating recurrent cardiac events and disability in patients with advanced disease.

Benefits of CR

Tremendous evidence has accumulated from randomized controlled trials (RCTs) and controlled cohort studies to demonstrate the efficacy of both center- and home-based CR for reducing morbidity and improving survival in patients with ACS (Buckingham et al., 2016; Dalal, Zawada, Jolly, Moxham, & Taylor, 2010; Oldridge, 2012; Rauch et al., 2016). CR is also cost-effective, with recent data from nearly 13,000 cardiac patients in Ontario showing a dose-response relationship between higher CR participation and lower healthcare utilization
expenditures (Alter, Yu, Bajaj, & Oh, 2017). In light of the clinical and cost-effectiveness of CR, there is consensus among major health organizations that CR is an essential component in the continuum of CAD care (Ades et al., 2017; Balady et al., 2011; Grace et al., 2013; National Institute for Health and Care Excellence, 2013; Piepoli et al., 2010; Smith et al., 2011). CR has Class I evidence indicating that it is recommended, useful, and effective in improving ACS outcomes, according to the American Heart Association and the American College of Cardiology (Smith et al., 2011). The International Charter of Cardiovascular Prevention and Rehabilitation, which was prepared by leading experts and CVD agencies from around the world, recently endorsed CR as the “only proven model that significantly and substantially reduces the mortality and morbidity…associated with CVD,” and “an essential, not optional, service” that should be offered to all patients with diagnosed CVD (Grace et al., 2013, pp. 129-130). The specific health benefits of CR are described further below.

**Mortality reduction.** The positive impact of CR on premature mortality has been consistently demonstrated (Anderson et al., 2016; Lawler, Filion, & Eisenberg, 2011). Early meta-analyses revealed mortality reductions ranging from 20-25% in CAD patients who attended CR (O’Connor et al., 1989; Oldridge, Guyatt, Fischer, & Rimm, 1988). More recently, a Cochrane Review by Anderson and colleagues (2016) summarized 63 RCTs that compared CR to no-exercise usual care in patients with myocardial infarction, angina, CAD and/or following revascularization. These data demonstrated a 26% reduction in cardiovascular mortality at 12-month follow-up (relative risk 0.74, 95% CI 0.64-0.86; Anderson et al., 2016). To examine CR in the context of evolving medical treatments, Rauch and colleagues (2016) reviewed studies conducted only after 1995, when highly effective therapies including statin use and revascularization became commonplace. ACS patients who completed CR had approximately
one-third [hazard ratio (HR) 0.37, 95% CI 0.54-0.70] the risk of dying compared to usual care patients at 40-month follow-up (Rauch et al., 2016). Therefore, CR continues to remain a crucial strategy to improve outcomes following ACS.

Reduced recurrence. CR has also been demonstrated to favourably impact various indices of ACS recurrence including re-infarction and re-hospitalizations (Anderson et al., 2016; Oldridge, 2012). In meta-analyses, CR has been shown to reduce recurrent myocardial infarction by 17-47% (Clark, Hartling, Vandermeer, & McAlister, 2005; Lawler et al., 2011). Another Cochrane Review by Heran and colleagues (2011) reported evidence of reduced hospitalizations following CR among CAD patients when assessed at less than 12-month follow-up (relative risk 0.69, 95% CI 0.51-0.93), but no effect when assessed at 12-months or later. While heterogeneity in follow-up periods, in measurement of recurrence, in sample characteristics, in promptness of CAD treatment, and in CR program content may account for varied results across studies (Lawler et al., 2011; Oldridge, 2012), there is mounting evidence that CR is associated with reductions in recurrent ACS events.

Improved cardiorespiratory fitness. Cardiorespiratory fitness reflects the body’s ability to transport and use oxygen during physical activity, and is typically measured using maximal work capacity or oxygen uptake during an exercise test (Lee, Artero, Sui, & Blair, 2010). Lower cardiorespiratory fitness is an independent predictor of all-cause and CAD mortality in a variety of community and clinical populations (Kavanagh et al., 2002; Kavanagh et al., 2003; Lee et al., 2010; Martin et al., 2013). On average, CR is associated with a 1.55 metabolic equivalent (MET) increase in cardiorespiratory fitness, according to a meta-analysis of 31 studies (Sandercock, Hurtado, & Cardoso, 2013). Improvement in cardiorespiratory fitness during CR is associated with lower chances of death, with each one-MET increase during a 12-week CR program
corresponding to a 13% reduction in overall mortality (Martin et al., 2013). As such, improvements in cardiorespiratory fitness via exercise training represent a primary mechanism through which CR confers its health benefits (Sandercock et al., 2013).

**Risk factor management.** Patients who complete CR also show reductions in modifiable CAD risk factors including smoking, blood lipids, and blood pressure (Dalal et al., 2010; Lawler et al., 2011; Oldridge, 2012). Across CR programs with varying content and duration, program participation is associated with 13-23% reductions in smoking rates, 0.12-0.37 mmol/L decreases in total cholesterol, 0.23 mmol/L decreases in triglycerides, and 3-5 mmHg reductions in systolic blood pressure (Oldridge, 2012). These improvements are consistent with the focus on aggressive risk factor reduction in CR. It remains unclear to what extent risk reduction effects are attributable to exercise training relative to other CR program components, such as tobacco cessation, nutritional counseling, and medication management. Regardless, roughly half of the mortality benefit from CR is attributable to reductions in CAD risk factors (Taylor, Unal, Critchley, & Capewell, 2006).

**Psychosocial benefits.** Patients are faced with a range of psychosocial issues including concerns about their course of illness, adjustment to physical limitations, changing interpersonal relationships, return-to-work, difficulty making lifestyle changes, and financial constraints following an ACS event (Stewart, Davidson, Meade, Hirth, & Makrides, 2000). Further, various forms of psychological distress such as depressed mood, hostility, and social isolation, are associated with having a worse prognosis from ACS (Albus, 2010; Gallagher, Parenti, & Doyle, 2015). Given the relevance of psychosocial factors to this population, CR programs generally incorporate stress management training or other types of psychological counseling, which have favourable effects on mood and perceived stress (Campbell et al., 2012; Klainin-Yobas, Ng,
Stephen, & Lau, 2016). Though improvements in psychological distress appear to be enhanced by the addition of formal stress management programming, CR exercise training on its own is associated with improved depressive symptoms, anxiety, hostility, and health-related quality of life (Anderson et al., 2016; Lavie, Menezes, De Schutter, Milani, & Blumenthal, 2016; Oldridge, 2012). Taken together, these data suggest patients can expect to receive both cardiovascular and psychosocial benefits from CR participation.

**The Problem of Low CR Enrolment**

There is compelling evidence that participation in CR is associated with significant improvements in prognosis, cardiorespiratory fitness, CAD risk factors, and psychosocial outcomes. Despite the importance of CR for secondary and tertiary prevention, CR programs are commonly underutilized by CAD patients in Canada (Grace, Turk-Adawi, Pio, & Alter, 2016) and in other countries (Goto, 2014; Humphrey, Guazzi, & Niebauer, 2014; Menezes et al., 2014). In Canada, there is one CR program per 7,779 eligible patients, whereas only 478 patients are treated at the average CR program per year, indicating potential under-supply and/or under-use of services (Grace et al., 2016; Polyzotis et al., 2012). Importantly, only a fraction of eligible patients participate in CR, with estimates ranging from 34% in Canada (Grace et al., 2014), 19-34% in the United States (Ades et al., 2017; Menezes et al., 2014) and 35-59% in the United Kingdom (British Heart Foundation, 2016). This widespread under-utilization is problematic because health benefits can only be reaped if patients are able and willing to access CR services. This notion was well-characterized by the American Heart Association in a presidential advisory statement noting that: “the remarkably wide treatment gap between scientific evidence of the benefits of CR and clinical implementation of rehabilitation programs is unacceptable” (Balady et al., 2011, p. 2952).
CR under-utilization can be explained by three interrelated, but distinct, components that exist along the cardiac care trajectory: lack of referral, non-enrolment, and low adherence after enrolment (Ades et al., 2017). *Referral* is defined as the “official communication between the healthcare provider [typically the in-hospital physician], the CR program, and the patient that recommends timely assessment and participation in an outpatient program” (Grace et al., 2011, p. E2). A physician referral is made around the time of hospital discharge for patients with a qualifying diagnosis (Balady et al., 2011), and is generally required for admission to CR (Oldridge, 2012). Referral typically involves recommending CR to the patient, sending patient medical information to the CR program, and ensuring coordination of care with the primary care provider (Grace et al., 2011). *Enrolment* is defined as attending at least one CR session following referral (Ades et al., 2017; Karmali et al., 2014). *Adherence* refers to how well a patient follows CR recommendations after enrolment, and is generally measured as the number of CR exercise sessions attended (Karmali et al., 2014; Oosenbrug et al., 2016). Problems at any point along these three phases can limit the magnitude of benefit patients receive from CR.

Non-enrolment after referral warrants particular concern given that eligible patients could presumably make significant treatment gains from CR. Patients who complete CR have fewer re-hospitalizations (HR 0.75, 95% CI 0.69-0.81) and lower mortality (HR 0.58, 95% CI 0.48-0.70) compared to those who were referred but never enrolled (Martin et al., 2012). Early enrolment in CR, usually defined as attending a first visit within 10 to 60 days following an ACS event, is known to predict higher attendance at scheduled CR sessions, reduced incidence of unplanned cardiac re-admissions, and greater improvements in METs and depressive symptoms during CR (Kehler et al., 2017; National Institute for Health and Care Excellence, 2013). Estimates from the United States suggest that increasing CR participation by 50% would prevent 25,000 deaths and
180,000 hospitalizations annually (Ades et al., 2017). Enrollment, therefore, represents a precondition to ongoing CR adherence and its health-related benefits.

Given that referral is a prerequisite to CR participation, it is useful to consider how many patients enroll in CR if they have received a referral. CR referral rates average 52% in Ontario, 39% in Alberta, 56% in the United States, and 82% in the United Kingdom (Grace et al., 2016), suggesting that a significant number of eligible patients do not know about CR and/or are not given the opportunity to enroll. Even with a CR referral, however, a significant subset of patients (14-81%) do not enroll according to data from Canada, the United States, and the United Kingdom (Gravely-Witte et al., 2010). Relatively higher rates of enrollment are observed when referral is automatized and involves a bedside conversation about CR, written materials about the program, and/or a common stance among healthcare providers that CR is part of cardiac care (Gravely-Witte et al., 2010; Higgins et al., 2008; Mueller, Savage, Schneider, Howland, & Ades, 2009; Weingarten, Salz, Thomas, & Squires, 2011). These data suggest that, while lack of referral contributes to low CR enrollment, it is also important to support patients who are referred but not yet enrolled during their transition to outpatient CR (Balady et al., 2011).

Factors Associated with CR Enrollment

Efforts have been made to elucidate variables that predict CR enrollment and ongoing CR adherence. Research in this area typically compares CR participators to non-participators using national audits of CR programs (Beswick et al., 2004; British Heart Foundation, 2016) and cross-sectional or prospective research designs (Cooper, Jackson, Weinman, & Horne, 2002; Jackson et al., 2005; Turk-Adawi, Oldridge, Tarima, Stason, & Shepard, 2014). This growing body of research has characterized a variety of healthcare- and patient-level variables associated with lower CR participation.
Healthcare-level variables can serve as a barrier to CR. Receiving a referral and recommendation to attend CR from a physician represents the most robust predictor of CR enrolment across a variety of studies (Cooper et al., 2002; Ghisi, Polyzotis, Oh, Pakosh, & Grace, 2013; Grace et al., 2008; Grace et al., 2011; Jackson et al., 2005). Inconsistent messages about CR from healthcare providers, such as being told that CR is not necessary or not suitable, may discourage patients from participating (Gallagher et al., 2015). Lower CR enrolment is also associated with inadequate insurance coverage (Jackson et al., 2005), with lack of cardiac specialist involvement while hospitalized (Ghisi et al., 2013), and with CR program characteristics such as poor transportation access, inflexible hours of operation, and longer wait times (Balady et al., 2011; Collins, Suskin, Aggarwal, & Grace, 2015). Further, a recent multi-site study of nearly 7,000 patients who had received a referral to CR showed an increased likelihood of enrolment if the CR program engaged in promotional activities (OR 2.35, 95% CI 1.39-4.00), was certified by the American Association of Cardiovascular Pulmonary Rehabilitation (OR 2.63, 95% CI 1.32-5.35), and was located in a rural setting, presumably because access was improved (OR 3.30, 95% CI 2.35-4.64; Turk-Adawi et al., 2014).

Characteristics of CR programs, providers, and broader healthcare systems, form a context that helps determine whether patients are able and willing to access CR services.

The patient-level variables most consistently associated with lower CR enrolment and adherence include female sex, older age, and depressed mood (Oosenbrug et al., 2016; Ruano-Ravina et al., 2016). Women comprise only 20% of CR patients and attend an average of four fewer CR sessions than men, despite more women than men dying from CAD (Coulter, 2011; Daly et al., 2002; Mieszczanska & Velarde, 2014; Oosenbrug et al., 2016). Women with CAD tend to be older, more social isolated, and have higher psychological distress and lower
socioeconomic status than their male counterparts (Hurley et al., 2017; Leening et al., 2014; Mieszczanska & Velarde, 2014), which may influence CR accessibility. Also, a documented history of clinical depression is associated with a 44% (95% CI 0.36-0.88) lower likelihood of CR enrolment among referred patients (Turk-Adawi et al., 2014). Other socio-demographic and medical factors that have been linked with CR under-utilization include lower socioeconomic status, comorbidities, cigarette use, and living alone (Gaalema, Cutler, Higgins, & Ades, 2015; Grace et al., 2008; Jackson et al., 2005; Ruano-Ravina et al., 2016). These results are disconcerting given the ability of CR to alleviate many of the modifiable patient factors discussed here (Lavie et al., 2016; Oldridge, 2012).

Research pertaining to patient-related predictors of CR participation highlight important patients who are at risk for non-enrolment or low program adherence. Findings also indicate CR program characteristics that may deter enrolment. However, these data provide little information about how patients’ perceptions, ideas, and experiences influence their initial decisions about CR participation. For example, little is known about how being depressed, being a woman, or receiving an inadequate physician recommendation might impact one’s choice to enroll or not enroll in CR. Also, research on predictors of CR utilization does not consistently report whether underrepresented patient groups were actually referred to CR and, therefore, may not have been given the opportunity to attend a CR program (Ruano-Ravina et al., 2016).

Qualitative studies have provided rich, patient-centered data on decision-making and views about CR participation using interview-based and focus group methodologies (Campkin, Boyd, & Campbell, 2016; Clark et al., 2012; Neubeck et al., 2011). A review by Neubeck and colleagues (2011) identified patient-reported reasons for low CR participation that emerged across 34 qualitative studies. These included system and service barriers, such as lack of
physician recommendation, poor provider communication (e.g., too coercive or didactic), and the emphasis on exercise in CR; \textit{emotions surrounding diagnosis} such as shock, disbelief, frustration, and denial; \textit{physical barriers} related to transportation, parking, and scheduling; \textit{personal barriers} such as patients being embarrassed about group exercise or believing CAD is uncontrollable; and \textit{cultural, linguistic, and gender barriers} such as women tending to prefer emotional over practical support and some minority participants feeling that CR is incompatible with religious or cultural customs. A similar pattern of patient-reported CR barriers has been documented in more recent systematic reviews (Campkin et al., 2016; Clark et al., 2012). Information gathered through qualitative research suggests patients’ reasons for and against CR are multifaceted, and provides insight into how to best support patients at this phase in their recovery.

Most qualitative research in this area has explored patient perceptions about CR in patients who have \textit{already attended} a CR program (e.g., Alavi, Irajpour, Giles, Rabiei, & Sarrafzadegan, 2013; Day & Batten, 2006; Dolansky, Moore, & Visovsky, 2006; Bronwyn Everett, DiGiacomo, Rolley, Salamonson, & Davidson, 2011; Herber, Smith, White, & Jones, 2017). Although useful for examining CR adherence, these findings may not fully characterize reasons for CR enrolment per se, and may ignore the possibility that CR initiation is influenced by different factors than ongoing program attendance. In studies that explicitly evaluate views about \textit{starting} a CR program, patients tend to be interviewed months or years after they have already completed, or chose not to complete, CR (Chauhan, Baker, Lester, & Edwards, 2010; Clark, Barbour, White, & MacIntyre, 2004; Cooper, Jackson, Weinman, & Horne, 2005; Hird, Upton, & Chesson, 2004; Jones, Farrell, Jamieson, & Dorsch, 2003; Pullen, Povey, & Grogen, 2009; Wyer, Earll, Joseph, & Harrison, 2001). Literature in this area would be enhanced if
patients’ experiences were sampled close in time to their actual decision-making, following a confirmed CR referral and prior to initiating a CR program.

**Strategies to Increase CR Enrolment**

Based on the research reviewed above, it appears that both healthcare- and patient-level factors influence CR enrolment. As such, existing strategies to promote enrolment have targeted both levels by altering cardiac care delivery and/or by altering patient perceptions of CR. There are at least 10 RCTs to date that have tested interventions to specifically increase CR enrolment, either as a primary or secondary outcome (Karmali et al., 2014). Relevant studies are detailed below.

**Changes to Healthcare Delivery**

There is accumulating evidence that modifying the delivery of ACS care, both at the time of CR referral and following hospital discharge, may increase the likelihood of CR enrolment. These healthcare-oriented changes include giving patients CR invitation letters alongside the referral, promptly scheduling the initial CR appointment, and modifying CR program content/format. For example, written invitations that provide information about CR are associated with 10-27% increases in program enrolment relative to usual care (Mosleh, Bond, Lee, Kiger, & Campbell, 2014; Wyer, Earll, Joseph, Harrison, et al., 2001). Mosleh and colleagues (2009, 2014) administered an invitation letter designed to highlight norms about CR (e.g., “your consultant and health team have recommended that you undergo...CR”), enhance perceived controllability (“...work together to tailor the programme to meet your individual needs”), increase perceived consequences of CAD (“...many patients still have episodes of chest pain...”), and improve attitudes about CR (“...people who attend CR are more physically fit...”). Receiving the invitation letter was associated with higher attendance to at least one CR
appointment (84%) compared to usual care (74%). The significant effect on enrolment was observed despite the relatively high usual care enrolment in this CR program (Mosleh et al., 2014). Delivery of written materials about CR programs to newly referred patients appears to be a low cost way of bolstering enrolment.

Early access to CR also appears to be an important predictor of subsequent program utilization. Pack and colleagues (2013) randomized patients to receive a CR orientation appointment within 10 days of hospital discharge or within 35 days of hospital discharge (standard care). Among 148 ACS patients, 77% of those with the earlier scheduled appointment versus 59% of controls attended the CR orientation, though there was no significant effect on enrolment in the CR exercise program, on number of CR exercise sessions attended, or on CR program completion. A Calgary-based study by Parker and colleagues (2011) evaluated whether pre-scheduling a CR orientation appointment within 14 days of hospital discharge would increase CR participation. In ACS patients who had received a CR referral, the early orientation appointment was associated with increased attendance at the orientation appointment (96% vs. 37%), increased CR enrolment (88% vs. 60%), and increased CR completion (71% vs. 54%), compared to a historical comparison group. These findings underline the importance of continuity of cardiac care, though more work is needed to optimize enrolment after patients receive an orientation to what CR entails.

In addition to ensuring early access, changing the content and nature of CR programming may also increase enrolment rates. Dolansky, Zullo, Boxer, and Moore (2011) demonstrated the efficacy of a family-based “intermediate” rehabilitation program held post-acute care, but prior to formal CR. It consisted of two 30-minute educational sessions on exercise, symptom management, and communication strategies, plus a low-intensity walking regimen. One-third of
patients who attended the intermediate program reported enrolment into the main CR exercise program at six weeks post-hospital discharge, compared to only 12% of usual care participants. In another intervention, Varnfield and colleagues (2014) demonstrated that post-ACS patients randomized to receive smartphone-based home service delivery of CR showed significantly higher enrolment (80%) compared to those in traditional center-based CR (62%). Women-only CR programming has also shown promise for increasing number of exercise sessions attended, relative to traditional CR, in a recent RCT; however, the effect on CR enrolment was not specifically evaluated (Beckie & Beckstead, 2010). When possible, offering CR in a variety of convenient formats with pre-CR educational programming, technological enhancements, and gender-specific options may attract eligible patients who otherwise would not enroll.

Overall, these results are consistent with position papers from the Million Hearts CR Collaborative (Ades et al., 2017) and the American Heart Association (Balady et al., 2011) which indicate that efforts to increase CR enrolment should incorporate various healthcare-level approaches including automatic referrals, home-based CR, flexible operational hours, and prompt scheduling of the first CR appointment. However, many healthcare-level strategies, such as automatic referrals, written information about CR, continuity of care, pre-CR educational sessions, and home-based rehabilitation options are now commonplace at some CR settings. Yet, broad system-level interventions still leave a subset of patients who do not enroll in CR. It could be that these interventions are not being adequately tailored to the wide variety of unique reasons why individual patients do not enroll in CR.

**Individual Liaison Support**

Providing patients with one-on-one support amid their transition to outpatient care may complement system-level efforts to promote CR enrolment. This individual-focused support,
often referred to as a *liaison* support, generally involves a conversation about CR, its benefits, and assistance with coordinating the enrolment process (Grace et al., 2011). Liaison support has been delivered by peer mentors, who are typically former CR patients. In one peer-based liaison intervention, for example, a peer mentor provided information about the benefits and practical aspects of accessing CR during a hospital visit, by phone one week post-discharge, and by mail (Scott, Gravely, Sexton, Brzostek, & Brown, 2013). Randomization to the intervention was associated with higher CR enrolment (23.6%) compared to usual care (6.7%). Similar peer-based interventions involving in-hospital and post-discharge education and encouragement to attend CR have not led to significant increases in CR enrolment (Ali-Faisal, Benz Scott, Johnston, & Grace, 2016; Parry et al., 2009). The utility of peer support to promote CR enrolment remains equivocal due to small sample sizes and differences in intervention design, referral practices, and definitions of enrolment across studies.

Individual liaison support aiming to promote CR enrolment has also been delivered by allied healthcare providers (e.g., nurses, occupational therapists, social workers) in at least six RCTs (Cossette, Frasure-Smith, Dupuis, Juneau, & Guertin, 2012; Hillebrand, Frodermann, Lehr, & Wirth, 1995; Jolly, Bradley, Sharp, Smith, & Mant, 1998; McPaul, 2007; Price, 2012) including one RCT that combined healthcare provider- and peer-delivered support (Carroll, Rankin, & Cooper, 2007). The nature and duration of patient contact have been highly variable across studies. Interventions have included phone calls and/or face-to-face visits, delivered in-hospital and after discharge. Intervention content has included the provision of information about CR, medication, physical activity, and lifestyle; assistance with managing physical symptoms and overcoming CR barriers; as well as advice on communicating with healthcare providers and setting behaviour change goals. These professionally led liaison interventions have been
associated with enrolment rate increases between 12% to 30% (Carroll et al., 2007; Cossette et al., 2012; Hillebrand et al., 1995; Jolly et al., 1998; Price, 2012). Also, face-to-face liaison support from a healthcare provider has been demonstrated to be superior to written and phone-based modalities for increasing CR enrolment (Cebrick-Grossman, 2015). These findings point to the importance of in-person support to patients who are deciding whether to attend CR programs after referral. Given the multi-component nature of most liaison studies, however, more work is needed to define crucial intervention elements.

**Summary and Limitations**

In light of the expanding literature described above, review papers have been published that summarize findings from intervention studies focused on increasing CR enrolment (Beswick et al., 2005; Davies et al., 2010; Dressler, Pattenden, Atkin, & Lewin, 2012; Grace et al., 2011; Gravely-Witte et al., 2010; Karmali et al., 2014). Most recently, a Cochrane Review by Karmali and colleagues (2014) reported that eight of 10 RCTs testing various healthcare- and patient-focused strategies to increase CR uptake (variably defined) showed favourable effects. Karmali and colleagues concluded that evidence is currently weak for the effectiveness of interventions to increase CR uptake, but that promising approaches include healthcare provider-led liaison contacts, motivational letters, prompt CR appointments after hospital discharge, gender-tailored CR, and intermediary programming before starting CR. Similarly, Dressler and colleagues (2012) reported in their systematic review that there is promising support for professionally led liaison interventions to increase CR enrolment but, “due to multiple variables impacting on uptake, firm conclusions cannot be drawn” (p. 344).

Tentative conclusions about the efficacy of existing motivational interventions are largely due to methodological issues. A key limitation in extant literature is that “interventions rarely
targeted barriers to uptake and adherence frequently cited by patients” (Karmali et al., 2014, p. 14). Healthcare system-based interventions, such as early CR orientation appointments or gender-tailored programs, fail to address common barriers to CR attendance such as transportation issues, functional limitations, and employment responsibilities (Shanmugasegaram et al., 2012). Although one-on-one interventions may help address this issue by allowing conversation about each patient’s unique CR barriers, it appears most interventions to date have relied on encouraging patients to attend CR using information and advice. This didactic approach ignores each patient’s level of intention change and, as such, may be perceived as coercive and inadvertently deter CR participation (Hancock, Davidson, Daly, Webber, & Chang, 2005; Neubeck et al., 2011). In order to optimally target patients’ motivational readiness for CR, there is a need for research to clarify the barriers specific to CR enrolment, to strategically target these barriers using well-defined interventions, and to examine whether interventions are actually “creating a signal” on putative motivational end-points such as intentions, barriers, and beliefs about CR.

In addition, existing studies have included incomplete details on randomization and intervention fidelity, heterogeneous and multi-component interventions, reliance on self-report measures of CR participation, and inconsistent reporting of whether patients had actually been referred to CR (Dressler et al., 2012; Karmali et al., 2014). Large variation in what constitutes usual care, including CR referral practices and baseline rates of CR enrolment, may also affect intervention efficacy and generalizability across settings (Dressler et al., 2012). The poorly described and multi-component nature of some interventions also precludes an understanding of how or why these interventions might operate (Karmali et al., 2014). In the few studies that explicitly state the “motivational target(s)” of the intervention, such as self-efficacy (Mosleh et
al., 2014), attitudes about CR (Wyer, Earll, Joseph, Harrison, et al., 2001), and social support (Carroll et al., 2007; Parry et al., 2009), those targets are not routinely measured as trial outcomes. More early-phase, pre-efficacy research is needed to characterize and evaluate specific, single, well-defined interventions in the context of CR enrolment after referral.

A Novel Framework for Promoting CR Enrolment

In order to build upon existing efforts to increase CR enrolment, a conceptual framework should incorporate considerations regarding patients’ level of intention to attend CR, providers’ use of motivational interviewing, and a phased approach to behavioural intervention development. Each of these elements is described below.

Stage-Based Models of Behaviour Change

It is plausible that interventions to promote CR enrolment would be improved by tailoring content to individuals’ level of intention to change. Stage models of behaviour change, including the Transtheoretical Model (TTM; Prochaska & Velicer, 1997) and the Health Action Process Approach (HAPA; Lippke, Ziegelmann, & Schwarzer, 2005; Schwarzer, Lippke, & Luszczynska, 2011; see Figure B.1), offer a useful framework to guide such efforts. These models posit that individuals attempting behaviour change progress through at least three stages: pre-intention (not yet decided to act; corresponds to pre-contemplation and contemplation stages in TTM), intention (decided but not yet started to act according to intentions; corresponds to preparation stage in TTM), and action (behaving according to one’s intentions; corresponds to action and maintenance stages in TTM; Schüz, Sniehotta, Mallach, Wiedemann, & Schwarzer, 2009). Both the TTM and HAPA acknowledge two transitions that are required for behaviour change including (a) a transition from pre-intention to intention that corresponds to forming a behavioural objective, and (2) a transition from intention to action that corresponds to initiating
the intended behaviour (Schüz et al., 2009; Schwarzer et al., 2011). On a conceptual level, there is evidence that these stages of change (particularly pre-intention and intention stages) actually represent a continuous construct of intention rather than discrete categories (Courneya, Plotnikoff, Hotz, & Birkett, 2001; De Vet, De Nooijer, De Vries, & Brug, 2007). The implication is that CR enrolment requires forward movement in patients’ intention to attend CR plus an ability to follow through on “good intentions” after patients decide to attend CR.

There is emerging evidence that stage-based frameworks may be well-suited to understanding and motivating exercise adoption, including CR participation (Devereaux, Pauly, Fietek, Bigelow, & Shores, 2005; Guillot, Kilpatrick, Hebert, & Hollander, 2004; Hellman, 1997; Reid et al., 2007; Scales, 1998). A prospective study with 782 CAD patients indicated a range of exercise stages of change during hospitalization with 28% in pre-intention, 33% in intention, and 38% in action stages of change (Reid et al., 2007). The same study indicated that progression from pre-intention stages to at least one stage forward from baseline to six-months was associated with stronger beliefs that exercise reduces cardiovascular risk, greater intention to exercise, greater availability of home exercise equipment, and greater likelihood of participation in CR compared to patients who remained at the same stage or regressed, suggesting that efforts to advance intention for CR participation may improve the likelihood of enrolment. Literature reviews have also reported that stages-of-change-informed interventions for exercise promotion using face-to-face and/or written materials demonstrate efficacy for improving short-term (< 6 months) exercise adoption in 71% (n = 12) to 73% (n = 15) of studies (Adams & White, 2002; Hutchison, Breckon, & Johnston, 2009). Given the exercise-based focus of CR, tailoring CR promotion efforts to each patient’s level of intention to attend might also be beneficial.
Motivational Interviewing

Motivational interviewing is a clinical method consistent with stage-based models of behaviour change (Miller & Rollnick, 2009; Miller & Rollnick 2013). It is defined as a “collaborative conversation style for strengthening a person’s own motivation to change.” (Miller & Rollnick, 2013, p. 12). In motivational interviewing, the healthcare provider adopts a stance of collaboration with the patient that involves acceptance, compassion, and active listening. Emphasis is also placed on evoking the patient’s own reasons for change, rather than engaging in the “righting reflex”—that is, the approach of trying to convince patients to make behaviour change using advice and information. Further, there is an assumption in motivational interviewing that ambivalence is a common and uncomfortable experience among individuals considering behaviour change, such as those lifestyle changes required in CR. The provider listens for patients’ mixed feelings about change, and strategically responds using counseling skills such as open questions, reflections, affirmations, and summary statements.

Motivational interviewing was never explicitly designed from stage-based models of behaviour change (i.e., TTM and HAPA). The conceptual fit, however, is widely acknowledged in that motivational interviewing provides an example of how to flexibly adapt interventions based on a patient’s level of intention to change (Dray & Wade, 2012; Hoy, Natarajan, & Petra, 2016; Miller & Rollnick, 2009). In motivational interviewing, patients’ language about change is used to guide the intervention on a moment-to-moment basis (see Figure B.2 for an illustration). If the patient is talking about his or her arguments for change (i.e., change talk or commitment talk), the provider adopts a guiding approach characterized by action planning, problem-solving, and helping the patient tie behaviour change with important personal values. If the patient is talking about arguments against change (i.e., sustain talk or resistant talk), the provider adopts
an empathic approach characterized by “rolling with resistance,” reflecting affect, supporting autonomy, and exploring ambivalence.

Research support for motivational interviewing originally came from the area of substance use behaviours (Allsop, Saunders, Phillips, & Carr, 1993; Bien, Miller, & Tonigan, 1993; Marlatt et al., 1998). Since the 1990s, motivational interviewing has been successfully used to promote health behaviour change in a variety of other clinical areas (Knight, McGowan, Dickens, & Bundy, 2006; Lundahl et al., 2013; Purath, Keck, & Fitzgerald, 2014). Recent examples include: physical activity (O’Halloran et al., 2014; O’Halloran, Sheilds, Blackstock, Wintle, & Taylor, 2016); medication adherence (Vanderwaal, 2015); weight loss (Armstrong et al., 2011; Barnes & Ivezaj, 2015); and self-management of human immunodeficiency virus (Dillard, Zuniga, & Holstad, 2017), diabetes (do Valle Nasntcimeo et al., 2017; Ekong & Kavookjian, 2016), chronic pain (Alperstein & Sharpe, 2016), dyslipidemia (Bóveda-Fontán et al., 2015), and dental issues (Kay, Vascott, Hocking, & Nield, 2016). Importantly, motivational interviewing has shown promise for increasing attendance at various health programs, such as mental health and addictions therapy (Fiszdon, Kurtz, Choi, Bell, & Martino, 2016; Strong et al., 2012), health screenings (Miller, Foran-Tuller, Ledergerber, & Jandorf, 2017), childbirth classes (Rasouli et al., 2017), and blood donation (Sinclair et al., 2010).

Three meta-analyses (Hettema, Steele, & Miller, 2005; Lundahl et al., 2013; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010) reported at least modest efficacy of motivational interviewing for improving treatment adherence across a range of health practices. Another meta-analysis by Rubak, Sandbaek, and Christensen (2005) reported that motivational interviewing “outperforms traditional advice-giving in the treatment of a broad range of behavioural problems and diseases” (p. 305) and can be effective even in brief, 15-minute
encounters. A recent systematic review of nine RCTs by Lee, Choi, Yum, and Chair (2016) indicated favourable effects of motivational interviewing on smoking, mood, and quality of life in patients at risk for or diagnosed with CVD. Consistent with this growing evidence base, a scientific statement from the American Heart Association concluded that motivational interviewing is useful and effective for promoting dietary and physical activity changes to reduce cardiovascular risk (Artinian et al., 2010). Across a variety of clinical populations, there is convincing evidence that motivational interviewing can enhance health behaviours, including those relevant to secondary and tertiary prevention of CAD.

Given the complex behavioural changes required during CR, the idea that motivational interviewing may be well-suited to CR participants is not novel (Collins, Butryn, & Jennings, 2007; Hancock et al., 2005). Principles of motivational interviewing are included in the Canadian Association of Cardiovascular Prevention and Rehabilitation guidelines (Stone, 2009). Case reports and commentaries have also posited that motivational interviewing can be applied to CR patients (Hancock et al., 2005; Pietrabissa et al., 2015; Van Nes & Sawatzky, 2010). Whereas anecdotal support for the use of motivational interviewing in CR has existed for at least a decade, empirical evidence has been more limited (Beckie & Beckstead, 2010; Hughes et al., 2002; Pietrabissa, Manzoni, Rossi, & Castelnuovo, 2017; Scales, Akalan, Miller, & Lueker, 2003; Sieke, McGrady, & Badenhop, 2016). There is preliminary evidence for the use of one to four motivational interviewing sessions for reducing physical inactivity and increasing exercise attendance during outpatient CR (Beckie & Beckstead, 2010; Scales et al., 2003; Sieke et al., 2016) and for increasing physical activity post-CR (Hughes et al., 2002). These results suggest that motivational interviewing can be used to promote exercise behaviour among patients already in CR, but it has been speculated that this counseling approach “may be most advantageous when
used to get patients to CR following an ACS event” (Collins, Butryn, & Jennings, 2007, p. 73). Overall, there is a need to empirically substantiate the use of motivational interviewing in CR, and adapt it to the specific problem of CR non-enrolment.

**Phased Approach to Behavioural Intervention Development**

Complex behaviour change interventions, such as those to promote CR enrolment, are often prematurely studied in efficacy and effectiveness trials (Campbell et al., 2000; Craig et al., 2008; Czajkowski et al., 2015; Riddle & Ferrer, 2015). Both the Medical Research Council (Campbell et al., 2000; Craig et al., 2008) and the National Institutes of Health (NIH; Edmondson et al., 2016; Riddle & Ferrer, 2015) suggest that behavioural interventions should be designed using a phased approach, similar to the process of drug development. In 2015, the NIH launched the Science of Behaviour Change program which aims to address the widespread issue of poor health behaviours (e.g., inactivity, poor diet) by supporting early-phase research to investigate how and why behavioural interventions work (Edmondson et al., 2016). Similarly, the NIH-funded Obesity-Related Behavioural Intervention Trials (ORBIT) Model was recently published to guide early, pre-efficacy phases of behavioural treatment development for chronic disease (Czajkowski et al., 2015). Attention to active ingredients underlying behavioural interventions may help optimize efficacy and prevent premature abandonment of interventions that fail to impact behavioural and/or biomedical endpoints (Barlow, Bullis, Comer, & Ametaj, 2013; Czajkowski et al., 2015). Together, these initiatives advocate for pre-efficacy research to define behaviour change interventions through basic science (e.g., qualitative research), to characterize putative targets through which the intervention will lead to improved outcomes, and to assess feasibility and acceptability.
Overview of the Present Research Project

With increasing survival rates after ACS, a growing number of individuals are living with CAD and dealing with long-term challenges such as managing risk factors and coping with psychosocial sequelae of their disease. CR is designed to help patients navigate life with CAD, and is an essential part of cardiovascular care, yet many patients who are referred to CR do not enroll. To best serve ACS patients during their transition from acute care, a better understanding is required of what patients report they need in order to successfully attend CR. Furthermore, liaison interventions with post-ACS patients might benefit from mitigating the “righting reflex” (Miller & Rollnick, 2013) of telling patients why to attend CR and how to overcome barriers. Rather, a motivational interviewing approach that tailors communication to patients’ level of intention to change may be useful. Motivational interviewing has been previously tested in CVD samples, but has yet to be evaluated as a means to enhance CR enrolment.

This dissertation presents the results from a two-part, mixed-methods research project aimed at increasing CR enrolment by increasing patients’ intention to attend a 12-week CR program. The research involved the design and evaluation of a brief motivational intervention to promote enrolment in CR that incorporated a phased approach to intervention development, a consideration of stage models of behaviour change, and a motivational interviewing counseling style. Chapter 2 presents results from a qualitative study that was conducted to identify factors that patients identify as crucial to address amidst their transition to CR. Chapter 3 outlines how these qualitative data were used to design a brief motivational intervention to enhance patients’ intention to attend CR, and outlines the protocol for a small-scale behavioural RCT to assess preliminary efficacy. Results from the RCT are presented in Chapter 4.
CHAPTER TWO: A Qualitative Study Exploring Factors that Influence Enrolment in Outpatient Cardiac Rehabilitation
Abstract

Purpose: This study explored patients’ decision-making about whether or not to enroll in cardiac rehabilitation (CR), an under-utilized program that is associated with significantly improved health outcomes. Method: Face-to-face interviews were conducted with acute coronary syndrome patients (n = 14) after referral to a local CR center, but prior to program enrolment. Thematic analysis was used to derive themes from interview transcripts. Results: Three themes emerged including anticipated benefit, perceived ability, and contextual influences. Participants believed key benefits of CR would be access to specialist healthcare providers, improved longevity, reduced cardiovascular risk, as well as improved motivation, accountability, learning opportunities, and general fitness. Participants were concerned about their ability to engage in and travel to exercise sessions, pay the program fee, and manage scheduling conflicts. Contextual influences on decision-making included healthcare provider recommendation, first impressions of the CR center, knowledge gaps about what CR entails, input from family and peers, and psychological distress. Conclusion: The period following CR referral but prior to enrolment represents an optimal opportunity to promote in-the-moment decisions in favor of CR. Patients report both positive and negative aspects of CR, suggesting individualized efforts to resolve ambivalence may increase program participation.
Introduction

Cardiovascular disease is a leading cause of worldwide mortality (World Health Organization, 2014), accounting for approximately 2,200 deaths each day in the United States alone (Mozaffarian et al., 2015). Cardiac rehabilitation (CR) represents an effective tertiary prevention strategy to reduce cardiovascular morbidity and mortality following a cardiac event (Stone, 2009). Although services vary across programs, CR is generally focused on medically supervised exercise training, as well as support with smoking cessation, stress reduction, medication management, and dietary change (Stone, 2009). CR is associated with a remarkable 26% reduction in cardiovascular mortality compared to usual medical care (Anderson et al., 2016). Further, evidence from randomized controlled trials shows that CR contributes to improvements in blood pressure, lipid profile, cardiorespiratory fitness, smoking habits, psychological distress, and quality of life in in heterogeneous samples including patients with coronary heart disease and patients after myocardial infarction or cardiac surgery (Dugmore et al., 1999; Macchi et al., 2007; Taylor et al., 2004). In light of strong evidence supporting the benefits of CR for reducing morbidity and mortality, there is a consensus among major health organizations (Balady et al., 2011; National Institute for Health and Care Excellence, 2013; World Health Organization, 1993) that CR is an essential component in the continuum of cardiovascular care.

The multifactorial benefits of CR, however, can only be accrued when patients are referred to, attend, and complete CR programs. Recent prospective findings demonstrate clear associations between adherence to CR and improved survival (Beauchamp et al., 2013; Doll et al., 2015; Martin et al., 2012). For example, a prospective cohort study of 5,886 cardiac patients demonstrated that those who completed CR had fewer hospitalizations (HR 0.75, 95% CI 0.69-
0.81) and improved survival (HR 0.58, 95% CI 0.48-0.70) compared to those referred but who never enrolled (Martin et al., 2012). Further, timely entry into CR (e.g., within 10 days of hospital discharge) improves subsequent CR adherence and reduces cardiac re-admissions (National Institute for Health and Care Excellence, 2013), indicating the importance of early CR enrolment to optimize risk factor modification.

Despite the availability of CR and its documented health benefits, under-utilization is widely reported (Balady et al., 2011). Under-utilization can be attributed to drop-off at multiple points along the continuum of cardiovascular care including lack of referral, non-enrolment after referral, poor adherence to CR components after enrolment, and early dropout (Grace et al., 2006; Jackson et al., 2005). In response to CR under-utilization, many programs have adopted automatic referral systems (Beswick et al., 2005) and strategies to improve exercise adherence after enrolment (Karmali et al., 2014). However, the problem of non-enrolment remains relatively understudied, which is problematic given that referral to CR does not guarantee enrolment (Gravely-Witte et al., 2010) and that non-enrollers may not receive even basic health coaching related to cardiovascular risk reduction. Estimates of CR non-enrolment vary widely (33-94%; Bethell, Turner, Evans, & Rose, 2001; British Heart Foundation, 2015; Grace et al., 2014; Suaya et al., 2007; Turk-Adawi et al., 2014), at least in part due to inconsistent reporting of whether non-enrollers had received a referral. To fully address CR under-utilization, more work is needed to identify and understand the subset of patients who receive a referral and recommendation to attend CR, but who do not enroll.

Qualitative methods are used to develop a better understanding of complex, subjective processes such as the decision to participate in CR. Some qualitative research has focused on reasons for not enrolling in CR (Chauhan et al., 2010; Clark et al., 2004; Cooper et al., 2005;
Hird et al., 2004; Jones et al., 2003; Pullen et al., 2009; Wyer, Earll, Joseph, & Harrison, 2001); these reasons include negative interactions with healthcare systems/providers, lack of physician recommendation, poor understanding of cardiovascular disease, physical and practical constraints (e.g., cost, scheduling, distance, poor health), the belief that CR is not beneficial, and the view that cardiovascular disease is not controllable. All but two of these studies (Cooper et al., 2005; Hird et al., 2004) are limited by retrospective reports about reasons for/against enrolment, collected several weeks or even years after participating in or declining CR. Patients’ in-the-moment decision-making about whether to take part in CR needs to be further examined.

Thus, the aim of this study was to explore factors that influence intention to enroll in a 12-week outpatient CR program. In order to capture real-time decision-making, the focus was on understanding patients’ experiences shortly after referral but prior to attendance at the first scheduled CR appointment. We used an inductive approach (Tracy, 2012) in which the aim was to describe individuals’ decision-making about CR enrolment, rather than to test or validate theory. As such, there were no a priori hypotheses about themes that would be identified in the data.

Methods

The current study adhered to RATS guidelines for qualitative research (Clark, 2003) in terms of Relevance of study question, Appropriateness of method, Transparency of procedures, and Soundness of interpretative approach. Ethical approval was obtained from the Conjoint Health Research Ethics Board at the University of Calgary. All participants included in the study provided written informed consent. Confidentiality was ensured by removing identifying information from questionnaires and interview responses, and by limiting access to individual participant data to the research team.
CR Program Description

This study involved patients referred to the largest outpatient CR center within a large Canadian city. The center adheres to national CR guidelines (Stone, 2009). An automatic referral system is in place where all patients with an approved indication who are admitted to coronary care units or a cardiology ward within the city are scheduled for a CR orientation appointment. The orientation appointment is held within seven days of hospital discharge, and consists of an exercise stress test, medication consultation, and encouragement to enroll in the 12-week exercise-based CR program. For patients with difficulty attending supervised exercise sessions, a home-based program is available. After completion of the 12-week exercise program, patients are offered cardiac follow-up appointments at one- and two-years. A program fee ($500 Canadian) is fully waived for patients with financial constraints. Previous research at this CR center indicates program completion is associated with improved survival, decreased hospitalizations, and improved physical and mental health outcomes (Campbell et al., 2012; Martin et al., 2012). Most (≈ 85%) patients attend an initial orientation appointment and 70% of referred patients enroll in the CR program (i.e., attend at ≥1 exercise appointment).

Participants

Patients met inclusion criteria if they were diagnosed with acute coronary syndrome (i.e., myocardial infarction, unstable angina), referred to and eligible for the CR program, English-speaking (due to lack of an available translator), able to schedule data collection prior to their first scheduled CR exercise appointment, and no documented participation in the CR program within the past two years. Participants were recruited for the study following the orientation session, but prior to enrolment in the 12-week exercise program. Purposive sampling (Emmel,
2013) was used to maximize sample diversity in terms of socio-demographic characteristics, with particular attention to recruiting women and individuals across the age spectrum.

**Recruitment Process**

During an initial phone call to confirm the orientation appointment, administrative staff at the CR center asked patients’ permission to be contacted about this research study. The researcher (C.R.R.) then contacted consenting patients by phone to explain the study and determine interest and eligibility. If the patient was interested, a meeting was scheduled during which the patient provided written informed consent, completed baseline questionnaires, and took part in a semi-structured interview. Patients were given the option to meet with the researcher at one of three sites including the CR center venue, the researcher’s office, or a home visit. Recruitment was terminated when theoretical saturation was achieved, defined as lack of new or relevant themes or sub-themes emerging with additional interviews (Tracy, 2012). Saturation was determined by consensus between C.R.R. and K.M.K.

**Data Collection**

**Sample characteristics.** Information about age, sex, and medical characteristics (e.g., diagnosis, cardiac procedures, date of cardiac event, Hospital Anxiety and Depression Scale score; Zigmond & Snaith, 1983) was acquired via chart review. Additional baseline data were collected using a self-report questionnaire that assessed education, racial identity, family income, self-reported travel time to CR, and perceived strength of the referring physician’s endorsement of CR (five-point scale with 1 = physician did not recommend CR, 5 = strong recommendation; Ades, Waldmann, Polk, & Coflesky, 1992). Enrolment was determined by chart review 60 days after the initial orientation appointment.
**Semi-structured interviews.** In-depth interviews were selected over other methods of data collection (e.g., focus groups) in order to understand individual decision processes, while providing a private space to discuss potentially sensitive topics. A template of open-ended questions (adapted from Pullen et al., 2009) aimed at understanding decision-making about enrolment in CR was used as a starting point for each interview. Interview questions addressed patients’ decision-making process about CR; perceptions about their disease, its causes, course, and treatment; experience of the referral process; beliefs about CR and benefits/drawbacks of taking part; and perceptions about what would make it easier/more difficult to attend. As the individual interviews progressed, additional probing questions were added. Interview duration ranged from 39-90 minutes (median 59 minutes). A clinical psychology doctoral candidate (researcher, C.R.R.) with clinical and research experience with cardiac patients conducted all interviews. The researcher had no clinical relationship with the study participants. The interviews were audiotaped, then transcribed verbatim by a research assistant. The researcher then checked all interview transcripts against the original audio files for accuracy.

**Data Analysis**

Interview transcripts were analyzed using thematic analysis (Braun & Clarke, 2006), facilitated by NVivo software (QSR International Pty Ltd. Version 11, 2015). Thematic analysis is a qualitative descriptive approach used to identify, organize, and report patterns within a dataset (Braun & Clarke, 2006). Consistent with recommendations by Braun and Clarke (2006), analysis began with two of the researchers (C.R.R. and K.M.K.) independently reading transcripts and making notes about patterns within the data. Both researchers then generated a systematic list of codes to describe the content of each relevant data extract. This was followed by an iterative process of sorting codes into potential themes and sub-themes in order to ensure
inclusion of new or contradictory patterns. Trustworthiness of data interpretation was ensured by holding routine team meetings to build consensus. An audit trail consisted of recording personal reflections, methodological decisions, and interview transcriptions throughout the research process. Finally, themes and sub-themes were named, clearly defined, and examined in terms of their relationships to one another. Quotes reported here represent data extracts selected as highly representative of each theme.

**Results**

**Descriptive Statistics**

During a four-month recruitment period, 164 patients with acute coronary syndrome were referred to the CR program. Of these, 17 were not eligible for the study due to limited English ($n = 9$) or participation in the CR program within the past two years ($n = 8$). An additional 19 declined to be contacted by the researcher to discuss the study. Of the remaining 128 patients who provided consent to be contacted about the study, the researcher attempted to reach 37 patients based on purposive sampling. Twelve could not be contacted, 11 were interested in the study but unable to schedule the qualitative interview prior to their first scheduled CR exercise appointment, and the remaining 14 patients provided informed consent and comprise the study sample.

Aggregate sample characteristics are presented in Table 2.1. Participants ranged from 42 to 85 years old (median 61 years), were predominately White ($n = 13, 92.9\%$), and came from a range of socioeconomic and educational backgrounds. Over one-third were foreign-born. On average, symptoms of anxiety and depression fell within the normal range. Primary CR referral reasons included myocardial infarction ($n = 9, 64.3\%$) and unstable angina ($n = 5, 35.7\%$), for which all patients in the study had undergone percutaneous coronary intervention with either
drug-eluting or bare metal stenting. Data collection occurred a median of 15 days after the cardiac event. Participants tended to report that their in-hospital physician had given a moderate to strong recommendation to attend CR (median 4 on a 1-5 scale). Only 8 (57.1%) of the patients ultimately enrolled in CR, defined as attendance at ≥1 exercise appointment. When asked about their intention to enroll in CR during the qualitative interview, 2 patients (14.3%) reported they had decided against attending the CR program, 6 (42.9%) said they were still undecided, and 6 (42.9%) intended to enroll.

**Qualitative Findings**

Three main themes were identified relating to participants’ decision-making about CR enrolment: anticipated benefit, perceived ability, and contextual influences (Table 2.2). Each of these themes is described along with illustrative quotations below (ID numbers reported after each quotation correspond to the individual participants listed in Table 2.3).

**Anticipated benefit.** The first dominant theme concerned patients’ assessment of what outcomes CR could produce, and whether those outcomes were personally relevant. Several subthemes were identified that characterize common benefits anticipated from CR participation.

**Access to specialist healthcare providers.** Receiving care from providers who specialize in cardiovascular recovery was perceived as a key benefit of CR. Close monitoring by a cardiologist, for example, was seen as advantageous: “*There’s the cardiologist there that I can make appointments with and they’re going to monitor my medication . . . which I think is good, that a cardiologist is monitoring it . . . because I feel like my family doctor is not really qualified, you know, to tweak my medications and that*” (ID #10).

Of the specialized healthcare services provided in CR, supervised exercise tended to be seen as the most valuable. Participants expected the program would provide a safe venue for
exercise initiation, and would teach them the optimal amount/type of exercise for cardiovascular health: “I think what really interested me in the program was, was that there were trainers that knew, that were familiar with cardiac problems, someone that would know . . . what level is appropriate and how I might increase it” (ID #02). Similarly, one participant noted, “That’s what I need clarification on from the people at [the CR program], is when can I start doing more strenuous household activities for instance. I don’t want to do it too soon, ‘cause I don’t want to damage the surgery that I had” (ID #11).

In deciding whether the specialized services were worth the investment of time, effort, and resources, participants compared CR to less intensive approaches. For example, some participants were unconvinced that CR could provide benefits over and above those offered through a community gym: “The biggest factor that I’m going to make my judgment or my decision on would be how watchful do I have to be, or how careful do I have to be, regarding the whole exercise thing . . . is it something that I can easily monitor myself, or is it something that, you know, is more something for a professional to be monitoring for?” (ID #03). Some participants also thought they could achieve the same benefit through home exercise: “‘Cause I said . . . you want me in this program, which is great, but I’m suggesting other alternatives . . . [they said] ‘you know, you could do more damage.’ And I’m thinking, doing it at home I could do just as much damage” (ID #12).

**Longevity and reduced cardiovascular risk.** Participants also valued the program’s ability to attenuate their risk for future cardiac events: “You know, your own mortality can motivate you to do a lot of things that you probably wouldn’t have done” (ID #05) and “I do not want to be stuck in that hospital bed, doing that again, ever, ever . . . that’s motivation enough right there” (ID #06). Some participants used more optimistic terms when describing their hope
that CR would contribute to longevity by indicating the specific activities they wanted to do with their extra years of life: “I want to be around and enjoy my grandkids, and enjoy life, and go on vacations with my husband, you know.” (ID #11). Some participants, in contrast, doubted whether CR could reduce their cardiovascular risk: “To me, it seems like a common-sense approach . . . ‘cause you are looking at exercise and diet and other lifestyle choices. Since I don’t smoke and I don’t drink alcohol anymore (laughs), and I’m not obese, so I don’t have all of the concerns you know?” (ID #14).

**Motivation, accountability, and support.** Several participants anticipated that CR would provide a supportive atmosphere in which to successfully pursue health behaviour change. There was a sense that being part of the program would provide accountability to attend exercise sessions: “If I know somebody is relying on me . . . if it’s a one-on-one thing, I certainly don’t want that person to waste their time going there and me not showing up, so I have to be there. I would feel the obligation to go” (ID #03). In a similar line of thought, one participant believed that CR would help him follow through on his intentions for lifestyle change: “The way I see it is, I know what I need to do, it’s just a matter of doing it, and that’s what we’re doing, is working on doing” (ID #11). Participants generally expressed they did not want to go through the recovery process on their own, and valued the support offered by CR: “At that time [of the referral to CR], I was looking for somebody to take care of me so I just don’t care what the program . . . looks like” (ID #01).

**Learning opportunities.** Participants tended to describe a general openness to the information that would be provided in the program, as noted by this participant who had previously attended CR: “I thought, well, you know if I can learn something, or, find some new ways of exercising and this type of thing, and find out more about my condition, I would. It’d be
worthwhile for me” (ID #09). Similarly, another participant expected the educational component of CR would help her make informed decisions about her heart health: “The education they give, whether it be about the heart and heart events and symptoms and that kind of thing . . . I think those are all things that a person who has had a heart event should know about and should be aware of” (ID #11).

**Fitness and general functioning.** Participants described wanting additional health benefits over and above those related to cardiovascular disease. For example: “[The CR program] is very much designed to, be very cardiac-specific for improving the health of the heart and whatnot, and in turn like that, it leads more to overall health obviously” (ID #05). Some participants spoke about generally wanting to “feel better” as a result of CR: “So my attitude is just, get through this patch, have the doctor sign me off, get back to work, back into a routine again, back into building up the exercise, and feeling better” (ID #12). Others spoke specifically about wanting to improve their physical fitness, strength, and energy levels: “I’m just tired . . . I really want to get back into shape. I really want to get my strength back” (ID #10).

**Perceived ability.** While considering the potential benefits of CR, participants simultaneously weighed whether they would be able to attend. That is, the second major theme relates the perceived ability to attend CR in light of various personal obstacles. This aspect of the decision-making process is well-illustrated by this participant: “Me sitting in their shoes and saying, ‘well this is really important for you.’ And it’s true, it is. But, when you switch chairs, it’s ‘yeah, I know it’s really important, how do we work all this in?’ That’s where it starts getting tricky” (ID #05). There were four sub-themes relating to perceived ability to attend CR, described below.
Concerns about exercise. Some participants expressed concern about their ability to physically take part in the exercise component of CR, expecting difficulties with endurance, boredom, and physical symptoms. For instance, this participant noted concerns about pain during exercise: “If it’s going to make my back and my hips sore, I don’t want it, because I’ve had enough problems,” although she also described being open to the program if it was “geared to the things that I can do” (ID #13). A similar point was raised by a participant with comorbid cancer, concerned his fatigue might interfere with CR participation: “One thing, that leukemia does, is it also, you get tireder and tireder . . . so, it’s sort of the old catch 22 . . . for the cardiovascular aspect of the coin, you should be out there exercising, then on the other side of the coin is you got your body saying, ‘you don’t have the energy, what are you doing?’” (ID #05). Some patients anticipated that their ability to exercise would improve with time and practice: “I don’t know how long my endurance will be, but I can build that up hopefully by keeping to exercise” (ID #09).

Distance and transportation. Another factor related to perceived ability was the question of “how will I get there?” This was especially pertinent to participants who had their driver’s license temporarily suspended post-cardiac event: “Well the fact that I’m not allowed to drive right now for a month, it’s obviously is a hindrance . . . I can’t even consider starting until the first week of February . . . because I’d have to figure out who’s going to take me there” (ID #03). Some participants also expressed concerns about winter weather, inconvenient commutes via public transit, and anxiety about driving. One participant said transportation issues represented her primary barrier to attending CR: “I just don’t care for the drive down there. You know, that’s the main reason” (ID #08). Participants discussed their ongoing problem-solving to overcome transportation-related barriers, which included potential solutions such as delaying CR initiation.
until able to drive, participating in the home-based program, and asking friends and family for rides. However, participants expressed concern about burdening their loved ones with transportation requests: “We haven’t really decided about the exercise program yet . . . I think it’s a good idea. The thing is I’m gonna inconvenience people to be able to do it, and I just have, a little bit of reservation about that right now” (ID #09).

**Financial considerations.** Nearly all participants described the program fee as influencing their decision-making about CR. Despite being informed about the availability of a fee waiver, some participants continued to be deterred from joining the program. For example: “It almost makes you feel like ‘ok come on down here, we’ll fix you. But it’s going to cost you’ . . . nowadays who’s got an extra 500 bucks kicking around?” (ID #04). Another participant was initially concerned about the fee, but subsequently felt able to attend after receiving a waiver: “And that there was the cost involved was a lot easier to take than if I had to foot the bill on my own . . . I said if there is any costs involved it’s a deal-breaker, so it was waived” (ID #06). In contrast, some participants were confident in their ability to pay the fee and/or believed the fee was worth it for the benefits they would achieve: “Considering it’s a two-year program, it’s not bad if you break it down per month . . . and, as my husband said, your health is important, and that’s quite true” (ID #11).

**Scheduling conflicts.** The time commitment required for CR represents a frequently mentioned barrier to program enrolment. Participants described uncertainty about whether they could attend morning exercise sessions twice per week for 12 weeks due to employment and family-related responsibilities. One participant provided a representative description of this struggle: “There’s so much other pressures in your life, you know, there’s work, and then I have, you know, children and grandchildren, and the house and everything, and pets . . . and then also
with having my boss on board, you know?” (ID #10). Similarly, one participant who is primary caregiver to his wife expressed concerns about spending his small amount of leisure time at CR: “One of the balls in the air . . . is how to incorporate it into our routine because of the fact we don’t have a lot of free time as a general rule. Then when you do have free time, quite often you just sort of, ‘oh my God, we can actually relax!’ (laughing) You know rather than, ‘oh, come on, let’s go get sweaty!’” (ID #05). Many participants either resolved these scheduling conflicts, or were considering resolving them, by reminding themselves that CR is time-limited, by choosing a different exercise time/location, by speaking with their employer, or by asking their family physician to advocate for their time off from work.

**Contextual influences.** The third theme relates to the broader context in which participants engaged in decision-making about CR. There were an array of situational and emotional factors that seemed to influence the benefits patients anticipated from CR and their perceived ability to attend.

**Healthcare provider recommendation.** One of the most prominent contextual influences was the physician’s suggestion to join CR. Participants remarked that the cardiologist’s opinion of CR was weighted heavily in their own decision-making: “*Having a cardiologist, I think that was, that was the big, you know, big push. You know? ‘Cause then you think, ok that’s really important for the cardiologist bring it up*” (ID #10). In addition to considering the opinion of their referring cardiologist, some participants indicated the opinions about CR from the nurses in hospital and their family physician were also important. For some participants, the physician’s recommendation was so important that they were instantly compelled to join CR: “*Well for me it was sort of a no-brainer. I thought, I’m going to do this . . . almost right away, like when the doctor first told me about it I said, ‘yeah’*” (ID #14).
**First impressions.** For some participants, initial interactions with the CR program were identified as an important element in decision-making about enrolment. When participants attended their initial orientation appointment at the CR center, they were acutely aware of their surroundings including the exercise facilities (e.g., locker rooms, equipment), patient demographics, and staff demeanor. Some participants, for example, felt they did not fit in after seeing other patients: “Oh my God they’re all so old! I feel like I’m—do I really belong here?” (ID #06). Interactions with staff were viewed favorably by most participants, making them feel hopeful about the help available through the program: “I’ve been impressed with the staff. They’re very courteous, very friendly, and if they’re not the one to help you they can always point you in the right direction” (ID #11). Two participants indicated that unpleasant interactions with CR staff were pivotal to their decision against CR enrolment, as described by this participant: “I personally feel that the doctor looked at me and thought, ‘well she’s overweight and that’s her problem,’ because he kept stressing the exercise . . . that made a major decision. Bedside manner goes a long way” (ID #12). Similarly, another participant perceived the initial orientation appointment as disorganized and was uncomfortable discussing the program fee in the waiting area: “Everybody could hear what you were saying! . . . they’re saying, ‘well if you can’t afford it.’ And I’m like, ‘ok, there’s people sitting here’” (ID #04).

**Evolving knowledge about CR.** Participants’ decision-making was often a moving target, influenced by ongoing changes in their knowledge about what the CR program entails. As they received more information (e.g., cost, schedule, details of program), participants became more informed about their questions of “will I benefit?” and “can I do it?” While some participants said their decision about program enrolment was relatively automatic upon referral, others said they were waiting until they had more information: “When you’re first going for these type of
things you’re sort of on information-gathering, not necessarily on decision-making” (ID #05). Specifically, some participants wanted more information about potential benefits of the program and/or about their ability to participate, as noted by this woman with concerns about her ability to take part in exercise: “Well I thought probably it would be a good idea, then the more I heard of it, the more I wondered, because I didn’t know how . . . it was going to be geared—if it was to my level, or to one level and everyone was expected to work up to that, or what? And, as I say, I still don’t really know for sure what they program is gonna be” (ID #13).

Although all participants noted that the referring physician had described the basic components of the program, some participants also received information from family members and friends who had previously completed CR. For example, this participant had learned about the benefits of CR via her husband’s participation: “First of all it was the benefits that I saw from my husband. Because my husband afterwards, he was like a different person.” (ID #10). In contrast, another participant whose husband had completed CR said she did not want to attend because she had already knew exactly what the program involves: “If it hadn’t been for what transpired last year with my husband, I would be jumping on the bandwagon right away. But because I know exactly what, what the program entails . . . it would be so repetitious for me” (ID #08). Interestingly, most participants knew about the exercise component of the CR program whereas far fewer were aware of the other risk factor modification services such as stress management, smoking cessation, and support from a dietician. Therefore, participants often reported they did not have enough information about CR with which to make a choice and/or were not fully aware of all the services offered.

*Input from family and peers.* Another contextual variable that influenced participants’ decisions-making was partners’, friends’, and family members’ opinions about CR. There were
some participants whose family members were supportive of their participation in the program, such as this participant’s husband, “He is in favor of it . . . I think he wants to see me healthy, or healthier, and uh, you know this is his number 1 priority . . . it’s a joint affair, so to speak” (ID #11), and this participant’s wife, “Truth be known, if I didn’t go, she would kill me (laughing)” (ID #05). Others’ family members had expressed concern about the patient completing CR: “I think he [husband] was a little dubious about it, and my daughter was—thought the same. She wondered if the program would be too strenuous, I guess” (ID #13). One participant had even received input about the program from a church minister she met in the hospital: “Well that [conversation with the minister] is what kind of settled me more . . . he said . . . ‘definitely check into it, ‘cause it really is a good program.’ And he said, ‘I’ve learned lots.’ And I said ‘well that’s good to know’” (ID #04). Despite the influence of others on decision-making about CR, patients generally expressed that, in the end, they wanted to make the decision for their own reasons and not be pressured by others.

**Psychological distress.** Participants often described feeling anxious, overwhelmed, and exhausted; these emotions provided an important context in which patients were considering CR. Several participants avoided thinking about CR because they were still in a state of shock about what had happened, such as this participant who had not yet read the CR information booklet: “I think it was just too much in, in—‘cause I mean, she gave me the book, and I thought you know I’m taking the book home, and I haven’t even looked at it, cause I just, it was just too much all at once . . . I’ll look at it when I feel a little bit more settled here” (ID #04). Another participant shared a similar experience: “So really I haven’t even thought about it [CR], ‘cause I was more, just glad to be home. Glad to be able to sleep through the night without them coming in and taking my blood pressure or drawing blood or whatever” (ID #05). Others described their
psychological distress as being a driver behind their motivation to join CR: “I had so many questions in my mind. My job, my family, my kids, and everything so, whatever they tells me, I said ok [to joining CR] because I don’t have a choice . . . I’m really motivated to start doing their, whatever they just give me” (ID #01).

Discussion

These qualitative findings provide insight into patients’ subjective decision-making about whether or not to enroll in CR. The novelty of this study is our exploration of considerations made by patients shortly after referral, in real-time. The data suggest that, regardless of patients’ intentions regarding CR participation, they tend to evaluate what they might gain from the program while simultaneously evaluating their ability to address pragmatic and physical barriers to attendance. The context in which this decision-making occurs is also relevant, such that various interpersonal, emotional, and healthcare-related factors influence the extent to which eligible patients see CR as feasible and important to attend.

This study complements existing quantitative research on CR adherence by describing the subjective “how” and “why” of program enrolment. To date, efforts to elucidate reasons for non-enrolment have generally involved the comparison of hospital discharge statistics in patients who attended versus those who did not attend CR. This quantitative literature indicates the factors most consistently associated with lower enrolment include female sex, older age, comorbid illness, social deprivation, depressed mood, longer distance to CR, lower socio-economic status, and lack of physician recommendation (Cooper et al., 2002; Daly et al., 2002; Jackson et al., 2005; Sharp & Freeman, 2009; Turk-Adawi et al., 2014). Although socio-demographic and medical predictors help characterize underrepresented patient groups, they generally provide little information about how individuals’ perceptions and experiences
influence their initial decision about CR participation. Our qualitative design, in contrast, facilitated insight into decision-making processes that might not be uncovered using standard quantitative instruments; these processes include the fluidity of patients’ intentions over time, the importance of healthcare provider communication style (e.g., private, sensitive discussions about the CR program fee), and the reasons why a physician’s recommendation is perceived to be important.

Our findings also confirm several themes reported in previous qualitative studies conducted at less optimal time-points—namely, after patients have already chosen to attend or not attend CR. Clark and colleagues (2004), for example, conducted focus groups with patients eligible for a 12-week outpatient CR program within the previous year, including those with high attendance (>60% CR sessions), high attrition (<60% attendance), and non-attendance (i.e., non-enrollers; 0% attendance). Participants were asked to recall their first reactions and concerns about CR. Non-enrollers tended to describe a current sense of being fearful and uncertain about the future, described poor relationships with healthcare providers, and viewed CR as something for “old, illness-focused, and generally needy” people (p. 11). Their study design, which is representative of research in the area (Chauhan et al., 2010; Clark et al., 2004; Heid & Schmelzer, 2004; Kate Jolly, Greenfield, & Hare, 2004; Jones et al., 2003; McCorry et al., 2009), introduces the potential for skewed recall. It could be that patients inadvertently remember their initial impressions about CR in a manner consistent with their decision to not attend (e.g., “I chose not to enroll, therefore it must be a terrible program”) or in a manner consistent with their current negative affect (e.g., “I feel upset now, therefore I am more likely to remember upsetting aspects of the decision-making process”), in accordance with confirmatory and mood-congruent memory biases (Mayer, McCormick, & Strong, 1995; Nickerson, 1998). Understanding
motivations to attend CR in real-time reduces the potential for retrospective bias to colour individuals’ reporting of their experiences.

Using a prospective study design, we observed that patients consider the potential benefits of CR during their initial decision-making about program enrolment. Although the purpose of this study was not to develop or validate theory, it is noteworthy that the “anticipated benefit” theme is consistent with well-established theories of health behaviour change, which posit that favourable attitudes toward a given behaviour (Theory of Planned Behaviour; Ajzen, 1991), beliefs that a certain course of action will reduce susceptibility to illness (Health Belief Model; Janz & Becker, 1984), and positive outcome expectancies (Health Action Process Approach; Schwarzer et al., 2011) increase the probability of a target behaviour. This finding is also consistent with themes from several other qualitative studies on CR participation, such as “benefits of CR” (Cooper et al., 2005), “CRP [cardiac rehabilitation programme] as beneficial” (Wyer, Earll, Joseph, & Harrison, 2001), and “positive value of CR” (Pullen et al., 2009). The specific benefits anticipated by our participants were also similar to those previously described, including the desire to resume or increase physical activity, to learn how much exercise to do in a safe environment, to bolster motivation and social support, and to generally improve one’s health and “get well” (Cooper et al., 2005; Heid & Schmelzer, 2004; Hird et al., 2004; McSweeney & Crane, 2001). Interestingly, our observation that some patients did not expect CR to produce any benefit over and above their typical physical activity was also reported as a theme by McCorry and colleagues (2009) in their interviews with 14 patients, seven to 22 months post-myocardial infarction, who had decided not to attend CR. Efforts to promote enrolment should highlight the benefits of CR that are valued by patients, while addressing potential misunderstandings regarding the importance of structured aerobic exercise in cardiovascular recovery.
Our qualitative investigation adds to this existing literature by drawing attention to patients’ real-time deliberations about whether the anticipated benefits of CR are worth the burden, time, physical pain, money, commute, conflict with employer—and so on—that would need to be overcome in order to attend. Patients’ considerations about “perceived ability” are in line with a wide array of mainstream theories of motivation that imply a central role of self-efficacy, or “the belief in one’s own ability to successfully perform a behavior” (p. 20) in health behaviour change (Nutbeam, Harris, & Wise, 2010). Nearly all patients expressed at least some concern about their ability to attend CR, including those who enrolled in the program, suggesting that patients’ perceived ability exists on a continuum and is not a perfect predictor of CR enrolment. In addition, patients varied considerably in the amount of problem-solving they had done to alleviate their concerns, such as arranging transportation to CR, requesting a fee waiver, and reminding themselves that exercise will become easier with the passage of time. As noted by others (Cooper et al., 2005), the degree to which a patient works to overcome their barriers to CR might relate to their perceived importance of the program. Given the modifiable nature of most barriers identified by patients, these findings underline the importance of assessing self-efficacy in prospective CR patients while collaboratively problem-solving to overcome obstacles to CR participation.

Of the many contextual influences on their decision-making, the one described most frequently by patients was the conversation about CR with their referring healthcare provider. This finding is supported by systematic reviews of qualitative and quantitative studies examining CR participation, representing dozens of heterogeneous CR programs from across the world, which consistently indicate that a stronger recommendation to join CR by the referring physician is associated with higher rates of enrolment and attendance (Daly et al., 2002; Jackson et al.,
In this study, however, only 57% of patients ultimately enrolled in CR despite all patients having received a referral and recommendation to attend. Whether or not patients adhered to their physicians’ recommendation might relate to unmeasured nuances of how the recommendation was delivered, given strong evidence for the role of provider communication in treatment adherence (Alexander, Sleath, Golin, & Kalinowski, 2006). There was also considerable variation across participants in terms of how much and what type of CR information was provided by the referring physician, and in terms of how strong the recommendation was perceived to be. Although systematic patient referrals and education about CR are clearly effective for some patients (Gravely-Witte et al., 2010), our findings suggest that simply telling patients to enroll in CR is not always sufficient to motivate program utilization.

Our findings also highlight the emotional underpinnings of patients’ choice to enroll in CR, a theme which has largely gone unreported in retrospective qualitative studies. The present study adds to prior literature on the association between depressed mood and poor CR attendance (Glazer, Emery, Frid, & Banyasz, 2002) by demonstrating that other aspects of psychological distress including acute feelings of fear, shock, and anxiety can influence initial decision-making about program uptake. Whether these unpleasant negative emotions facilitate or interfere with CR participation remains unclear. Some patients reported that psychological distress motivated them to join CR, whereas others reported that their psychological distress interfered with the ability to thoughtfully consider whether CR was right for them. These findings, combined with the importance of patients’ initial impressions of the CR center and staff, suggest that healthcare providers should attend to the emotional context of prospective CR patients while acknowledging that patients’ psychological distress might interfere with the retention of relevant information (Mitoff, Wesolowski, Abramson, & Grace, 2005).
Rigor of the study was enhanced by transcription of interviews and consensus of themes achieved by two independent researchers. Despite these efforts, several limitations should be considered when interpreting the results. Although there is no consensus about ideal sample size in qualitative research (Tracy, 2012), there is the potential that inclusion of a greater number of individuals may have uncovered additional themes in the barriers to attending CR. However, there was evidence of saturation of themes and consistency with other studies in the literature, giving us confidence in the findings. Additionally, the sample was composed of only English speakers and the majority of participants identified as White. Inclusion of a more diverse sample with regard to language and race may have identified additional or differing barriers and/or motivations for attending CR. The sample was embedded within the context of all having been recommended to attend CR and may not be representative of individuals who do not receive an automatic referral and/or heavily subsidized participation costs. Finally, the selection of interview questions and interpretation of qualitative themes may have been influenced by the researchers’ social lens. This concern is mitigated by the observation that two interdisciplinary researchers with divergent training backgrounds (nursing, psychology) independently read the transcripts and came to consensus about themes.

The present findings indicate that the brief period following referral, but prior to CR participation, represents an optimal opportunity to assist patients in making in-the-moment decisions in favor of this highly effective secondary/tertiary prevention program. Importantly, this study yields valuable insights that can be used to inform novel strategies to promote CR utilization, consistent with the innovative ORBIT Model (Czajkowski et al., 2015) which endorses a phased approach to behavioural intervention development. Given that patients report both positive and negative aspects of CR participation following referral, individualized efforts
to address knowledge gaps, inform patients about the multifaceted nature of CR services (beyond just exercise), collaboratively problem-solve barriers, and build motivation by resolving ambivalence (e.g., through motivational interviewing; Miller & Rollnick, 2013) may represent effective strategies for increasing enrolment. The next logical step in future research is to define and test a behavioural intervention to promote CR enrolment that addresses the patient-identified issues in this study, while incorporating appropriate evidence-based behaviour change theory and techniques.
Table 2.1

Aggregate Sample Characteristics (n = 14)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>61.0</td>
<td>42-85</td>
</tr>
<tr>
<td>Education (years)</td>
<td>13.0</td>
<td>8-18</td>
</tr>
<tr>
<td>Time since event (days)</td>
<td>14.5</td>
<td>10-40</td>
</tr>
<tr>
<td>Strength of physician endorsement (1-5)</td>
<td>4.0</td>
<td>2-5</td>
</tr>
<tr>
<td>Distance to CR (minutes)</td>
<td>30.0</td>
<td>8-150</td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms of depression</td>
<td>3.0</td>
<td>0-6</td>
</tr>
<tr>
<td>Symptoms of anxiety</td>
<td>3.0</td>
<td>2-15</td>
</tr>
</tbody>
</table>

\(^a\)Cut-off scores indicate symptoms in the normal (0-7), mild (8-10), moderate (11-14), and severe (15-21) ranges.

<table>
<thead>
<tr>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>8</td>
</tr>
<tr>
<td>Enrolled in CR</td>
<td>8</td>
</tr>
<tr>
<td>Primary diagnosis</td>
<td></td>
</tr>
<tr>
<td>STEMI</td>
<td>4</td>
</tr>
<tr>
<td>NSTEMI</td>
<td>5</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>5</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married or common-law</td>
<td>12</td>
</tr>
<tr>
<td>Single or divorced</td>
<td>2</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>6</td>
</tr>
<tr>
<td>Retired</td>
<td>6</td>
</tr>
<tr>
<td>Disability leave</td>
<td>2</td>
</tr>
<tr>
<td>Highest education</td>
<td></td>
</tr>
<tr>
<td>High school diploma or less</td>
<td>9</td>
</tr>
<tr>
<td>Trade school/community college</td>
<td>4</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>1</td>
</tr>
<tr>
<td>Racial identity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>13</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>Foreign-born</td>
<td>5</td>
</tr>
<tr>
<td>Family income (CAD$)</td>
<td></td>
</tr>
<tr>
<td>20,000-40,000</td>
<td>1</td>
</tr>
<tr>
<td>40,001-60,000</td>
<td>3</td>
</tr>
<tr>
<td>60,001-80,000</td>
<td>4</td>
</tr>
<tr>
<td>100,000+</td>
<td>4</td>
</tr>
</tbody>
</table>

Note. CR = cardiac rehabilitation, STEMI = ST-segment elevation myocardial infarction, NSTEMI = Non-ST-segment elevation myocardial infarction, CAD$ = Canadian dollars.
Table 2.2

*Themes and Sub-Themes Identified in Qualitative Interviews*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated Benefit</td>
<td><em>Access to specialist healthcare providers</em></td>
</tr>
<tr>
<td></td>
<td><em>Longevity and reduced cardiovascular risk</em></td>
</tr>
<tr>
<td></td>
<td><em>Motivation, accountability, and support</em></td>
</tr>
<tr>
<td></td>
<td><em>Learning opportunities</em></td>
</tr>
<tr>
<td></td>
<td><em>Fitness and general functioning</em></td>
</tr>
<tr>
<td>Perceived Ability</td>
<td><em>Concerns about exercise</em></td>
</tr>
<tr>
<td></td>
<td><em>Distance and transportation</em></td>
</tr>
<tr>
<td></td>
<td><em>Financial considerations</em></td>
</tr>
<tr>
<td></td>
<td><em>Scheduling conflicts</em></td>
</tr>
<tr>
<td>Contextual Influences</td>
<td><em>Healthcare provider recommendation</em></td>
</tr>
<tr>
<td></td>
<td><em>First impressions</em></td>
</tr>
<tr>
<td></td>
<td><em>Evolving knowledge about cardiac rehabilitation</em></td>
</tr>
<tr>
<td></td>
<td><em>Input from family and peers</em></td>
</tr>
<tr>
<td></td>
<td><em>Psychological distress</em></td>
</tr>
</tbody>
</table>
Table 2.3

Characteristics of Individual Respondents (n = 14)

<table>
<thead>
<tr>
<th>ID #</th>
<th>Age (Years)</th>
<th>Sex</th>
<th>Strength of Physician Recommendation (1-5)</th>
<th>Travel Time to CR (Minutes)</th>
<th>Marital Status</th>
<th>Enrolled in CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>≤60</td>
<td>M</td>
<td>5</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>02</td>
<td>&gt;60</td>
<td>M</td>
<td>3</td>
<td>&gt;30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>03</td>
<td>≤60</td>
<td>M</td>
<td>4</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>04</td>
<td>&gt;60</td>
<td>F</td>
<td>5</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>N</td>
</tr>
<tr>
<td>05</td>
<td>≤60</td>
<td>M</td>
<td>5</td>
<td>&gt;30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>06</td>
<td>≤60</td>
<td>M</td>
<td>4</td>
<td>&gt;30</td>
<td>Single/Divorced</td>
<td>N</td>
</tr>
<tr>
<td>07</td>
<td>≤60</td>
<td>M</td>
<td>5</td>
<td>≤30</td>
<td>Single/Divorced</td>
<td>N</td>
</tr>
<tr>
<td>08</td>
<td>&gt;60</td>
<td>F</td>
<td>2</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>N</td>
</tr>
<tr>
<td>09</td>
<td>&gt;60</td>
<td>M</td>
<td>3</td>
<td>&gt;30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>10</td>
<td>≤60</td>
<td>F</td>
<td>5</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>11</td>
<td>&gt;60</td>
<td>F</td>
<td>3</td>
<td>&gt;30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
<tr>
<td>12</td>
<td>≤60</td>
<td>F</td>
<td>3</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>N</td>
</tr>
<tr>
<td>13</td>
<td>&gt;60</td>
<td>F</td>
<td>3</td>
<td>&gt;30</td>
<td>Married/Common-Law</td>
<td>N</td>
</tr>
<tr>
<td>14</td>
<td>&gt;60</td>
<td>M</td>
<td>4</td>
<td>≤30</td>
<td>Married/Common-Law</td>
<td>Y</td>
</tr>
</tbody>
</table>

Note. CR = cardiac rehabilitation.
CHAPTER THREE: The Design and Evaluation of a Brief Motivational Intervention to Promote Enrolment in Cardiac Rehabilitation Following Acute Coronary Syndrome: The UPBeAT-CR Study
Abstract

Background: Despite the clinical and cost-effectiveness of cardiac rehabilitation (CR), only a subset of eligible patients enroll. This paper describes the development of a brief motivational intervention to promote enrolment in CR, and details the protocol for a randomized controlled trial to assess feasibility and preliminary efficacy. Methods/Results: A two-part study is being conducted with acute coronary syndrome patients following referral but prior to starting a 12-week outpatient CR program. Part 1 involved the application of qualitative findings in designing an intervention to bolster anticipated benefits of CR, assist patients in overcoming barriers, and address contextual variables, using a motivational interviewing style of counseling. Part 2 is an ongoing investigation to pilot the intervention and examine its impact on intention to enroll in CR. Patients were randomly assigned to a brief motivational intervention or usual care. Secondary outcomes include CR beliefs, barriers, exercise self-efficacy, perceived illness severity, social support, actual enrolment, and intervention acceptability. Between June 2015 and April 2016, 100 patients were recruited in-person or by phone following a CR orientation appointment. Two patients dropped out before receiving the intervention, and two were excluded, yielding a final $n = 96$. Recruitment is complete, and results are expected in mid-2017. Conclusion: This study will inform efforts to promote participation in an under-utilized program that significantly improves health outcomes. Key strengths are the use of patient-identified targets to inform intervention design and the exploration of plausible mechanisms.
Background

Despite advances in diagnosis and treatment, cardiovascular disease (CVD) remains a leading cause of death worldwide (World Health Organization, 2014), with acute coronary syndrome (ACS; myocardial infarction and unstable angina) accounting for roughly half of CVD mortality (Kolansky, 2009). Cardiac rehabilitation (CR), which typically involves a combination of supervised exercise, health education, medical assessments, and comprehensive risk factor modification (Grace et al., 2014; Humphrey et al., 2014; Menezes et al., 2014; Sandesara et al., 2015), is an essential and effective tertiary prevention strategy for ACS (Balady et al., 2011; National Institute for Health and Care Excellence, 2013; World Health Organization, 1993). CR is associated with reductions in mortality (20-26%) and CVD events (Anderson et al., 2016; Rutledge, Redwine, Linke, & Mills, 2013; Taylor et al., 2004). Even with remarkable evidence supporting its clinical and cost-effectiveness (Anderson et al., 2016), CR remains under-utilized, with only 19-59% of eligible patients enrolling depending on location and referral practices (Ades et al., 2017; British Heart Foundation, 2016; Grace et al., 2014).

Efforts to improve CR utilization have included automatic referral (Beswick et al., 2005) and encouraging attendance following enrolment (Balady et al., 2011; Davies et al., 2010). Over the past five years, however, there has been growing recognition that non-enrolment by referred patients represents a distinct problem (Humphrey et al., 2014; Mazzini, Stevens, Whalen, Ozonoff, & Balady, 2016; Menezes et al., 2014). At least 10 randomized controlled trials (RCTs) have now tested interventions designed to increase CR enrolment using a variety of strategies, including peer and professional support, informational pamphlets, changes to CR program delivery (e.g., prompt scheduling of initial appointment, home-based programs), assistance with coordinating care, education, and general encouragement (Ali-Faisal et al., 2016; Beckie &
Interventions that have specifically targeted patients who received a CR referral have resulted in enrolment increases ranging from 10-27% compared to usual care (Cossette et al., 2012; Mosleh et al., 2014; Pack et al., 2013; Price, 2012; Wyer, Earll, Joseph, Harrison, et al., 2001). These findings suggest several promising approaches to bridge the gap between CR referral and enrolment, though clear conclusions cannot be drawn due to limitations of the existing literature. These include problems with study design including the targeting of patients who may not have been referred to CR, unclear descriptions of intervention fidelity, and lack of attention to potential mechanisms of change. For example, even when variables thought to influence enrolment are explicitly targeted [e.g., intention (Mosleh et al., 2014), beliefs about CR and its benefits (Dankner et al., 2015; Mosleh et al., 2014), self-efficacy/perceived behavioural control (Carroll et al., 2007; Mosleh et al., 2014), illness perception (Mosleh et al., 2014), and social support (Carroll et al., 2007; Parry et al., 2009)], they are generally not measured as trial outcomes. Perhaps most importantly, efforts to promote CR enrolment have not been tailored to barriers frequently cited by patients (Karmali et al., 2014).

In this paper, we (1) describe how a brief motivational intervention was developed to promote enrolment in CR among ACS patients who received a CR referral, and (2) detail the protocol and recruitment results for the Understanding and Promoting Behaviour Change Amid Transition to Cardiac Rehabilitation (UPBeAT-CR) Study, an ongoing small-scale RCT to assess feasibility and preliminary efficacy of this intervention. We took an innovative, phased approach
to intervention design, based on the Obesity-Related Behavioural Intervention Trials (ORBIT) model (Czajkowski et al., 2015), in which qualitative methods were first used to characterize elements identified by patients as crucial to address amid their transition to CR.

**Study Aims and Hypotheses**

The primary aim of this study is to examine whether a brief motivational intervention can increase intention to attend CR, relative to a usual care control group. We focus on intention as the primary outcome in order to understand whether the intervention can influence intermediary variables purported to underlie actual health behaviour change. Secondary objectives are to evaluate the impact of the intervention on CR beliefs, barriers, exercise self-efficacy, illness perception, social support, and actual CR enrolment. Actual CR enrolment is assessed to characterize rates of program uptake and to get a preliminary indication of efficacy. Feasibility measures include study recruitment and intervention acceptability. We hypothesize that, compared to usual care, the motivational intervention will be associated with greater intention to attend CR, more positive beliefs about CR, fewer CR barriers, higher exercise self-efficacy, greater perceived illness severity, greater social support, and a greater likelihood of CR enrolment.

**Materials and Methods**

**Study Setting**

This study targets patients referred to TotalCardiology Rehabilitation, a major outpatient CR program serving a large urban center in Alberta, Canada. The program adheres to the Canadian Association of CR guidelines (Stone, 2009) and involves 12 weeks of supervised moderate-intensity exercise sessions, held twice weekly. In addition, the CR programs offers supplementary courses on stress management, yoga, and strength training, and individual
appointments with physicians and other healthcare providers (i.e., dietician, exercise specialists, smoking cessation nurse). There is a participation fee of $500 Canadian. This fee is routinely reduced to $0 for patients with financial barriers, though patients can be hesitant to ask for the fee waiver (Rouleau et al., 2016). Supervised exercise sessions are available at two sites to serve patients across the city. A home-based exercise program is available to patients who have difficulty attending in-person exercise sessions, and involves attendance at one in-person session with subsequent follow-up support by phone. Published data from this CR center demonstrate improved survival, decreased risk of all-cause hospitalizations, and improved physical and mental health outcomes associated with program completion (Campbell et al., 2012; Martin et al., 2012).

All ACS patients admitted to the cardiology ward or coronary care units in the city are automatically referred to the CR center (see Figure 3.1 for a summary of clinic practices and baseline enrolment statistics for this CR program). Prior to hospital discharge, all patients receive an information pamphlet about the CR program and a recommendation to enroll by the attending physician. A referral form is sent to the CR program from the hospital ward/unit. An initial CR orientation appointment is automatically scheduled at the CR center within seven days of hospital discharge. At this appointment, patients receive an exercise stress test, consultation about medication and symptom management, and further encouragement to enroll in the CR exercise program. The CR orientation appointment is attended by the majority (≈ 85%) of referred patients. Most referred patients (≈ 75%) also attend two educational classes about CVD and risk factors held prior to starting exercise, which are designed to further prepare patients for the main CR program. Depending on health status and personal circumstances, the first exercise session is typically scheduled within 2 to 3 weeks of the orientation appointment.
At the time of study implementation, approximately 140 new ACS referrals were received per month, and there was a 70% enrolment rate (i.e., attendance at ≥1 exercise session) among eligible patients who receive an original referral. This high enrolment rate compared to other programs (Cossette et al., 2012; Mosleh et al., 2014; Pack et al., 2013; Price, 2012; Wyer, Earll, Joseph, Harrison, et al., 2001) is likely attributable to rigorous use of standard practices known to increase utilization including automatic referrals. Yet, 30% of referred patients still do not enroll.

**Intervention Development**

The intervention was designed based on a review of the literature relating to strategies for effectively promoting health behaviour change and CR utilization, as well as formative qualitative research. Existing literature indicates the potential value of one-on-one support from a healthcare provider (Cebrick-Grossman, 2016; Dressler et al., 2012; Harkness et al., 2005; Jolly et al., 1999), assistance with overcoming CR barriers (Ali-Faisal et al., 2016; Cossette et al., 2012; Dolansky et al., 2011; Harkness et al., 2005; Price, 2012), continuity of care (Jolly et al., 1999; Pack et al., 2013; Scott et al., 2013), education about CVD and the benefits and components of CR (Carroll et al., 2007; Cossette et al., 2012; Dankner et al., 2015; Dolansky et al., 2011; Harkness et al., 2005; Jolly et al., 1999; Mosleh et al., 2014; Price, 2012; Scott et al., 2013; Wyer, Earll, Joseph, Harrison, et al., 2001), and encouragement to attend (Carroll et al., 2007; Cossette et al., 2012; Dankner et al., 2015; Jolly et al., 1999; Parry et al., 2009), for promoting uptake into CR. Consistent with concerns raised in recent systematic reviews (Davies et al., 2010; Karmali et al., 2014), however, we wanted to tailor the intervention to reflect specific concerns identified by patients from our CR setting. We also observed that existing interventions appear to emphasize educating patients about CR and why it is important, despite
the limitations of education/advice as the sole means of motivating health behaviour change (Rollnick, Kinnersley, & Stott, 1993; Rubak et al., 2005).

We therefore postulated that motivational interviewing would address the need to individually tailor the intervention to patients’ level of intention and barriers to change. Motivational interviewing is a directive, patient-centered counseling style designed to elicit patients’ own reasons for change and resolve ambivalence (Miller & Rollnick, 2013). Compared to traditional advice-giving, motivational interviewing has demonstrated efficacy for enhancing a range of health behaviours including attending medical appointments, engaging in physical activity, and adhering to medications (Lundahl et al., 2013; Rubak et al., 2005), making it potentially suitable for prospective CR patients given the complex adherence requirements of this program. There is preliminary support for the use of motivational interviewing to promote patient-initiated referrals to CR (Grace et al., 2005), exercise and adherence behaviours during CR (Beckie & Beckstead, 2010; Scales et al., 2003), and exercise following CR (Hughes et al., 2002), but this approach has not been assessed as a means to support the initial decision to enroll. Further, motivational interviewing is effective even in brief (15-30 minute) encounters (Hughes et al., 2002; Rubak et al., 2005).

To design the intervention, we also used results from qualitative research conducted with ACS patients who were referred to the CR program but who had not yet enrolled. Details about this qualitative study are reported elsewhere (see Chapter 2; Rouleau et al., 2016). Results from thematic analysis suggested the intervention should: (a) bolster anticipated benefits of CR by highlighting personally relevant outcomes, (b) assist patients in overcoming common and modifiable barriers to attendance, while (c) addressing contextual variables that patients deem important as they transition from hospital to outpatient rehabilitation, such as emotional distress.
and knowledge gaps about CR. See Table 3.1 for a description of how qualitative themes from Rouleau et al. (2016) were incorporated into the intervention.

The qualitative study also provided insight into how to feasibly deliver the intervention within our particular setting. We originally intended to intervene before patients had any interaction with the CR program to ensure inclusion of patients who do not even attend the orientation appointment; however, this proved to be unfeasible. When approached about participation in the qualitative study, patients generally reported being unable to answer questions about their decision to attend/not attend CR without first learning what the program entails at the orientation appointment.

After identifying factors that were important to address in the intervention, the research team met with CR staff members from multiple disciplines (nurses, managers, administrative staff, and exercise physiologists) to brainstorm a menu of strategies that have helped previous patients overcome common obstacles to CR enrolment. These strategies were also incorporated into the intervention.

**Trial Design**

Ethical approval for this study was obtained from the Conjoint Health Research Ethics Board at the University of Calgary. The study is an unblinded, parallel, two-group RCT evaluating the effects of the motivational intervention versus usual care (clinicaltrials.gov registration #NCT02721758). Eligible patients were informed they would be randomly assigned to one of two groups aimed at better understanding the barriers to CR participation: an “interview group” or a “no-interview group.” As shown in the study flowchart (Figure 3.2), after providing written informed consent, patients completed baseline questionnaires focused on demographic and covariate information, then were assigned to the motivational intervention.
(interview group) or usual care (no-interview group) using blocked randomization with a 1:1 allocation ratio and a random number generator (www.randomizer.org; randomization completed by an assistant otherwise uninvolved with the study). Allocation was concealed through the use of sealed envelopes, prepared by a research assistant, and opened by the interventionist following the patient’s completion of baseline questionnaires. At the end of the meeting, participants in both conditions were given a questionnaire package assessing primary and secondary outcomes, to be completed at least one day after meeting with the researcher but prior to their first CR exercise appointment. CR enrolment status is in the process of being obtained from patients’ medical records.

Participants

Participants include men and women with confirmed ACS who were eligible for the CR program described above, English-speaking, had no apparent cognitive or hearing impairment that would interfere with study participation, and reported being able to complete the study prior to their first scheduled CR exercise appointment. The latter criterion was included to promote retention in the study and completion of outcome measures. Eligibility criteria for the CR program include age $\geq 18$ years, a physician referral to CR, and medical clearance to exercise.

Recruitment Strategy

Patients were recruited after being referred to CR, but prior to starting the 12-week exercise program. CR referral and age $\geq 18$ were confirmed by a program nurse prior to scheduling the CR orientation appointment and, therefore, were not assessed by the research team. Clearance to exercise was determined during an exercise stress test conducted during the CR orientation appointment. At the end of the initial CR orientation appointment, a staff member spent roughly 5-15 minutes to explain CR program content to patients who had been medically
cleared for exercise, then asked the patient’s permission to be contacted about the research study. CR staff informed the researcher if patients were clearly ineligible for the study (e.g., lack of English proficiency, not cleared to exercise) based on their interaction at the orientation appointment.

Patients who provided permission to be contacted either met with the researcher at the end of the orientation appointment (if feasible), or received a telephone call from the researcher within 1-2 days. During this meeting or phone call, a clinical psychology doctoral candidate (researcher, C. R. R.) further assessed eligibility including the patient’s ability to follow through with study requirements prior to their first CR exercise appointment. Issues with language, cognition, and hearing were evaluated based on patients’ behaviour during the eligibility screen and/or by asking the patient whether these issues would interfere with study participation. Interested patients scheduled a time to complete the study either at the CR center, the University of Calgary, or at a home visit. Randomization was undertaken during the research meeting, following informed consent and completion of baseline questionnaires.

**Motivational Intervention Condition**

Patients assigned to the intervention participated in a single 30- to 60-minute session with the researcher (see Appendix C for intervention protocol). There were no restrictions regarding patients’ access to concomitant care including services offered through the CR program. The intervention was framed to patients as a component of their initial CR orientation appointment:

“*During our meeting today, my goal is to work with you to discuss whether the CR program could be of benefit to you and, if so, in what ways. I generally follow the structure of asking about what might be important to you in the program, and any obstacles you might see to taking part,*” followed by an invitation for the patient to contribute to the session agenda.
The intervention components (Table 3.1) were delivered using a template that included:
(1) developing rapport (attending to emotion and physical context, inviting significant others to join, promoting favourable first impressions); (2) clarifying and building importance (providing education as-needed, incorporating CR information that patients find valuable, tying CR participation to personal goals/values); (3) building confidence and evoking a change plan (collaboratively problem-solving barriers to CR attendance), and; (4) summarizing the session.

In addition to covering these content areas, the interventionist adopted a motivational interviewing style of communication (Miller & Rollnick, 2013) which involved a stance of equipoise, strategic responding to change- and sustain-talk (i.e., patients’ utterances related to reasons for and against CR, respectively), promotion of patients’ autonomy, and affirmations about the patients’ strengths.

Usual Care Condition

Patients randomized to usual care met with the researcher after the CR orientation appointment but prior to program enrolment. During the meeting, patients completed questionnaires assessing baseline socio-demographic information, learned about their randomization (i.e., that they would not be asked to do an interview), then discussed instructions for the outcome questionnaires. The researcher did not provide advice or information about the program or about overcoming CR barriers. Usual care also comprised of encouragement from the cardiologist and program staff to participate in the 12-week CR exercise program. We elected to use usual care as the comparison group because we are primarily concerned with examining the added benefit of the motivational intervention compared to the standard of care. In our setting, standard of care represents state-of-the-art, guideline-adherent practice (Stone, 2009) that is consistently delivered to ACS patients in the region, suggesting usual care is a stringent
comparator (Freedland, Mohr, Davidson, & Schwartz, 2011). Further, usual care is considered an appropriate control condition in early intervention development (Freedland et al., 2011).

**Intervention Fidelity**

To ensure fidelity, the interventionist (C. R. R.) followed a manualized intervention protocol (Appendix C) and was a qualified doctoral candidate in clinical psychology with over 200 hours of supervised experience with motivational interviewing in a CR population. The interventionist also attended a two-day advanced motivational interviewing workshop (Institute for Individual and Organization Change, 2014, Spokane, USA). With patients’ permission, all intervention sessions were audio-recoded and reviewed for fidelity during regular supervision meetings with a doctorally prepared clinical health psychologist (T.S.C.) who has expertise in motivational interviewing (Armstrong et al., 2011; Armstrong et al., 2013; Rash et al., 2016; Rouleau et al., 2015; Sinclair et al., 2010). Following the intervention, patients completed the Client Evaluation of Motivational Interviewing (CEMI; Madson et al., 2013), a 16-item, patient-reported fidelity measure that assesses the degree to which a clinician exhibits key relational and technical aspects of motivational interviewing. Factorial validity of the CEMI has been previously established (Madson et al., 2013). Fidelity will be reported using CEMI descriptive statistics, and correlations between CEMI scores and study outcomes.

**Measures**

**Baseline characteristics.** Baseline sample characteristics were obtained via a questionnaire package, administered following receipt of informed consent and prior to randomization. The baseline questionnaires assessed self-reported racial identity, marital status, education, family income, distance from the CR center, employment status, symptoms of depression (Center for Epidemiologic Studies Depression Scale 10; Irwin, Artin, & Oxman,
1999), fatigue (Fatigue Severity Scale; Krupp, La Rocca, Muir-Nash, & Steinberg, 1989), personality characteristics (Big Five Inventory 10; Rammstedt & John, 2007), and perceived strength of physician endorsement of CR (1 = physician did not recommend, 3 = moderate recommendation for CR, 5 = strong recommendation; Ades et al., 1992). Age, sex, and disease information (e.g., treatments received, time since ACS event) were obtained by medical chart review.

**Primary and secondary outcomes.** See Table 3.2 for details and psychometric properties of primary and secondary outcome measures, administered at least one day post-intervention but prior to attending the first scheduled CR exercise class. Enrolment in CR was defined as attendance at ≥1 exercise appointment while a patient’s referral was open with the CR program, evaluated using chart review. Referrals were closed if the patient explicitly refused to participate in the CR program or if program staff were unable to contact the patient within 60 days. Intervention acceptability was evaluated by asking participants in the intervention arm to rate the usefulness of the brief motivational intervention, their comfort level during the intervention, how much the intervention influenced decisions about CR participation, and to list what they learned and liked/disliked (adapted from Adamian, Golin, Shain, & DeVellis, 2004). To reduce social desirability, participants were given permission to critique the session and were informed of the need for honest feedback.

**Data Analysis Plan**

Data analysis for the present study will begin once all outcome data are collected and cleaned. Reporting will follow Consolidated Standards of Reporting Trials (CONSORT) guidelines (Schulz, Altman, Moher, & Group, 2010). Analyses will be carried out using SPSS 24.0 for Windows (International Business Machines Corporation, Armonk, NY). Tests will be
performed using a two-sided alternative hypothesis, at a critical significance level of 5%. Owing to the preliminary nature of this study, $p$-values will be unadjusted for multiple comparisons. For all analyses, relevant assumptions (e.g., normality, heterogeneity) will be evaluated and effect sizes will be reported whenever possible. Descriptive statistics for outcome variables will be reported in order to estimate key feasibility parameters (e.g., actual CR enrolment) and to inform power calculations in future trials.

**Primary analysis.** To evaluate the first hypothesis that patients in the motivational intervention will report greater intention to attend CR relative to patients in usual care, a between-subjects analysis of covariance (ANCOVA) will be conducted with group (intervention, usual care) as the between-subjects factor, and age, sex, strength of physician recommendation to attend CR, and depressive symptom severity as covariates. Covariates were selected a priori based on variables consistently associated with CR participation in previous research (Daly et al., 2002; Mazzini et al., 2016; Turk-Adawi et al., 2014). Covariates will be included to improve precision of the intervention effect estimates by reducing unexplained variance attributable to extraneous influences on CR intention (Van Breukelen & Van Dijk, 2007). The same covariates will also be included in the secondary analyses described below.

**Secondary analyses.** To evaluate the second hypothesis that, relative to patients in usual care, those in the motivational intervention will report more positive beliefs about CR, fewer CR barriers, higher exercise self-efficacy, greater perceived illness severity, and greater social support, a series of between-subjects ANCOVA tests will be conducted for each dependent variable, with group as the between-subjects factor, using the same four covariates described above. To evaluate the third hypothesis that patients in the motivational intervention condition will be more likely to enroll in CR, a hierarchical logistic regression will be conducted with
covariates entered in Block 1 and group membership (intervention, usual care) entered in Block 2, with enrolment in CR (1= yes, 0 = no) as the dependent variable. To evaluate the fourth hypothesis that the motivational intervention will be acceptable to patients, descriptive statistics will be used to report aggregate responses on the intervention acceptability measure.

**Data management.** Given the short duration of this trial and lack of known risks, there is no formal data monitoring committee and no interim analyses will be conducted. Study data are securely stored and accessible only by the research team. Paper files, including questionnaires, are kept in a locked filing cabinet, and audio-recordings of intervention sessions are stored on a password-protected computer in a locked office. Identifying information, including consent forms and a file linking participants’ names to their identification numbers, is stored independently of data files. Data are entered into an electronic database by an undergraduate research assistant trained in SPSS and data entry. To ensure accurate entry, meetings are held once per month between the research assistant and study team. Further, 20% of electronic data will be checked against hard-copy files, and range checks will be completed for all study variables.

**Sample Size Calculation**

Sample size was estimated based on the number of patients needed to assess the primary outcome, intention to attend CR. Intention has been measured as an outcome of motivational interventions for reducing substance use, but not as an outcome in interventions for CR enrolment. A combination of these two types of studies was used to estimate required sample size. First, an RCT testing brief (15-20 minute) motivational interviewing for substance use showed large reductions in intention to use marijuana relative to usual care ($d = 0.86$, which corresponds to $f = 0.43$ D’Amico, Miles, Stern, & Meredith, 2008). Second, in an RCT
conducted in a CR program with a baseline enrolment rate similar to our program (Mosleh et al., 2014), a theory-based invitation letter to CR resulted in a 10% increase in enrolment \( (d = 0.59, \text{ which corresponds to } f = 0.30) \) compared to usual care (Mosleh et al., 2014); in the current trial, we anticipate the brief motivational interviewing intervention will improve intention to attend CR by at least this magnitude. Using the \( f \)-values reported above, setting power at 80% and alpha \( = .05 \), using two-tailed hypothesis-testing, and including four covariates, a total of 45 to 90 patients (23 to 45 per group) was estimated to be necessary (calculated with \( G^* \)Power 3.1 Software, Heinrich-Heine-University Düsseldorf; Faul, Erdfelder, Lang, & Buchner, 2007). Taking into account potential attrition, we aimed to recruit 50 patients per group for a total sample of 100.

**Recruitment Results**

As shown in Figure 3.2, a total of 164 patients were approached about study participation and assessed for eligibility between June 2015 and April 2016. Of these, 100 patients provided informed consent, baseline questionnaire data, and were randomized to either the motivational intervention or usual care. Among patients excluded from the study \( (n = 64) \), a small subset declined to participate due to lack of interest \( (9\%, n = 15) \), with reasons that included feeling too overwhelmed, living out of town, or feeling like they would not benefit from the study. The remaining 49 were excluded due to not meeting inclusion criteria, with the most common reason being inability to schedule the study prior to the first CR exercise session \( (23\%, n = 37) \).

One patient who provided informed consent and was assigned to the control condition completed study questionnaires after he was already several weeks into the CR exercise program, presumably due to miscommunication about the prescribed time frame for the study; this participant’s data will not be used. Among patients randomized to the intervention condition, one
started the motivational session but was unable to follow the intervention protocol due to extraneous interference so was excluded. Two patients dropped out before receiving the intervention, which led us to re-evaluate our study protocol after recruiting 25% of the sample. The protocol initially involved the option to break up the study into two meetings—one meeting to complete informed consent and baseline questionnaires, and one meeting to complete the motivational intervention (as applicable)—which led to dropout between the two meetings.

Instead, we began administering informed consent, baseline questionnaires, and the motivational intervention all during a single meeting. This modification eliminated dropout. Completion rates for outcome questionnaires were 98% for patients who received usual care ($n = 48$) and 100% ($n = 47$) for patients who received the motivational intervention. We are still in the process of collecting actual CR enrolment outcomes and baseline medical characteristics; it is expected CR enrolment data will be available for all participants given our use of chart review.

**Discussion**

The UPBeAT-CR Study will provide preliminary information regarding the efficacy of a brief intervention that targets patient-identified barriers and utilizes a motivational interviewing style of counseling to increase CR enrolment. Such an intervention is crucial because CR has the potential to lead to widespread and clinically significant improvements in CVD morbidity and mortality. Key strengths of this study include the use of patient-centered qualitative research to inform intervention development; the characterization of outcomes through which the intervention might operate to promote CR enrolment; the delivery of the intervention during a period that appears central to decisions about CR participation (Rouleau et al., 2016); the use of state-of-the-art behaviour change strategies such as motivational interviewing; and the inclusion of well-described fidelity and intervention procedures. Further, this trial targets a previously
understudied group of patients—namely, those with a documented referral to CR who have not yet enrolled. This is essential, given that referral from a cardiologist or primary care physician is generally required for access to CR but does not guarantee the patient will enroll. As such, this research will inform replicable, patient-centered approaches that match patients’ needs, support comprehensive risk factor reduction, and enhance patients’ sense of control and responsibility for their own health.

Recruitment results indicate the preliminary feasibility of providing a brief health behaviour change intervention to ACS patients after hospital discharge but prior to attending CR, as indicated by the high rate of study enrolment by eligible patients (87%). Recruitment was facilitated by formative qualitative research, which provided key information about how and when to approach patients about study participation. The most common challenge in recruitment related to patients not having time to complete the study in the prescribed time frame. To address this, future research might benefit from incorporating face-to-face motivational interventions into standard clinic practices versus scheduling a separate appointment, and using electronically supported delivery (e.g., video calls) in order to fit within constraints of patients’ busy schedules following hospital discharge.

There is the potential that the intervention in its current form is not widely generalizable to real-world clinical practice. For instance, we only had access to the 85% of referred patients who attended the CR orientation appointment, whereas future research is required to characterize the remaining 15% who have no contact with the CR clinic at any point during their trajectory of CVD recovery. Although formal statistics are not available on the subset of patients who do not attend the initial CR orientation appointment, anecdotal evidence from CR staff indicates these patients are commonly non-English-speaking; therefore, it is possible that many would not have
been eligible for the present study. Further, the intervention was designed as an adjunct to
eexisting CR orientation services at our clinic, such as comprehensive education classes about
CVD and risk factor modification, and may not be representative of all CR programs. Also, it
may not be feasible to hire a full-time psychologist to deliver a 30- to 60-minute motivational
intervention, in person or during a home visit, to all prospective CR patients who are referred to
the program. Generalizability of study findings will be further limited by the convenience
sample. In particular, the exclusion of non-English-speaking patients is problematic given that
ethnic minorities are often underrepresented in CR (British Heart Foundation, 2016; Grace et al.,
2014).

Despite these limitations, this study will provide important early-phase evidence that is
needed prior to real-world implementation of novel behavioural strategies to support individuals’
enrolment in CR, consistent with the ORBIT model of intervention development (Czajkowski et
al., 2015). ORBIT endorses a phased approach to designing behavioural interventions that target
chronic disease management, in which preliminary research focused on intervention definition
and refinement is conducted prior to large-scale RCTs (Bacon et al., 2014; Czajkowski et al.,
2015). If the present study demonstrates an effect of this brief motivational intervention on
intention to attend CR, the next step will be to run an efficacy trial powered for the primary
outcome of actual CR enrolment. This evidence would be required prior to examining
effectiveness, including integration into routine practice delivered by a range of healthcare
providers.

Dissemination of the intervention, if ultimately warranted, will be enhanced by the
teachable, learnable nature of motivational interviewing skills that can be applied by a range of
healthcare providers (Rouleau et al., 2015). Future research might also examine whether the
motivational intervention is acceptable to ethnic minorities, and whether results can be replicated when delivered to non-English-speaking patients in their native language. The results will help inform future experimental and observational studies that may further refine the intervention and, eventually, may inform larger scale RCTs examining the impact of the intervention on longer term exercise adherence and CVD outcomes. Results from the UPBeAT-CR trial are expected to be available in mid-2017.
Table 3.1

*The Application of Formative Qualitative Research to the Design of a Brief Motivational Intervention to Promote Cardiac Rehabilitation Enrolment*

<table>
<thead>
<tr>
<th>Theme from Qualitative Interviews†</th>
<th>Intervention Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anticipated Benefit</strong></td>
<td>Discuss and build upon perceived benefits of CR, with a focus on enhancing favourable beliefs about the program. For patients motivated by negative affect (e.g., fear of recurrent CVD events), discuss the potential importance of tying CR participation to personal values and positive long-term goals. For patients who have difficulty identifying personal benefit, discuss CR outcomes valued by other patients, while addressing potential misunderstandings regarding CR program content.</td>
</tr>
<tr>
<td><strong>Perceived Ability</strong></td>
<td>Discuss the patient’s concerns about attending CR, while assessing for common barriers identified by other patients. Collaboratively problem-solve barriers, incorporating the patient’s own ideas and strengths. Always ask permission to give advice about potential solutions, provide a menu of options, emphasize multiple courses of action, and elicit the patient’s reaction to advice. If the patient feels ready to do so, work together to build a specific plan for addressing barriers.</td>
</tr>
<tr>
<td><strong>Contextual Influences</strong></td>
<td>Consolidate the physician’s recommendation to attend CR by informing the patient that CR is the gold standard treatment post-ACS. Help the patient tie CR participation to their own values/goals rather than being motivated only by external sources (e.g., what physician wants them to do). Foster a favourable first impression of CR through skillful rapport-building and discussion of the patient’s initial thoughts about the program. Acknowledge different levels of CR knowledge among patients, and address knowledge gaps as required. Attend to the patient’s emotional state, reflecting affect when appropriate. Invite the patient to include a family member or friend in the session, and discuss others’ views about the patient participating in CR.</td>
</tr>
</tbody>
</table>

†See Rouleau et al. (2016) for full details about qualitative themes.
Table 3.2

Description and Psychometric Properties of Primary and Secondary Outcome Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description and Psychometric Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Outcome:</strong></td>
<td></td>
</tr>
<tr>
<td>Intention to Attend CR</td>
<td>Assessed using the average of two items: (1) “My goal is to attend exercise classes at CR” with responses ranging from 1 (no exercise classes) to 7 (all exercise classes) and (2) “I intend to attend scheduled classes during CR” with responses ranging from 1 (strongly disagree) to 7 (strongly agree Ajzen, 2001; Blanchard, Courneya, Rodgers, Daub, &amp; Knapik, 2002; Mosleh et al., 2014). Greater intention, as measured above, has demonstrated associations with CR enrolment and adherence, positive attitudes toward exercise, greater perceived behavioural control over attending CR, and greater subjective norms about CR attendance (Blanchard et al., 2002; Blanchard et al., 2003; Mosleh et al., 2014). The correspondence between intention and behaviour ranges from $r = 0.40$-$0.82$ (Sheeran, 2002).</td>
</tr>
<tr>
<td><strong>Secondary Outcomes:</strong></td>
<td></td>
</tr>
<tr>
<td>Beliefs about CR</td>
<td>Assessed using the Beliefs About Cardiac Rehabilitation Scales (BACR; Cooper, Weinman, Hankins, Jackson, &amp; Horne, 2007), a 13-item questionnaire with items rated on a 5-point scale ranging from “strongly disagree” to “strongly agree.” Items are summed to provide a score on each of four subscales: perceived necessity, concerns about exercise, practical barriers, and perceived suitability. BACR subscales have demonstrated adequate internal consistency ($\alpha$ for individual subscales ranging from 0.70 to 0.79) and account for 65% of variance in CR adherence (Cooper et al., 2007).</td>
</tr>
<tr>
<td>CR Barriers</td>
<td>Assessed using the Cardiac Rehabilitation Barriers Scale (CRBS; Shanmugasegaram et al., 2012), a 21-item questionnaire designed to assess perceptions of patient, provider, and health system barriers to CR participation. Items are rated on a 5-point scale ranging from “strongly disagree” to “strongly agree,” and are averaged to provide a total score, with higher scores indicating greater perceived barriers. The CRBS has demonstrated criterion validity, convergent validity with related measures, acceptable test-retest reliability, and good internal consistency (Shanmugasegaram et al., 2012).</td>
</tr>
<tr>
<td>Measure</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Exercise Self-Efficacy</td>
<td>Assessed using the Multidimensional Self-Efficacy for Exercise Scale (MSES; Rodgers, Wilson, Hall, Fraser, &amp; Murray, 2008), a 9-item questionnaire that evaluates task, coping, and scheduling efficacy. Items are rated on a 100-point scale ranging from 0 (not at all confident) to 100 (completely confident), and are averaged to provide an overall estimate of exercise self-efficacy. The MSES has demonstrated a stable factor structure as well as internal consistency (α for subscales ranging from 0.79 to 0.96) and concurrent validity with exercise tolerance in CR patients (Fraser &amp; Rodgers, 2010; Rodgers, Murray, Selzler, &amp; Norman, 2013).</td>
</tr>
<tr>
<td>Illness Perception</td>
<td>Assessed using the Brief Illness Perception Questionnaire (BIPQ; Broadbent, Petrie, Main, &amp; Weinman, 2006), an 8-item questionnaire that assesses cognitive and emotional representations of illness. It evaluates perceived consequences, timelines, personal/treatment control, symptoms, concern, understanding, and emotional consequences associated with the illness. Items are summed to provide a total score, with higher scores indicating greater perceived threat of the illness. The BIPQ has demonstrated test-retest reliability, concurrent validity with related measures (e.g., self-efficacy r = 0.61), and predictive validity with CR session attendance (Broadbent et al., 2006).</td>
</tr>
<tr>
<td>Social Support</td>
<td>Assessed using the ENRICHD Social Support Inventory (ESSI; Mitchell et al., 2003), a 7-item questionnaire designed to assess social support in patients post-myocardial infarction. Items are rated from 1 (“none of the time”) to 5 (“all of the time”), and are summed to provide a total score, with higher scores indicating greater perceived social support.</td>
</tr>
<tr>
<td>Time Since Referral:</td>
<td>0 Days</td>
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<tr>
<td>----------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Program Component (Utilization Rate):</td>
<td>Referral (100%)</td>
</tr>
</tbody>
</table>

*Figure 3.1. Approximate timeline of referral and utilization for the TotalCardiology Rehabilitation CR program (based on unpublished program statistics at the time of study planning/implementation).*
Assessed for eligibility ($n = 164$)

Excluded ($n = 64$)
- Not meeting inclusion criteria ($n = 49$)
- Not eligible for CR ($n = 3$)
- Unable to schedule before CR enrolment ($n = 37$)
- Hearing impairment ($n = 1$)
- Not able to communicate in English ($n = 8$)
- Declined to participate ($n = 15$)

Informed consent ($n = 100$)

Baseline assessment ($n = 100$)

Randomized ($n = 100$)

Allocated to intervention ($n = 50$)
- Received allocated intervention ($n = 47$)
- Did not receive allocated intervention ($n = 3$)
  - Dropped out before receiving intervention ($n = 2$)
  - Unable to adhere to intervention protocol ($n = 1$)

Allocated to usual care ($n = 50$)
- Received allocated intervention ($n = 49$)
- Did not receive allocated intervention ($n = 1$)
  - Completed entire study after CR enrolment ($n = 1$)

Received allocated intervention ($n = 47$)

Did not receive allocated intervention ($n = 3$)

Dropped out before receiving intervention ($n = 2$)

Unable to adhere to intervention protocol ($n = 1$)

Completed outcome questionnaires ($n = 47$)
(Approx. 1-14 days)

Completed outcome questionnaires ($n = 48$)
(Approx. 1-14 days)

Assessment of CR enrolment ($n = 47$)
(Approx. 60 Days)

Assessment of CR enrolment ($n = 49$)
(Approx. 60 Days)

Figure 3.2. CONSORT flowchart of UPBeAT-CR study design and recruitment results
CHAPTER FOUR: Results from a Randomized Feasibility Trial of Motivational Interviewing to Promote Enrolment in Outpatient Cardiac Rehabilitation
Abstract

Background: Cardiac rehabilitation (CR) is an effective tertiary prevention program. Yet, a significant subset of referred patients do not enroll, and still fewer attend all scheduled CR sessions. Motivational interviewing could be beneficial in this context, but its efficacy for use with prospective CR patients has yet to be examined. Purpose: To examine the preliminary efficacy of motivational interviewing for increasing patients’ intention to participate in CR. Methods: Individuals with acute coronary syndrome (n = 96) were randomized to a single-session motivational interviewing session or to usual care, following CR referral but before CR enrolment. The aims of the intervention were to enhance perceived benefits of CR, problem-solve barriers, and address contextual influences on decision-making. The primary outcome was intention to attend CR, measured using a validated two-item scale. Secondary outcomes included self-reported CR beliefs, barriers, exercise self-efficacy, illness perception, social support, intervention acceptability, and chart-confirmed 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 CR sessions (p = .008). Mediation analyses revealed an indirect effect of the intervention on CR enrolment (b = 0.45, 95% CI 0.04-1.18) and CR adherence (b = 2.59, 95% CI 0.95-5.03) through higher levels of intention. Conclusions: Motivational interviewing delivered to patients with acute coronary syndrome prior to CR impacted important motivational variables and program adherence. The findings will inform future efforts to optimize behavioural interventions to enhance CR participation.
Introduction

The burden of cardiovascular disease (CVD) is well-documented. Although overall CVD mortality is declining in developed countries, it still accounts for one-third of deaths in the United States and remains the leading cause of death from non-communicable disease globally (Ford et al., 2007; Mozaffarian et al., 2015; Roth et al., 2015; World Health Organization, 2014). CVD is also associated with disability, increased hospitalizations, reduced quality of life, recurrent cardiovascular events, and substantial annual healthcare costs—over $300 billion in the United States alone (Mozaffarian et al., 2015; Smolina et al., 2012). One method to help relieve this significant burden is through cardiac rehabilitation (CR), the gold standard tertiary prevention treatment for various types of CVD including coronary artery disease, myocardial infarction, and unstable angina (Anderson et al., 2007; National Institute for Health and Care Excellence, 2013; Smith et al., 2011).

CR is comprised of medically supervised exercise and multidisciplinary self-management interventions such as smoking cessation, psychosocial support, medication consultation, and dietary counseling (Grace et al., 2014; Menezes et al., 2014). There is clear evidence of improved morbidity, survival, psychological distress, and cost-effectiveness resulting from CR (Alter et al., 2017; Anderson et al., 2016; Lavie et al., 2016; Oldridge, 2012), but its therapeutic benefits are limited by broad under-utilization. The vast majority of eligible patients do not participate in CR following myocardial infarction (86%) or coronary artery bypass surgery (69%), according to data from United States Medicare claims (Suaya et al., 2007). Lack of CR participation by referred patients is explained by two related, but distinct, behaviours: failure to enroll in CR and, among enrollees, failure to attend all recommended CR sessions (Ades et al., 2017). Across American, Canadian, and European CR settings, between 14-81% of CVD
patients referred to CR do not enroll (Gravely-Witte et al., 2010). Enrolment rates vary across regions due to factors such as cost, referral practices, and patient characteristics (British Heart Foundation, 2016; Grace et al., 2014; Menezes et al., 2014). Sustained CR adherence also remains suboptimal, with the average patient attending only 67% of prescribed sessions according to a recent meta-analysis (Oosenbrug et al., 2016). Given the importance of CR for improving health outcomes, it is critical to engage prospective CR patients soon after referral to promote their initiation and continued engagement with this highly effective treatment program (Ades et al., 2017).

Though reasons for low CR enrolment and adherence are multifaceted, a key barrier is patients’ ambivalence about change. Qualitative and survey-based data suggest patients commonly hold conflicting thoughts and feelings about attending CR (Everett et al., 2011; Rouleau et al., 2016; Shanmugasegaram et al., 2012). On the one hand, patients tend to recognize the importance of CR for their health, know it is physician-recommended, and value program elements, such as supervised exercise and social interaction. On the other hand, patients worry about engaging in exercise, believe they can make lifestyle changes on their own, or face practical barriers such as cost, scheduling, and transportation (Cooper et al., 2005; Dolansky et al., 2006; Rouleau et al., 2016; Shanmugasegaram et al., 2012). These findings suggest that a purely didactic approach that involves telling patients to attend CR and why it is important may be insufficient to promote utilization, as it ignores their level of intention to attend CR and difficulty associated with fitting CR into their lives.

In contrast to the traditional didactic approach, motivational interviewing may be better suited to increase intention to attend CR (Hancock et al., 2005). Motivational interviewing is a “person-centered counseling style for addressing the common problem of ambivalence about
change” (Miller & Rollnick, 2013, p. 29). It involves evoking patients’ own reasons for change, eliciting their problem-solving skills for overcoming barriers, and supporting autonomy through the use of empathy, collaboration, and strategic responding to statements about change (Moyers, Manuel, & Ernst, 2014). Increasing clinical attention has been devoted to the use of motivational interviewing for reducing CVD risk, but empirical data remain equivocal (Everett, Davidson, Sheerin, Salamonson, & DiGiacomo, 2008; Lee et al., 2016; Pietrabissa et al., 2015). A recent systematic review identified only four randomized controlled trials (RCTs) in which motivational interviewing was used with CVD patients (Lee et al., 2016), and indicated favourable effects on quality of life (Beckie & Beckstead, 2011; Chair et al., 2012; Chair et al., 2013), physical activity (Beckie & Beckstead, 2010), and smoking cessation (Bredie, Fouwels, Wollersheim, & Schippers, 2011; Cao, Wang, Shao, & Zhu, 2012). Despite substantial promise for the use of motivational interviewing to reduce CVD risk, existing research is limited by poorly described intervention procedures, and lack of attention to interventionist training, fidelity, and underlying processes of change (Copeland, McNamara, Kelson, & Simpson, 2015; Lee et al., 2016; Morton et al., 2015). A brief motivational intervention delivered prior to CR may address the considerable problem of patients not engaging in CR despite a referral and access to the program.

The present study is the first to evaluate motivational interviewing as a means to promote initial enrolment in CR. The limitations of prior research have been addressed by incorporating strategies to ensure and describe intervention fidelity, and by including several plausible mechanisms of change as study outcomes. The primary aim was to examine the impact of a brief motivational interviewing intervention to increase intention to attend CR among CVD patients who were referred to, but had not yet started, a CR program. Secondary outcomes included
beliefs about CR, barriers, exercise self-efficacy, illness perception, social support, actual CR participation, and intervention acceptability. The hypothesis was: relative to usual care, participants randomized to the motivational intervention would report greater intention to attend CR, more positive beliefs about CR, fewer barriers to attending CR, higher exercise self-efficacy, greater perceived illness severity, more social support, and would demonstrate higher rates of CR enrolment and CR adherence.

Methods

Study Design

A comprehensive description of methods and recruitment results has been previously reported (see Chapter 3). The Understanding and Promoting Health Behaviour Change Amid Transition to Cardiac Rehabilitation (UPBeAT-CR) Study utilized an unblinded, parallel RCT design (clinicaltrials.gov registration #NCT02721758). All participants provided written informed consent, completed baseline questionnaires assessing descriptive and covariate measures, and were then randomized using a 1:1 allocation ratio to either the motivational intervention or to a usual care control group. Next, participants were provided with a questionnaire package assessing primary and secondary outcome measures. They were instructed to complete the outcome questionnaires at least one day after the intervention (or, for control participants, one day after meeting with the researcher), but prior to their first scheduled CR exercise session. Chart review was subsequently conducted to ascertain CR enrolment and attendance, and to obtain additional socio-demographic and medical characteristics. A debriefing form about the study was sent to all participants after they had completed the full 12-week CR program (if they enrolled), or after their CR referral file was closed (if they did not enroll).
Recruitment was completed between June 2015 and April 2016. Ethical approval was obtained from the Conjoint Health Research Ethics Board at the University of Calgary.

**Participants and Setting**

Patients were eligible for study participation if they: were referred to a centralized outpatient CR program serving Calgary, Canada; had attended an initial CR orientation appointment; had a chart-confirmed diagnosis of acute coronary syndrome (i.e., myocardial infarction or unstable angina); were English-speaking; and if they reported being able/willing to complete the study prior to their first scheduled CR exercise session. The initial CR orientation appointment involves informing patients about the CR program structure/schedule and assessing the safety of initiating exercise on the basis of an exercise stress test. The CR orientation appointment was an inclusion criterion to ensure patients had basic information about the program and were suitable candidates to engage in CR-based exercise.

An automatic referral process exists for all patients diagnosed with acute coronary syndrome who are admitted to coronary care units or the cardiology ward within Calgary. These patients are recommended to attend the CR program by their in-hospital cardiologist, and then are automatically scheduled for the CR orientation appointment within seven days of hospital discharge. Prior to enrolling in CR, patients are also encouraged to attend education classes that provide more comprehensive information about CR, CVD risk factors, exercise, and other health behaviours that can positively influence heart health. The core CR program is comprised of 24 twice-weekly supervised exercise sessions for 12 weeks, offered at two clinic sites or in a home-based format (for patients unable to attend clinic-based exercise sessions). Patients are typically scheduled to start the CR exercise program (i.e., enroll in CR) within three to four weeks of referral.
Study Conditions

Refer to Chapter 3 for a comprehensive description of the intervention design. The intervention was based on the *Motivational Interviewing: Helping Patients Change* manual (Miller & Rollnick, 2013) and findings from qualitative research on patients’ decision-making about enrolment at this CR program (Rouleau et al., 2016; Chapter 2). Patients in the intervention attended a single, 30-60 minute motivational interviewing session held after referral to CR but prior to their first scheduled CR exercise class. The intervention was delivered by the researcher (C.R.R.), a clinical psychology doctoral student. The intervention involved discussing potential CR outcomes valued by the patient, collaboratively problem-solving barriers to CR attendance, and addressing contextual variables such as the patient’s emotional state and first impressions of the program. During the intervention session, participants also completed baseline questionnaires and received instruction for outcome questionnaires. Participants in the control condition received usual care, which included encouragement to attend CR by their referring cardiologist and by clinic staff during their CR orientation appointment. Control participants also met with C.R.R. to complete baseline study questionnaires and received instruction on how to complete the outcome questionnaires.

Fidelity was maintained through the use of a manualized intervention protocol (Appendix C). The interventionist also completed extensive training in motivational interviewing, including an advanced workshop through the Motivational Interviewing Network of Trainers (MINT), and a supervised clinical practicum focused on motivational interviewing and health behaviour change in CR patients. Fidelity was further ensured through weekly supervision and review of audiotaped sessions by a doctoral-level registered clinical psychologist with expertise in motivational interviewing (T.S.C.). The 16-item *Client Evaluation of Motivational Interviewing*
(CEMI; Madson et al., 2013) was used as an index of fidelity, completed by patients at least one day following the intervention but prior to their first scheduled CR session. Scores can range from 16 to 64, with higher scores indicating more motivational interviewing-consistent technical and relational behaviours by the interventionist. Internal consistency for the CEMI was acceptable (Cronbach’s $\alpha = 0.70$). The average CEMI score was divided by the total possible score of 64 to provide an index of interventionist skill. Associations were also examined between CEMI scores and trial outcomes.

**Measures**

**Baseline sample characteristics.** Before randomization, baseline descriptive information was gathered using a questionnaire package. Patients were asked to report their marital status, employment, education, family income, racial identity, estimated travel time to the CR center, perceived strength of the referring physicians’ recommendation to attend CR (1 = did not recommend, 3 = moderate recommendation, 5 = strong recommendation; Ades et al., 1992), and depressed mood (Center for Epidemiologic Studies Depression Scale 10, CESD-10; Irwin et al., 1999). Primary CVD diagnosis, age, time since coronary event, and baseline CVD risk factors (i.e. cholesterol profile, blood pressure, body mass index, and cardiorespiratory fitness) were routinely collected by the CR clinic, and were gathered with participants’ consent using medical chart review for this study.

**Outcome measures.** Psychometric properties of outcome measures are detailed in Chapter 3. The primary outcome, *Intention to Attend CR*, was measured using the average of two items rated on a seven-point scale, where higher values indicate greater intention (Blanchard et al., 2002; Blanchard et al., 2003). Internal consistency was excellent (Cronbach’s $\alpha = 0.96$).
The *Beliefs About CR* (BACR) scales were used to measure patients’ views and beliefs about the CR program (Cooper et al., 2007). The BACR comprises 13 items rated on a 5-point scale, separated into four subscales; higher scores on the *Perceived Necessity* scale reflect more favourable beliefs about CR, whereas higher scores on *Concerns about Exercise, Practical Barriers, and Perceived Suitability* reflect less favourable beliefs. Internal consistency in the present study (Cronbach’s $\alpha = 0.65-0.77$) was deemed adequate according to $\geq 0.60$ cutoff for scales with a small number of items (Loewenthal, 2001).

The *Cardiac Rehabilitation Barriers Scale* (CRBS) assessed the degree to which various patient-, provider-, and healthcare-related obstacles interfere with CR attendance (Shanmugasegaram et al., 2012). The average of 21 items is used to calculate a total CR barriers score, with higher scores indicating greater perceived barriers to CR attendance. Internal consistency in the present study was good (Cronbach’s $\alpha = 0.88$).

The *Multidimensional Self-Efficacy for Exercise Scale* (MSES) was used to measure patients’ confidence that they could complete exercise tasks correctly, engage in exercise in the face of challenges, and schedule exercise regularly (Rodgers et al., 2008). The nine MSES items are averaged to provide a total score ranging from 0 to 100%, where 100 = completely confident and 0 = not at all confident. The MSES demonstrated good internal consistency (Cronbach’s $\alpha = 0.88$).

The *Brief Illness Perception Questionnaire* (BIPQ) was used to measure the degree to which patients view their disease as severe or threatening (Broadbent et al., 2006). It consists of eight items rated on a 10-point scale which assess cognitive and emotional representations of illness. This dataset showed an acceptable internal consistency for BIPQ scores (Cronbach’s $\alpha = 0.77$).
The Enhancing Recovery in Coronary Heart Disease (ENRICHD) Social Support Inventory (ESSI) is a seven-item instrument designed to examine structural, tangible, and emotional forms of social support in cardiac populations (Mitchell et al., 2003). Internal consistency was good (Cronbach’s α = 0.88).

CR Enrolment was defined as attending at least one CR exercise session (1 = enrolled, 0 = did not enroll). After preparing the trial protocol (see Chapter 3), a post-hoc decision was made to also examine CR Adherence in order to explore whether the intervention had lasting effects beyond initial program enrolment. Adherence was defined as the number of exercise sessions attended out of the total 24 scheduled sessions that comprise the CR program. Patients who elected to participate in the home-based CR program were excluded from analyses of CR adherence because they were not expected to formally attend any exercise sessions. CR enrolment and adherence were determined by chart review of exercise attendance logs and check-in sheets completed by clinic staff during each CR session.

Intervention Acceptability was evaluated using a six-item survey (Adamian et al., 2004), administered to the intervention condition only. The first three items asked patients to rate the usefulness and comfort level of the intervention, and the degree to which the intervention influenced their decision about CR participation, using a four-point scale (1 = not at all, 4 = a great deal). The remaining three items invited open-ended responses about what they learned, what they disliked, and what they liked about the session.

Data Analysis

Primary and secondary outcomes. A series of between-subjects analyses of covariance (ANCOVA) 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
the binary outcome of CR enrolment. In all ANCOVA and logistic regression analyses, group (intervention, control) was used as the independent variable, and age, sex (0 = male, 1 = female), CR recommendation strength, and depressed mood were used as covariates that were decided upon a priori (see Chapter 3). Effect size magnitude was estimated using conventions for partial eta-squared in ANCOVA analyses (0.01 = small, 0.06 = medium, 0.14 = large) and for odds ratio (OR) in the logistic regression (1.5 = small, 3.5 = medium, 9.0 = large; Cohen, 1988; Pryjmachuk & Richards, 2007). All analyses were performed in SPSS for Windows 24.0 (IBM Corp. Released 2016. Armonk, NY).

**Post-hoc exploratory analyses.** After examining the primary and secondary outcomes outlined above, two sets of exploratory analyses were conducted to clarify potential mechanisms of the intervention. First, two-tailed Pearson correlations were used to examine associations between actual CR participation (i.e., enrolment and adherence) and motivational constructs (i.e., intention, CR beliefs, barriers, exercise self-efficacy, social support, and illness perception). Second, mediation analyses were conducted using the PROCESS Macro (Hayes, 2013) in order to explore the indirect effects of the intervention on CR participation via motivational variables. Two separate parallel mediation models were tested: one with CR enrolment as the dependent variable, and one with CR adherence as the dependent variable (see Figure 4.1). In both models, group (intervention, control) was the independent variable. Motivational constructs that were impacted by the intervention (based on results from the primary and secondary ANCOVA analyses) were simultaneously entered as potential mediators. The mediation models were analyzed using 5,000 bias-corrected bootstrap samples. A variable was deemed to be a significant mediator if the 95% confidence interval surrounding the indirect effect did not include zero (Hayes, 2013). In the model examining the dichotomous dependent variable CR
enrolment (Panel I in Figure 4.1), $b$ coefficients were converted to a more easily interpretable OR metric by exponentiating ($e^b$) point estimates and confidence intervals (A. Hayes, personal communication, August 30, 2014).

**Intervention acceptability.** Descriptive statistics were used to summarize Likert-style responses on the intervention acceptability questionnaire. Responses to open-ended questions were entered into NVivo software (QSR International Pty Ltd. Version 11, 2015) and categorized using thematic analysis (Braun & Clarke, 2006).

**Results**

**Sample Characteristics**

A total of 96 patients were included in the final sample (Figure 3.2 and Table 4.1). Participants tended to be male (82%), White (84%), in a committed partner relationship (74%), and had been referred to CR following myocardial infarction (66%). On average, patients were 60 years old (range 34-80), received a strong recommendation to attend CR (range 2-5 on a five-point scale), participated in the study 19 days post-cardiac event (range 2-80), and reported non-depressed mood (range 0-21 on the CESD-10). In terms of baseline CVD risk, on average, patients were overweight (Health Canada, 2015) with moderate cardiorespiratory fitness (Martin et al., 2013), and well-controlled blood pressure and lipids (Leung et al., 2016; Statistics Canada, 2013). Chi-square tests (for categorical variables) and independent samples $t$-tests (for continuous variables) indicated no group differences in baseline characteristics, suggesting that random assignment successfully produced group equivalence on the collected data.

**Data Cleaning**

There were less than 3% missing data-points on all variables. Data were missing at random, based on Little’s MCAR test, $\chi^2 = 65.28$, $df = 62$, $p = 0.364$. The expectation-
maximization imputation algorithm in SPSS 24.0 was used to handle missing data. No multivariate outliers were detected using Mahalanobis distance, and a total of 11 univariate outlier values ($z > \pm 3.29$) were winsorized. Assumptions were tested regarding independence, linearity, normality, homogeneity of variance and regression, multicollinearity and, for logistic regression, case-to-variable ratios and linear relationships between the independent variables and log odds (Meyers, Gamst, & Guarino, 2013; Tabachnick & Fidell, 2007). Models were deemed robust to violations (see Box D.1 for supplementary details on data checking).

**Effects of the Motivational Intervention on Intention to Attend CR**

When examining the effect of the intervention on intention to attend CR (Table 4.3), results from the ANCOVA demonstrated that group membership accounted for 11.0% of variance, which corresponds to a medium-to-large effect size. On average, patients who received the intervention reported greater intention ($M = 6.74, SE = 0.22$) compared to controls ($M = 5.69, SE = 0.22$), $F(1,90) = 11.07, p = .001$, following statistical adjustment for covariates. CR recommendation strength showed a positive association with intention to attend CR, $b = 0.60, SE = .187, F(1,90) = 10.23, p = .002$, whereas the remaining covariates, age ($b = -.011, SE = .015, p = .476$), sex ($b = -0.36, SE = .414, p = .386$), and CESD-10 ($b = -0.03, SE = .029, p = .271$), did not significantly predict the primary outcome.

**Effects of the Motivational Intervention on Secondary Outcomes**

Compared to usual care, the motivational intervention was associated with more favourable beliefs about CR, including greater perceived necessity, $F(1,90) = 4.54, p = .036$, and fewer concerns about exercise, $F(1,90) = 6.70, p = .011$, following adjustment for covariates (see Table 4.2). In addition, patients who received the motivational intervention attended an average of five more exercise sessions than controls, $F(1,75) = 7.31, p = .008$. There was no intervention
effect on practical barriers, perceived suitability, total CR barriers, exercise self-efficacy, illness perception, or social support.

Results from the hierarchical logistic regression (Table 4.2) indicated that the combination of age, sex, depressed mood, and CR recommendation strength entered in Block 1 predicted CR enrolment, $\chi^2 = 11.11$ (df = 4, n = 96), $p = .025$. Goodness-of-fit did not improve with the addition of group membership (intervention, control) into Block 2 of the model, $\chi^2(df = 1, n = 96) = 3.41$, $p = .065$. There was a 3.7-fold increase in the odds of CR enrolment in the intervention group (OR = 3.69, 95% CI 0.92-14.77), with 92% of patients in the intervention versus 80% in usual care attending at least one CR session. Though this difference did not achieve statistical significance ($p = .065$), the OR value corresponds to a medium effect size. The overall pattern of results was similar regardless of intention-to-treat, data imputation, or exclusion of covariates (see Tables D.1-D.3 for supplementary analyses).

**Exploratory Analyses of Intervention Mechanisms**

**Associations between motivational variables and CR participation.** Greater levels of intention to attend CR, perceived necessity, and exercise self-efficacy, as well as lower concern about exercise, lower practical barriers, and lower total CR barriers were associated with higher CR enrolment ($p$-values < .05; refer to Table 4.3). 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.

**Indirect effects of the intervention on CR participation.** After demonstrating that intention to attend CR, perceived necessity, and concerns about exercise were impacted by the intervention (as detailed above), these three variables were simultaneously entered as potential...
mediators to explain the relationship between the intervention and CR enrolment/adherence (see Figure 4.1). There was an indirect effect of the motivational intervention on CR enrolment ($b = 0.45, SE = 0.32, 95\% \text{ CI} 0.04-1.18$) and on number of CR sessions attended ($b = 2.59, SE = 1.02, 95\% \text{ CI} 0.95-5.03$) via higher intention to attend CR. Every one-point increase in intention corresponded to a 52\% increase in the odds of CR enrolment (OR = 1.52, 95\% \text{ CI} 1.08-2.14), and to 2.53 more CR sessions attended ($SE = 0.69, p < .001$). The intervention also showed an indirect effect on CR adherence via lower exercise concerns ($b = 1.13, SE = 0.67, 95\% \text{ CI} 0.16-2.92$). Each one-point decrease on the BACR Concerns About Exercise scale was associated with 0.65 more CR sessions attended ($SE = 0.30, p = .032$).

**Intervention Acceptability and Fidelity**

Most patients reported the motivational intervention was useful (85\%), comfortable (96\%), and had influenced their decision about CR participation (54\%), by responding “somewhat” or “a great deal” (see Figure 4.2). Open-ended responses to the acceptability survey indicated several themes. First, patients tended to enjoy interpersonal aspects of the session, such as the ability to discuss their experiences with a supportive listener without judgement. For example, patients commented they enjoyed the “one-on-one private conversation,” the “gentleness of the interviewer,” “feeling like the system cares about me,” and explained that “for the first time after the heart attack, someone was listening to me without judgement so that I could think through the challenges I am currently and will be facing.” Second, patients tended to enjoy learning about the support and benefits available through CR, such as “ways to kick smoking,” “access [to] counseling if required,” “financial aspects,” and “benefits of cardio rehab, benefits of regular exercise.” Third, patients described feeling an increased sense of motivation about pursuing CR (e.g., “I learned that I am very motivated to change my health. I
am in a good place to see the rehab program” and “the interviewer mirrored back my confidence in successfully completing the cardiac rehab program”). In the subset of patients who provided negative feedback \(n = 14\), comments included disliking the paperwork, the emotional focus, the time requirement, and the unstructured nature of the interaction.

In terms of intervention fidelity, average total CEMI score \(M = 51.93, SD = 4.85\) corresponded to 81% of the total possible score, indicating skillful intervention delivery. Although there were no significant associations between CEMI scores and trial outcomes (see Table D.4), correlations were in the expected direction wherein favourable evaluations of motivational interviewing delivery tended to correspond with more positive intervention outcomes. Intervention timing, location, duration, and partner presence were not correlated with any of the outcome measures \(p\)-values > .05; Table D.4).

**Discussion**

This RCT was designed to examine the preliminary efficacy of motivational interviewing for promoting intention to attend CR among patients with a recent coronary event. As hypothesized, a brief motivational intervention with patients following referral but prior to CR enrolment was associated with greater intention to attend CR, more favourable beliefs about the program, a greater likelihood of CR enrolment, and better adherence to scheduled CR sessions. Further, intention to attend CR mediated the effect of the intervention on both CR enrolment and adherence. The intervention was generally viewed as acceptable, with half of patients reporting it had influenced their decision-making about CR. The application of motivational interviewing as a prelude to outpatient CR is a promising strategy to facilitate recovery following an acute coronary syndrome event. More research is required to optimize the intervention and, ultimately, to assess long-term health behaviour change and biomedical outcomes. In particular, it remains
unclear whether a brief motivational intervention prior to CR can enhance CR-related improvements in survival, CVD risk factors, cardiorespiratory fitness, and psychological distress.

The findings suggest a face-to-face collaborative discussion about the benefits of and barriers to CR, delivered before patients start a CR program, can have lasting behavioural effects. On average, patients who received the motivational intervention attended 76% of their prescheduled CR sessions compared to a 55% attendance rate in usual care. Previous research has shown a dose-response relationship between higher CR adherence and lower all-cause mortality (Alter et al., 2017; Beauchamp et al., 2013), with each additional CR session attended associated with a 1% decrease in mortality at five-year follow-up (Martin et al., 2012). The intervention was also associated with a 3.6-fold increase in the likelihood of CR enrolment relative to usual care. Though not statistically significant ($p = .065$), this finding may be clinically important. Existing data from this 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 (Alter et al., 2017; Martin et al., 2012). While clear conclusions cannot be drawn due to lack of consensus about utilizing a strict $p < .05$ cutoff for statistical significance (Wasserstein & Lazar, 2016), it appears the intervention had a less reliable effect on initial CR enrolment compared to ongoing CR adherence. Interestingly, the intervention was designed to improve CR enrolment and did not explicitly target sustained CR attendance; these findings suggest efforts to promote CR uptake may inadvertently improve program engagement. Future trials powered on the primary outcome CR enrolment or CR adherence are required to replicate these results.

In addition to demonstrating an effect on the behavioural end-point of CR participation, this study helped clarify processes that underlie decision-making about whether to initiate (and continue with) a CR program. Intention, or motivational readiness, represents an explicit
decision to act and the degree of effort a person is willing to exert in order to perform a given behaviour (Ajzen, 1991; Schwarzer et al., 2003) and is a central pathway through which motivational interviewing is thought to operate (Apodaca & Longabaugh, 2009; Lundahl et al., 2010; Mcdermott, Oliver, Iverson, & Sharma, 2016). This 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 non-CVD patients (Apodaca & Longabaugh, 2009; Mcdermott et al., 2016). Intention to attend CR also predicted higher CR enrolment and adherence, consistent with prior research (Blanchard et al., 2002; Cooper, Lloyd, Weinman, & Jackson, 1999). Specifically, the intervention led to a one-point increase in intention (on a seven-point scale) which, in turn, was associated with a 50% increased likelihood of CR enrolment and with 2-3 more CR sessions attended. On average, patients who received the intervention also 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. Intention, perceived necessity, and exercise concerns should be retained as intervention targets in future efforts to promote CR.

The intervention did not improve total CR barriers, practical barriers, or exercise self-efficacy relative to usual care, 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-based exercise sessions specifically (as assessed by the BACR) rather than concerns about exercise behaviour in general (as assessed by the MSES). The BACR was also designed to be administered prior to CR enrolment, so may have better
captured patients’ experience compared to the CRBS and MSES which have been only been evaluated following CR enrolment (Fraser & Rodgers, 2010; Shanmugasegaram et al., 2012).

CR barriers and exercise self-efficacy both tap into the broader construct of self-efficacy, or “a person’s belief (or confidence) about his or her abilities to mobilize motivation, cognitive resources, and courses of action needed to successfully execute a specific task within a given context” (Stajkovic & Luthans, 2002, p. 126). Interestingly, there is limited evidence that self-efficacy accounts for the effectiveness of motivational interviewing (Copeland et al., 2015; Morton et al., 2015). For instance, in a recent systematic review examining self-efficacy and health behaviour outcomes (e.g., physical activity, diet) in motivational interviewing interventions, Copeland and colleagues (2015) reported that few (3/13) interventions have demonstrated effects on self-efficacy and most (10/13) show no association between self-efficacy and the behavioural outcome-of-interest. Consistent with prior findings, this brief motivational intervention delivered to prospective CR patients did not affect CR barriers or exercise self-efficacy.

A key contribution of this study is that it helped identify intervention targets that might be optimized in future research. The degree to which patients view their CVD as threatening, perceive they have social support, and see CR as suitable for young/active people did not predict CR enrolment or CR adherence in this sample. Modification of these perceptions might not be essential in order to successfully promote CR enrolment. In contrast, more work is needed to enhance patients’ self-efficacy to engage in regular exercise and to overcome CR barriers such as logistical issues, comorbidities, healthcare factors, and time conflicts. It could be that the problem-solving component of the intervention did not tend to focus on these particular areas of concern (due to the individualized nature of each session) or that a single motivational session
was an inadequate “dose.” The addition of follow-up sessions focused on action planning, providing instruction about exercise, and reinforcing efforts toward behaviour change could be useful, as these techniques have been shown to enhance both self-efficacy and actual physical activity (Williams & French, 2011). More work is also needed to explore and measure intervention targets such as self-regulation and stress reactivity that are known to drive health behaviour change (Edmondson et al., 2016), and could be relevant to CR participation (Janssen, Gucht, Dusseldorp, & Maes, 2012; Pietrabissa et al., 2017).

Despite our efforts to enhance replicability of the intervention through well-described intervention components and fidelity checks, it is uncertain whether results will generalize to other CR settings. There is large variability between CR programs in terms of program structure, referral practices, and accessibility (Grace et al., 2014; Gravely-Witte et al., 2010; Menezes et al., 2014). In particular, the CR program examined in this study has a markedly higher enrolment rate (80% in the present usual care sample) than documented elsewhere, such that CR enrolment to other programs generally falls below 70% (Ades et al., 2017; Gravely-Witte et al., 2010; Karmali et al., 2014). This is potentially due to healthcare-level factors including automatic referrals, fee waivers for patients with financial constraints, broad support for CR by referring healthcare providers, a short wait-time between referral and the first CR appointment, and the option to participate in home-based CR, all which have been associated with higher CR utilization (Balady et al., 2011; Collins et al., 2015; Cooper et al., 2002; Gallagher et al., 2015; Jackson et al., 2005). The high CR enrolment rate may also reflect the nature of this sample, in that the average patient was White (88%), male (81%), married (77%), and had relatively high socioeconomic status (66% had more than high school education and 40% had a family income of more than $100,000 per year). These factors may have contributed to ceiling effects that
limited intervention efficacy in this sample, given the high levels of intention to attend CR and high rates actual CR enrolment/adherence. More work is needed to examine the relative utility of face-to-face motivational support versus other CR promotion efforts across healthcare settings and diverse patient populations.

A key limitation is that this trial was un-blinded, in that the provider and patient knew the intervention being delivered. While this is a common problem encountered in behavioural RCTs (Friedberg, Lipsitz, & Natarajan, 2010), lack of blinding may have inadvertently biased the results. Bias was mitigated through allocation concealment, data entry by a research assistant not involved in intervention delivery, a priori selection of statistical tests, assessment of objective (i.e., non-self-report) outcome measures, and the use of an intervention manual. Patients were not told about the intervention rationale until the debriefing period (after they had been discharged from CR) and were reminded about the importance of honest responding on the questionnaires, which may have prevented expectancy or social desirability effects.

An additional limitation is that baseline values on outcome measures were not assessed due to time constraints. It was not possible to ascertain within-person changes in intention, CR beliefs, or other motivational variables, which would be ideal for proof-of-concept in intervention development (Czajkowski et al., 2015). In addition to clarifying pre-to-post intervention effects, it will be important for future research to establish the optimal frequency and duration of contacts, mode of delivery, and ideal candidates for the intervention. For instance, it may be useful to examine whether the intervention can successfully influence intention to attend CR when delivered using phone- or Skype-based formats. Further, efficacy and acceptability need to be examined in more diverse samples with particular attention to women, minority populations, and non-English speakers who are particularly prone to CR non-
enrolment (Balady et al., 2011). These refinements to the intervention may be beneficial prior to proceeding with large-scale efficacy research focused on clinical outcomes such as CVD mortality and risk reduction.

Under-utilization of CR is clearly linked with mortality and poorer health outcomes in patients with CVD (Ades et al., 2017; Martin et al., 2012). Our findings provide preliminary support for the use a brief, motivational interviewing-based intervention to successfully prepare patients for outpatient CR as they transition from inpatient care. Strengths of this study include use of formative qualitative research to inform intervention design (Rouleau et al., 2016), clarification of plausible mechanisms of action, attention to treatment fidelity, and the targeting of patients during a period which appears critical to decision-making about CR.
Table 4.1

Sample Characteristics in a Randomized Controlled Trial of Motivational Interviewing to Promote Enrolment in Outpatient Cardiac Rehabilitation (N = 96)

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Patients (n = 96)</th>
<th>Intervention (n = 47)</th>
<th>Usual Care (n = 49)</th>
<th>Group Comparison (p)</th>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
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<td>12</td>
<td>25.5</td>
</tr>
<tr>
<td>College/Trade Certificate</td>
<td>29</td>
<td>30.2</td>
<td>12</td>
<td>25.5</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>17</td>
<td>17.7</td>
<td>11</td>
<td>23.4</td>
</tr>
<tr>
<td>Degree Above Bachelor’s</td>
<td>17</td>
<td>17.7</td>
<td>4</td>
<td>8.5</td>
</tr>
<tr>
<td>Family Income, $CDN</td>
<td></td>
<td></td>
<td></td>
<td>.215*a</td>
</tr>
<tr>
<td>&lt;10,000-20,000</td>
<td>6</td>
<td>6.3</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>20,001-60,000</td>
<td>25</td>
<td>26.0</td>
<td>16</td>
<td>34.0</td>
</tr>
<tr>
<td>60,001-100,000</td>
<td>25</td>
<td>26.0</td>
<td>13</td>
<td>27.7</td>
</tr>
<tr>
<td>&gt;100,000</td>
<td>38</td>
<td>39.6</td>
<td>16</td>
<td>34.0</td>
</tr>
<tr>
<td>Primary Diagnosis</td>
<td></td>
<td></td>
<td></td>
<td>.717*a</td>
</tr>
<tr>
<td>STEMI</td>
<td>36</td>
<td>37.5</td>
<td>17</td>
<td>36.2</td>
</tr>
<tr>
<td>NSTEMI</td>
<td>27</td>
<td>28.1</td>
<td>13</td>
<td>27.7</td>
</tr>
<tr>
<td>Angina</td>
<td>32</td>
<td>33.3</td>
<td>17</td>
<td>36.2</td>
</tr>
</tbody>
</table>
| Unspecified            | 1                     | 1.0                   | 0                   | 0.0                 | 1.2.0

(continued)
<table>
<thead>
<tr>
<th>Variable</th>
<th>All Patients (n = 96)</th>
<th>Intervention (n = 47)</th>
<th>Usual Care (n = 49)</th>
<th>Group Comparison (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>CR Participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home-Based Program</td>
<td>15 15.6</td>
<td>6 12.8</td>
<td>9 18.4</td>
<td>.450</td>
</tr>
<tr>
<td>Education Classes</td>
<td>91 94.8</td>
<td>45 95.7</td>
<td>46 93.9</td>
<td>.681</td>
</tr>
<tr>
<td>Age, Years</td>
<td>59.79 10.66</td>
<td>59.78 11.23</td>
<td>59.80 10.21</td>
<td>.995</td>
</tr>
<tr>
<td>Time Since Event, Days</td>
<td>19.13 12.53</td>
<td>18.72 8.21</td>
<td>19.51 15.68</td>
<td>.758</td>
</tr>
<tr>
<td>Distance to CR, Minutes</td>
<td>29.29 15.93</td>
<td>28.98 14.09</td>
<td>29.58 17.66</td>
<td>.854</td>
</tr>
<tr>
<td>CR Recommendation, 1-5 Scale</td>
<td>4.43 0.84</td>
<td>4.45 0.80</td>
<td>4.40 0.88</td>
<td>.804</td>
</tr>
<tr>
<td>Depression Symptoms, CESD-10</td>
<td>7.19 5.41</td>
<td>7.91 5.76</td>
<td>6.50 5.01</td>
<td>.205</td>
</tr>
<tr>
<td>Cholesterol profile, mmol/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.48 1.17</td>
<td>4.59 1.13</td>
<td>4.36 1.21</td>
<td>.352</td>
</tr>
<tr>
<td>HDL</td>
<td>1.06 0.30</td>
<td>1.05 0.24</td>
<td>1.07 0.36</td>
<td>.703</td>
</tr>
<tr>
<td>LDL</td>
<td>2.61 1.03</td>
<td>2.71 0.98</td>
<td>2.51 1.09</td>
<td>.355</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>1.77 0.96</td>
<td>1.83 0.97</td>
<td>1.71 0.96</td>
<td>.551</td>
</tr>
<tr>
<td>Blood Pressure, mmHg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic</td>
<td>112.65 14.02</td>
<td>113.87 14.59</td>
<td>111.47 13.50</td>
<td>.404</td>
</tr>
<tr>
<td>Diastolic</td>
<td>69.38 8.48</td>
<td>69.15 8.88</td>
<td>69.59 8.17</td>
<td>.800</td>
</tr>
<tr>
<td>Body Mass Index, kg/m²</td>
<td>29.25 4.88</td>
<td>29.00 4.96</td>
<td>29.48 4.85</td>
<td>.632</td>
</tr>
<tr>
<td>Cardiorespiratory Fitness, METs</td>
<td>7.38 2.14</td>
<td>7.49 2.15</td>
<td>7.28 2.15</td>
<td>.638</td>
</tr>
</tbody>
</table>

Note. $CDN = Canadian dollars, STEMI = ST segment elevation myocardial infarction, NSTEMI = non-ST segment elevation myocardial infarction, ACS = acute coronary syndrome, CR = cardiac rehabilitation, CESD-10 = Center for Epidemiologic Studies 10-Item Depression Scale, HDL = high-density lipoprotein, LDL = low-density lipoprotein, METs = metabolic equivalents.

Due to low cell counts for individual categories, chi-square tests were conducted on dichotomized values: ethnicity (White/non-White), employment (employed/not employed), marital status (partner relationship/no partner relationship), diagnosis (myocardial infarction/other), education (high school or less/more than high school), income ($<80,000/>$80,000).
Table 4.2

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

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Intervention (n = 47)</th>
<th>Control (n = 49)</th>
<th>F</th>
<th>p</th>
<th>Partial ( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Marginal Means, M (SE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td>6.74 (0.22)</td>
<td>5.69 (0.22)</td>
<td>11.07</td>
<td>.001</td>
<td>.110</td>
</tr>
<tr>
<td>Perceived Necessity (BACR)</td>
<td>21.72 (0.44)</td>
<td>20.41 (0.43)</td>
<td>4.54</td>
<td>.036</td>
<td>.048</td>
</tr>
<tr>
<td>Concerns about Exercise (BACR)</td>
<td>5.12 (0.37)</td>
<td>6.49 (0.37)</td>
<td>6.70</td>
<td>.011</td>
<td>.069</td>
</tr>
<tr>
<td>Practical Barriers (BACR)</td>
<td>5.26 (0.41)</td>
<td>5.50 (0.40)</td>
<td>0.17</td>
<td>.681</td>
<td>.002</td>
</tr>
<tr>
<td>Perceived Suitability (BACR)</td>
<td>3.05 (0.23)</td>
<td>3.20 (0.22)</td>
<td>0.20</td>
<td>.654</td>
<td>.002</td>
</tr>
<tr>
<td>Total CR Barriers (CRBS)</td>
<td>1.65 (0.08)</td>
<td>1.81 (0.08)</td>
<td>1.84</td>
<td>.178</td>
<td>.020</td>
</tr>
<tr>
<td>Exercise Self-Efficacy (MSES)</td>
<td>80.49 (1.74)</td>
<td>77.67 (1.71)</td>
<td>1.31</td>
<td>.256</td>
<td>.014</td>
</tr>
<tr>
<td>Illness Perception (BIPQ)</td>
<td>35.00 (1.75)</td>
<td>34.98 (1.71)</td>
<td>&lt;0.01</td>
<td>.993</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Social Support (ESSI)</td>
<td>27.23 (0.80)</td>
<td>27.12 (0.79)</td>
<td>0.01</td>
<td>.922</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>CR Adherence a</td>
<td>18.15 (1.29)</td>
<td>13.12 (1.31)</td>
<td>7.31</td>
<td>.008</td>
<td>.089</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CR Enrolment</th>
<th>Enrolled in CR, n (%)</th>
<th>Wald ( \chi^2 )</th>
<th>p</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>43 (91.5)</td>
<td>39 (79.6)</td>
<td>3.41</td>
<td>.065</td>
</tr>
</tbody>
</table>

*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. Covariates included age, sex, CESD-10 score, and CR recommendation strength.

*\( n = 81 \) (excluded 15 home-based program participants from analysis)
Table 4.3

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

<table>
<thead>
<tr>
<th>Motivational Variables</th>
<th>CR Participation Enrolment (n = 96)</th>
<th>Adherence(a) (n = 81)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>0.44***</td>
<td>0.51***</td>
</tr>
<tr>
<td>Perceived Necessity (BACR)</td>
<td>0.31**</td>
<td>0.33**</td>
</tr>
<tr>
<td>Concerns about Exercise (BACR)</td>
<td>-0.29**</td>
<td>-0.32**</td>
</tr>
<tr>
<td>Practical Barriers (BACR)</td>
<td>-0.28**</td>
<td>-0.38***</td>
</tr>
<tr>
<td>Perceived Suitability (BACR)</td>
<td>-0.11</td>
<td>-0.09</td>
</tr>
<tr>
<td>Total CR Barriers (CRBS)</td>
<td>-0.44***</td>
<td>-0.53***</td>
</tr>
<tr>
<td>Exercise Self-Efficacy (MSES)</td>
<td>0.37***</td>
<td>0.41***</td>
</tr>
<tr>
<td>Illness Perception (BIPQ)</td>
<td>0.10</td>
<td>0.19</td>
</tr>
<tr>
<td>Social Support (ESSI)</td>
<td>0.06</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

\(p < .05, **p < .01, ***p < .001\)

*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

\(a\)Excluded 15 home-based CR program participants from analysis.
Figure 4.1. Results from mediation analyses. A brief motivational interviewing intervention showed an indirect effect on CR enrolment (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 \( a_{1}b_{1} \) represents the indirect effect through intention to attend CR. Path \( a_{2}b_{2} \) represents the indirect effect through perceived necessity. Path \( a_{3}b_{3} \) 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 or nature of the indirect effect of the intervention on CR adherence via intention and exercise concerns; the indirect effect on CR enrolment via intention was no longer significant when covariates were added to the mediation model (not shown).

*\( p \leq .05 \), **\( p < .01 \), ***\( p < .001 \)

†Significant indirect effect (indicated by 95% confidence interval that does not contain zero).
Figure 4.2. Descriptive statistics of patients’ responses to Likert-style questions regarding their participation in a brief motivational intervention session (n = 46). Note that one patient did not provide intervention acceptability data.
CHAPTER FIVE: Synthesis and Discussion
Summary of Research Findings

Given the crucial role of health behaviour change in mitigating the effects of coronary artery disease (CAD), there is an urgent need for effective motivational interventions within this population. CAD is estimated to affect over 16 million people in the United States and Canada, and is a leading cause of death (Public Health Agency of Canada, 2009; Sanchis-Gomar, Perez-Quilis, Leischik, & Lucia, 2016). Participating in cardiac rehabilitation (CR) represents one type of health behaviour that has been demonstrated to significantly improve survival, reduce morbidity, and alleviate the personal and societal cost of CAD (Alter et al., 2017; Anderson et al., 2016; Oldridge, 2012). In fact, CR is the gold standard tertiary prevention treatment following acute coronary syndrome (ACS; a clinical syndrome of CAD), recommended by healthcare agencies from around the world including the Canadian Association of Cardiovascular Prevention and Rehabilitation, the Canadian Cardiovascular Society, the American Heart Association, and the National Institute for Health and Care Excellence (Grace et al., 2011; National Institute for Health and Care Excellence, 2013; Smith et al., 2011). A major barrier is that CR programs remain under-used, at least in part, due to non-enrolment by eligible patients (Ades et al., 2017).

In the Chapter 1 of this dissertation, literature was reviewed with respect to the benefits of CR, the factors associated with low CR participation, and the prior efforts to enhance CR enrolment. In light of the various patient-level, modifiable factors that predict CR enrolment (e.g., attitudes about CR and CAD, practical barriers), various interventions have been tested in an effort to motivate eligible patients to initiate CR programs. There is emerging randomized controlled trial (RCT)-based evidence for the use of face-to-face liaison support, in which an allied healthcare provider discusses CR with the patient in order to facilitate the transition to
outpatient care; however, efficacy of this approach for enhancing CR enrolment remains equivocal. Taken together, the literature reviewed in Chapter 1 suggests that liaison support to prospective CR patients might be optimized by tailoring the intervention to each individual’s level of intention to attend CR. Motivational interviewing, “a person-centered counseling style for addressing the common problem of ambivalence about change” (p. 21), was hypothesized to be an appropriate strategy to accommodate and enhance patients’ intentions to attend CR (Miller & Rollnick, 2013).

The remaining chapters of this dissertation outlined how a multi-phase, mixed-methods program of research helped adapt motivational interviewing to address the important issue of CR non-enrolment. Specifically, the dissertation followed the ORBIT model (Czajkowski et al., 2015), which recommends that behavioural interventions for chronic disease be subjected to adequate early-phase research—including defining/refining the intervention (Phase I) and preliminary testing (Phase II)—before proceeding to large-scale investigations of efficacy (Phase III) or effectiveness (Phase IV). Chapter 2 reported on Phase I research in the form of a qualitative study wherein 14 ACS patients were interviewed about their views regarding TotalCardiology, a 12-week outpatient CR program in Calgary, Canada. Interviews took place after patients had been referred to CR by their physician, but prior to their first scheduled CR session. Thematic analysis of the interview responses helped characterize the types of CR-related benefits valued by patients (e.g., access to specialist healthcare providers, learning opportunities), their barriers to CR enrolment (e.g., scheduling conflicts, exercise concerns), and the contextual factors that influenced attitudes toward CR (e.g., knowledge gaps, psychological distress). An innovative feature of this study is that it explored factors impacting intention to attend CR while patients were in the midst of making decisions about program enrolment.
Chapter 3 detailed how these qualitative findings were used to tailor a motivational interviewing approach to prospective CR patients. For example, it was deemed important to highlight the potential benefits of CR that are valued by patients, while eliciting each individual’s own reasons for considering CR enrolment. Further, a list of potential solutions to CR barriers was created in response to the obstacles noted by qualitative study participants; these potential solutions helped guide collaborative problem-solving. Chapter 3 also presented the protocol for the UPBeAT-CR Study, a Phase II feasibility trial to investigate the impact of the intervention on intention to attend CR. The primary hypothesis was that a brief motivational intervention, delivered following CR referral but prior to CR enrolment, would be associated with greater intention to attend CR relative to usual care. Secondary hypotheses posited that the intervention would be associated with more positive beliefs about CR, fewer CR barriers, greater exercise self-efficacy, greater perceived illness severity, greater social support, and a greater likelihood of CR enrolment. Chapter 4 presented results from this Phase II research, which established proof-of-concept by showing a clinically significant “signal” on the primary outcome, intention to attend CR, as a result of one brief (i.e., average 43-minute) motivational interviewing session. The RCT also demonstrated preliminary evidence of acceptability and efficacy of the intervention for increasing actual CR participation. This was the first RCT to investigate the impact of motivational interviewing to support initiation of CR by eligible, referred patients.

As hypothesized, the primary results demonstrated that randomization to a brief motivational intervention was associated with a medium-to-large effect on intention to attend CR. Relative to usual care, 11% of variance in intention was accounted for by the intervention. Greater intention to attend CR also mediated the effect of the intervention on actual CR
participation (i.e., enrolment and adherence). While not previously evaluated as an outcome of CR promotion studies, intention has been examined as a mechanism in at least two RCTs of motivational interviewing for substance use (Apodaca & Longabaugh, 2009; Li, Zhu, Tse, Tse, & Wong, 2016). The present study demonstrated a larger effect than a single, 30-minute motivational interview that accounted for 6% of variance in intention to reduce substance use (measured using a six-item therapist-rated questionnaire; Longshore, Grills, & Annon, 1999). In contrast, it demonstrated a smaller effect than a 20-minute motivational interview plus follow-up call that accounted for approximately 16% of variance in intention to use marijuana (measured using a one-item patient-rated questionnaire; $d = 0.86$; Cohen, 1988; D’Amico et al., 2008). It could be that motivational interviewing has a greater impact on patients’ intention to change when intention is measured using self-report instruments and when a “booster” session is provided. However, given that reducing substance use and increasing CR participation are very different behaviours (characterized by stopping versus starting an action, respectively), more work is needed to compare efficacy across behavioural domains.

In addition to impacting intention, the intervention influenced other important motivational precursors to CR participation. 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, compared to those in usual care. These beliefs about CR predicted subsequent program enrolment and adherence, consistent with earlier research (Cooper, Weinman, Hankins, Jackson, & Horne, 2007). These findings are also in line with the stated purpose of the intervention—namely, to increase the benefits anticipated from CR while enhancing perceived ability to attend—and with the motivational interviewing aim of addressing ambivalence about change (Miller & Rollnick,
It could be that the intervention accessed and modified two key sources of conflicted feelings about CR, concern about the exercise sessions and lack of perceived necessity. Future efforts to promote CR utilization may similarly benefit from evaluating and altering patients’ expectations for CR and their exercise-related concerns about the program.

Secondary analyses in the RCT also demonstrated that the intervention was associated with a trend toward higher CR enrolment (92% in the intervention group versus 80% in the control group respectively, \( p = .065 \)). This 12% increase is relatively lower than the 12% to 30% increases in CR enrolment rates associated with professionally led liaison interventions in prior RCTs (Carroll et al., 2007; Cossette et al., 2012; Hillebrand et al., 1995; Jolly et al., 1998; Price, 2012). This is presumably because the baseline rate of CR enrolment in the present sample (80%) was much higher than reported in previous studies (12%-33%), making it difficult to directly compare results. In one of the only RCTs to date conducted in a setting with a high baseline rate of CR enrolment (74%), a theory-based invitation letter was associated with a 10% increase in CR enrolment (Mosleh et al., 2009; Mosleh et al., 2014). The letter was based on Theory of Planned Behaviour (Ajzen, 1991), and was designed to increase intention by improving attitudes about CR, enhancing subjective norms about CR attendance, improving self-efficacy, and increasing perceived consequences of CAD (Mosleh et al., 2009); however, intention and other motivational constructs were not measured as trial outcomes. The present study was able to increase enrolment despite being constrained by an already-high CR participation rate, and was able to quantify the intervention’s impact on intention and other theoretically relevant variables.

In the present study, it is not entirely clear why the intervention had a more reliable effect on CR adherence, compared to the effect on initial CR enrolment. On average, intervention
patients attended 75% of their scheduled CR sessions, compared to only 54% attendance in the control group. Average attendance at CR sessions documented across a variety of other programs is 67% (Oosenbrug et al., 2016) which, coincidentally, is also reported to be a clinically meaningful cut-off for predicting reductions in mortality and re-hospitalizations (Alter et al., 2017). The brief motivational intervention contributed to an average CR attendance of 75%, which is above this 67% cut-off. The findings are also consistent with studies in non-CR settings that have shown brief motivational interviewing to be efficacious for increasing treatment attendance when delivered as a means to prepare patients for cognitive rehabilitation (two 30- to 45-minute motivational interview sessions; Fiszdon et al., 2016), for inpatient therapy of alcohol use (one 90-minute session; Connors et al., 2002), and for childbirth educational classes (two 120-minute group-based sessions; Rasouli et al., 2017). The novel application of motivational interviewing as a preparatory intervention before CR may serve to increase program adherence.

The impact of the motivational intervention on CR adherence is not entirely surprising, given that discussions about the benefits and barriers to attending at least one CR appointment (i.e., enrolment) cannot be completely separated from discussions about the benefits and barriers to attending more than one CR appointment (i.e., adherence). It is plausible that patients continued to reflect upon the motivational interview session in the days and weeks after they started the CR program. Importantly, there was more variability in CR adherence than in CR enrolment, suggesting that lack of a significant effect on CR enrolment might be attributable to ceiling effects. Further, it is possible that reductions in exercise concern (as measured by the Beliefs about CR Scale; BACR) were more relevant to sustained CR adherence than to the initial decision to enroll in CR. This is consistent with exploratory results discussed in Chapter 4, wherein lower exercise concerns mediated the intervention effect on CR adherence but did not
mediate the intervention effect on CR enrolment. Similarly, prior research has shown that initial adoption of exercise is best predicted by level of intention to change, whereas exercise maintenance is best predicted by self-efficacy for exercise (Litt, Kleppinger, & Judge, 2002). Further research is needed to replicate and elucidate this pattern of results.

The brief motivational intervention had no impact on total CR barriers, illness perception, or social support, which represent purported targets in prior interventions to promote CR enrolment (Ali-Faisal et al., 2016; Carroll et al., 2007; Cossette et al., 2012; Dolansky et al., 2011; Harkness et al., 2005). Regarding CR barriers, it is possible that the “building confidence” component of this intervention was not adequate to impact patients’ perceived control over logistical, physical, healthcare, and scheduling-related obstacles to CR. It is also possible that low CR barriers at baseline limited the ability to produce meaningful effects. Although the CR Barriers Scale (CRBS) does not have an established cut-off for “high barriers,” the mean CRBS score of 1.81 in the control group corresponds to an average response somewhere between “disagreeing” to “neither agreeing nor disagreeing” that CR barriers will interfere with CR participation (Shanmugasegaram et al., 2012). Non-enrollees to CR report an average CRBS score of 2.46 compared to 1.77 in enrollees, according to previous research (Shanmugasegaram et al., 2012). It would be useful to examine sensitivity and specificity of the CRBS for predicting CR enrolment to facilitate screening patients with high CR barriers into future liaison interventions.

Illness perception and social support were not directly targeted by the intervention, but also did not predict whether patients ended up participating in CR. Illness perception was measured with the expectation that discussing anticipated benefits of CR, potential downsides of not attending, and exploring patients’ emotions surrounding the ACS event might inadvertently
make their illness feel more threatening. Social support was measured with the speculation that supportive contact with a healthcare provider and/or the process of problem-solving about how to elicit social support to overcome CR barriers (e.g., exercising with spouse, getting a ride to CR from a family member) might enhance perceptions of social support. Future refinements to this intervention may not require specific attention to increasing social support or altering the perceived threat of CAD.

Finally, responses to open-ended questions completed following the intervention highlighted which aspects of the session were most salient to patients. Patients tended to view non-specific therapeutic factors, such as feeling listened to and cared for, as important, which is consistent with prior qualitative research on patient experiences of motivational interviewing (Everett et al., 2008; Jones, Latchford, & Tober, 2016). Furthermore, the observation that patients described learning about aspects of CR other than structured exercise (e.g., stress management, smoking cessation) is consistent with qualitative research in this dissertation (Chapter 2) and in other papers (Cooper et al., 2005), suggesting that prospective CR patients are sometimes unaware of the availability of multidisciplinary CR services. Although the intervention acceptability data are limited due to the typically brief responses provided by patients, they underline the value of tailoring information to prospective CR patients’ intentions, needs, and knowledge. The importance of using “basic” counselling skills (e.g., empathic reflections, active listening) during conversations about health behaviour change also cannot be understated.

**Strengths and Limitations**

A key strength of this dissertation is the application of formative qualitative research to inform the design of a behavioural intervention to promote CR enrolment. Whereas previous
research in this area has typically relied on a quantitative approach in which demographic and medical factors (e.g., age, sex, depression, ethnicity) are used to predict CR participation (Daly et al., 2002; Oosenbrug et al., 2016; Ruano-Ravina et al., 2016), the present study utilized qualitative interviews that enabled exploration of individual patients’ perceptions and beliefs about CR. Therefore, it was possible to gather user-centered data on what patients deem important to address as they make the decision about whether or not to enroll in CR. This is in contrast to prior qualitative research which has typically been conducted retrospectively and has not confirmed that study participants had actually received a referral or physician recommendation to attend CR (Chauhan et al., 2010; Clark et al., 2004; Jones et al., 2003; Pullen et al., 2009; Wyer, Earll, Joseph, & Harrison, 2001). Although the findings were largely consistent with themes uncovered in prior qualitative research, a novel observation was that emotional distress, first impressions of the CR program, input from friends and family, and evolving knowledge about CR were important contextual influences on patients’ in-the-moment decision-making about CR enrolment.

The study was also able to characterize plausible intervention mechanisms. To design more effective behavioural interventions, growing consensus suggests a need to know the specific intervention components and why they work (Bacon et al., 2014; Barlow et al., 2013; Czajkowski et al., 2015; Edmondson et al., 2016; Michie et al., 2013). The exact ways in which prior interventions have successfully promoted CR enrolment are not well understood due to multi-component formats, inadequate descriptions of intervention methodology and referral practices, and poor measurement of purported active ingredients (Davies et al., 2010; Karmali et al., 2014). In contrast, this research clearly described the methodology/fidelity, measured putative mechanisms as trial outcomes, and ensured all participants had actually received a CR
referral. The RCT design ensured that patient characteristics were evenly distributed between conditions, and was appropriate for assessment of mediators (Kazdin, 2007). As a result of these methodological strengths, this study was able to provide evidence that a replicable motivational intervention increased the purported target (i.e., intention to attend CR) which, in turn, was linked with clinically important behavioural outcomes (i.e., CR enrolment and adherence).

Another strength is the incorporation of a motivational interviewing counseling style to overcome limitations associated with the didactic nature of prior liaison-based interventions. In research by Danker and colleagues (2011), for example, patients were “explained the benefits of CR, the content of such programs… [and] patients were reminded of the importance of CR, and further encouraged to participate” (p. 5). Similarly, Jolly and colleagues’ (1998) intervention involved “provision of advice and information on… CR, [and] recruiting patients to attend the CR program” (p. 552). Instead of telling patients to attend CR and why it is important, the present intervention recognized patients’ existing knowledge about CR and elicited their own reasons for potentially wanting to join the program. A motivational interviewing counseling style was applied in order to address concerns raised in prior qualitative and anecdotal reports, suggesting that patients may be deterred from CR as a result of perceiving healthcare providers to be prescriptive and coercive (Hancock et al., 2005; Neubeck et al., 2011). More research is needed to examine comparative efficacy of motivational interviewing relative to more didactic approaches to facilitate CR enrolment.

A potential limitation is the high level of intention and actual CR participation in this sample. Ceiling effects might have restricted potential improvement on trial outcomes, in that there might be more “room to move” in CR settings with low utilization rates. As a result, one might argue the intervention did not target the optimal patient group—i.e., those with
documented adherence problems (Lavoie, Campbell, & Bacon, 2012). However, it was deemed appropriate to target all prospective CR patients with the assumption that intention is a continuous construct and that “good intentions” do not always translate into behaviour change (Courneya et al., 2001; De Vet et al., 2007; Rhodes & Dickau, 2013). The observation that the intervention favourably impacted outcomes despite a potential ceiling suggests the importance of enhancing enrolment to even well-utilized CR programs. With roughly 2,200 CR referrals per year to TotalCardiology and a typical enrolment rate of 70%, increasing enrolment by even 5% translates to 110 extra patients per year who can benefit from evidence-based cardiovascular risk reduction services. The Canadian healthcare system is also estimated to incur $2,920 less per year for eligible patients who attend CR compared to those who are referred but do not enroll (Alter et al., 2017). Even small improvements in CR utilization have the potential to positively affect the patient and reduce burden on the healthcare system.

An additional limitation of the RCT is the use of self-report measures and the lack of masking which, to the extent that bias exists, could limit the ability to make causal conclusions (Meinert, 2012). The potential for social desirability and expectancy bias was mitigated by withholding information about anticipated study results until the debriefing period. As part of informed consent, patients were told: “This study will help us learn how people with heart conditions make decisions about whether CR is right for them, and to assess the role of collaborative discussion in helping people make those decisions.” Debriefing forms that described the study rationale of increasing CR participation were disseminated following patients’ discharge from the 12-week program. Patients were also reminded about the confidentiality of their data and about the importance of honest responding on the questionnaires. Self-report data were also supplemented with objective, chart-confirmed behavioural outcomes
Treatment-related biases were mitigated by concealing randomization until after baseline data collection, by using an intervention manual, by engaging in regular review of audiotapes to ensure intervention fidelity, and by pre-specifying primary and secondary analyses (Meinert, 2012).

Selection and representation biases might also limit generalizability of findings (Meinert, 2012). This dissertation targeted the roughly 85% of referred patients who choose to attend an initial CR orientation appointment at TotalCardiology, whereas characteristics of the remaining 15% of referred patients who do not attend the orientation appointment remain uncertain. Also, it was not possible to gather socio-demographic and medical information about patients who declined to take part in the qualitative study/RCT, as these patients had not consented to their data being used/reported for research purposes. In the future, these details would help ascertain whether patients who decline to participate in research on CR enrolment/adherence are systematically different than those who do participate. The research was also characterized by a relatively homogeneous sample consisting of mostly White men with myocardial infarction, a substantial limitation that is common to CVD research in general (Dougherty & Coulter, 2011; Karmali et al., 2014). CVD is a leading cause of death for both sexes and across ethnic groups (Centers for Disease Control and Prevention, 2015; Statistics Canada, 2015); underrepresentation of women and minority populations in research may lead to conclusions and interventions that are not generalizable to the broader population affected by this disease. Overall, these factors likely explain why a higher CR enrolment rate was observed in the usual care RCT condition (80%) compared to the CR enrolment rate reported in unpublished TotalCardiology program statistics (70%). Greater attention to recruiting women, patients with other types of CVD (e.g.,
heart failure, congenital heart disease), ethnic minorities, and non-English-speakers (e.g., through use of a translator) should be a priority in future studies.

**Future Research Directions**

These research findings have laid a foundation on which future work can evaluate and optimize the present motivational interviewing intervention. Specifically, the ORBIT model of behavioural intervention development provides a heuristic for how this program of research might proceed (Czajkowski et al., 2015). Having accomplished several tasks within Phase II preliminary testing, it is possible to proceed to Phase III efficacy research. The results from this pilot trial could be used to design an adequately powered RCT targeting the primary outcome of CR enrolment. Future RCTs in this area would benefit from more rigorous procedures to mitigate potential bias, including gold-standard fidelity assessment using Motivational Interviewing Treatment Integrity coding (Moyers et al., 2014); and use of separate personnel for data collection, intervention, and analysis (Meinert, 2012). It will ultimately be important to determine whether the intervention can create meaningful, long-term clinical and cost-effectiveness outcomes when delivered as part of standard care by multidisciplinary CR healthcare providers.

At present, however, a Phase III efficacy trial may be premature given that optimal content, duration, and mode of delivery remain unknown. It is suggested that these questions be addressed with further Phase I and Phase II research before proceeding with dissemination or efforts to characterize long-term cardiovascular outcomes. One potential next step is to evaluate the utility of adding behaviour change techniques to enhance self-efficacy for engaging in exercise and overcoming CR barriers. Adding a follow-up phone call, for example, might help patients continue working through their concerns about comorbidities, logistical factors, and
work/time conflicts identified during the face-to-face intervention session. Additional strategies worth testing include: enlisting social support (e.g., role modeling from a former CR participant), assisting with time management, reinforcing progress, setting graded tasks, and supporting self-management of comorbidities (e.g., pain, fatigue), which have been demonstrated to enhance self-efficacy for health behaviour change in other settings (French, Olander, Chisholm, & McSharry, 2014; Lorig, Sobel, Ritter, Laurent, & Hobbs, 2001; Michie et al., 2013; Olander et al., 2013; Rajati, Sadeghi, Feizi, Sharifirad, & Hasandokht, 2014).

Adaptive, stepped-care designs may be desirable, in which more resistant patients receive a greater dose of liaison support. Also, a lingering question is whether “pre-intenders” (i.e., those who have not formed an intention to attend CR) require a qualitatively different intervention than “intenders” (i.e., those who have formed an intention to attend CR). To answer this question, more research is needed to ascertain whether intention is best characterized as a continuous versus a categorical construct (De Vet et al., 2007; Weinstein, Rothman, & Sutton, 1998), and to adapt stage-based measures of health behaviour change (e.g., the University Rhode Island Change Assessment Scale; DiClemente & Hughes, 1990) in the context of CR enrolment and adherence. Efforts to enhance self-efficacy should also consider changes to CR program delivery, such as offering CR exercise classes on weeknights and weekends, offering more low-impact exercise options for patients with functional limitations (e.g., swimming), and offering social work services to determine eligibility for community-based practical supports (e.g., taxi chits, financial assistance for taking time off work to attend exercise sessions). Screening patients for baseline level of intention to attend CR and altering CR service delivery may better address patients’ barriers and needs.
Future research should also explore the influence of timing and provider characteristics on intervention efficacy. For example, there are ample opportunities to incorporate a motivational interviewing style into existing clinical encounters with TotalCardiology staff during the referral/enrolment process, such as when confirming and conducting the CR orientation appointment and during pre-CR educational classes. In addition, although all study participants reported having received a recommendation to attend CR by their in-hospital physician, both the qualitative and trial results suggest there was variability in perceived strength of this recommendation. It may be beneficial to incorporate elements from the motivational intervention into the inpatient referral conversation. This might enhance perceived recommendation strength, the most consistent predictor of CR enrolment and adherence in prior research (Cooper et al., 2002; Ghisi, Polyzotis, Oh, Pakosh, & Grace, 2013; Grace et al., 2008; Grace et al., 2011; Jackson et al., 2005). It is also unclear when is the best time is to intervene. Refinements to this intervention must consider the level of emotional distress and information-processing ACS patients might be experiencing in acute care and in the days and weeks following hospitalization. Previous liaison interventions to promote CR enrolment have been delivered during inpatient hospitalization, after hospital discharge, or both (Carroll et al., 2007; Cossette et al., 2012; Jolly et al., 1999; Parry et al., 2009; Scott et al., 2013). Further work is needed to ascertain which time-point and provider(s) are optimal.

There is also a need to establish how well motivational interviewing works to enhance CR enrolment relative to, or in combination with, other existing interventions. The RCT demonstrated that, even among usual care patients who had received various interventions to promote CR enrolment, roughly one-fifth of patients still did not enroll in the CR program. These other interventions included an automatic referral, a recommendation to attend CR from
the referring physician, pre-CR educational classes, financial support, a promptly scheduled initial CR orientation appointment, and the availability of home-based CR programming, all which have been demonstrated to increase CR participation (Ades et al., 2017; Balady et al., 2011). It would be interesting to investigate whether individual CR enrolment interventions are overlapping, additive, or synergistic in nature; dismantling study designs may be useful to elucidate these effects (Papa & Follette, 2015). Also, Michie and colleagues (2013) recently developed a taxonomy of 93 distinct behaviour change techniques (e.g., goal-setting, problem-solving, prompts/cues, verbal persuasion) that could help characterize the content of multi-component CR promotion activities across diverse settings. Importantly, the idiosyncrasies of the TotalCardiology CR program in terms of content, referral process, duration, and physical setting may have influenced the results and could impact generalizability to other CR programs. A clear understanding of individual intervention components and their efficacy will facilitate efforts to replicate, implement, and systematically review strategies for enhancing CR participation in the future.

The intervention might also be enhanced through the use of technology. Given the difficulty coordinating a face-to-face liaison appointment among patients with a recent ACS event, it would be worthwhile to examine whether the intervention can be successfully delivered in remote formats (e.g., using telephone or video calls). It is plausible that a telehealth motivational intervention would require fewer resources, could facilitate a multi-session format, and might give patients a greater sense of anonymity and control (Reese, Conoley, & Brossart, 2002). These issues could be particularly relevant when attempting to reach patients with physical limitations and/or transportation issues, who may be more at risk of non-participation in both research and CR programming. There have been promising results for the use of telehealth-
based interventions to support CR delivery and exercise adherence (Rawstorn, Gant, Direito, Beckmann, & Maddison, 2016), and for the use of telephone-delivered motivational interviewing to improve health behaviours such as medication adherence (Teeter & Kavookjian, 2014), physical activity (O’Halloran et al., 2014), and diabetes self-management (Reinhardt, van der Ploeg, Grzegrzulka, & Timperley, 2012). Whether motivational interviewing can also be remotely delivered to increase CR enrolment and adherence remains uncertain.

It will be crucial to address diversity factors in future interventions to increase CR enrolment. Ethnic and racial minority groups are often less likely to enroll in CR and report culture-specific barriers to participation (Balady et al., 2011; Neubeck et al., 2011). Qualitative studies have previously reported that language barriers, cultural beliefs about the uncontrollability of CAD (e.g., CAD as the “will of God”), lack of family member involvement in CR, religious sensitivities (e.g., being required to shave one’s chest for heart rate monitoring), and traditions about exercise behaviour (e.g., structured exercise being seen as a selfish activity) can deter CR participation in certain minority patients (Campkin et al., 2016; Jolly et al., 2004; Neubeck et al., 2011). South Asians, in particular, represent an important patient group to target. They are one of the largest-growing segments of the Canadian population and have a two- to three-fold higher risk of developing CAD than their White counterparts, but are less likely to participate in CR (Galdas & Kang, 2010; Grace et al., 2014; Grewal et al., 2005; Statistics Canada, 2007). Fortunately, there is accumulating evidence that motivational interviewing has a larger effect in racial and ethnic minorities compared to in White samples. However, cultural adaptations of motivational interviewing have been primarily applied to Latino Americans and American Indians in the context of substance use (Hettema et al., 2005; Oh & Lee, 2016). It will
be useful to examine strategies to culturally adapt motivational interventions for CR enrolment, such as ethnic matching between the provider and patient (Oh & Lee, 2016).

Women are also less likely than men to participate in CR (Oosenbrug et al., 2016), and may be more likely to report barriers such as caregiving responsibilities, depression, discomfort exercising in a mixed-gender setting, and lack of emotional support for recovery in CR programs (Day & Batten, 2006; McSweeney & Crane, 2001; Oosenbrug et al., 2016; Sedlak & Humphries, 2016). Women-only CR programs show promise for attracting eligible patients who might otherwise not enroll, but there is estimated to be only three women-only CR programs in Canada (Beckie & Beckstead, 2011; Sedlak & Humphries, 2016). Potential reasons for lack of widespread adoption are the cost and resources required to establish gender-specific CR programs, and the unclear effectiveness relative to traditional CR (Scott, 2010). Brief motivational interventions may offer the opportunity to have a conversation with the patient about gender- and culture-specific barriers to CR. RCTs with adequate sample size would enable sub-group analyses to examine the acceptability and impact of motivational interviewing within various socio-demographic and cultural groups. To optimally target women and minority groups, a combination of patient-level (e.g., using liaison support and motivational interviewing) and system-level (e.g., changing the structure/nature of CR programs to be more accessible) interventions is likely warranted.

Concluding Remarks

This program of research aligns with the aims of large-scale national and international initiatives to increase CR utilization by eligible patients (Ades et al., 2016; Grace et al., 2013; Grace et al., 2016), such as the Million Hearts program (U.S. Department of Health and Human Services, 2014). Million Hearts was launched in 2012 and renewed in 2017 with the goal of
preventing one million cardiovascular events over five years by implementing evidence-based behaviour change interventions (Ades et al., 2017). A sub-initiative called the Million Hearts CR Collaborative, recently proposed a “road map” to increase referral, enrolment, and adherence to CR among eligible patients. This road map involves using automatic CR referrals, limiting out-of-pocket expenses, including home-based CR options, having flexible hours of operation, limiting wait-times, and implementing liaison supports. Results from this dissertation afford further insight into the optimal road map toward increased CR utilization and more effective secondary and tertiary prevention of CAD.

Specifically, this is the first study to apply a motivational interviewing counseling style to address the problem of CR non-enrolment. The findings indicate that a single collaborative conversation about CR with ACS patients can increase both intention to attend CR and actual program participation. Spending time with patients after they have received basic information about CR, helping them verbalize their reasons for potentially wanting to join the program, supporting their ability to solve CR barriers, and engaging in active listening may positively influence CR enrolment and ongoing attendance. The road map to increasing CR participation might be augmented by incorporating a motivational interviewing counselling style into liaison approaches and by capitalizing on the brief time between CR referral and enrolment, which appears ripe for behaviour change intervention. Given that CR participation represents a “high stakes” health behaviour, high-quality behavioural interventions to resolve patients’ ambivalence about CR have the potential to reduce healthcare costs and save lives.
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Appendix A: Letters of Permission
feel free to use all the diagrams from our websites

Prof. Dr. Ralf Schwarzer
Freie Universität Berlin, Psychology

Dear Dr. Schwarzer:

I am currently a PhD student at the University of Calgary in Alberta, Canada. I am using your HAPA model of behaviour change to inform my dissertation research on motivating exercise in CVD patients. I am now in the process of writing up my dissertation, and I want to convey how the HAPA model applies to a behavioural intervention we tested in cardiac rehab patients.

I am writing to obtain your permission to include a copy of the HAPA model diagram from your website (http://userpage.fu-berlin.de/health/hapa.htm) in the appendices section of my dissertation. I would of course provide an appropriate citation. My dissertation will be added to the institutional repository at the University of Calgary and the Library and Archives Canada. Here are links where you can access further information about where the handout would be published: (1) University of Calgary Theses Repository – The Vault http://theses.ucalgary.ca/ and (2) Library and Archives Canada http://collectionscanada.gc.ca/obj/s4/f2/frm-nl59-2-e.pdf

Please let me know if you give permission for me to include this diagram in my dissertation and, if so, what would be the appropriate way to cite it.

Thank you in advance for your consideration of this request.

Kind regards,

Codie

Codie Rouleau, M.Sc.
Clinical Psychology Ph.D. Candidate
University of Calgary
Hi Codie!

I knew you were working on our dissertation, so it is great to hear this is the stage you are at with it! You do have my permission to use the handout in your dissertation. I have updated the version you last accessed to include the Types of Talk. Here is a citation format that I think would work:


Good luck with your defense and other pursuits!

Casey Jackson  |  Director

On Sun, Jan 15, 2017 at 10:25 AM, Codie Rouleau  wrote:

Dear Casey,

I attended your Advanced MI Training workshop back in June 2015. Your workshop proved to be essential for my dissertation research, which involved the design and evaluation of a brief MI intervention to promote patients’ attendance at a cardiac rehabilitation exercise program. I am now in the process of writing up my dissertation, and I want to convey how MI “maps onto” the Transtheoretical Model. The handout you provided during the workshop gives an excellent summary of this idea, and nicely conceptualizes how I tailored the intervention to match patients’ stages of change. (See attached for a scan of the handout I’m referring to).

With this in mind, I am writing to obtain your permission to include a copy of the attached handout in the Appendices section of my dissertation. I would of course provide an appropriate citation and your copyright information. My dissertation will be added to the institutional repository at the University of Calgary and the
Library and Archives Canada. Here are links where you can access further information about where the handout would be published: (1) University of Calgary Theses Repository – The Vault http://theses.ucalgary.ca/ and (2) Library and Archives Canada http://collectionscanada.gc.ca/obj/s4/f2/frm-n159-2-e.pdf

Please let me know if you give permission for me to include this handout in my dissertation and, if so, what would be the appropriate way to cite it. If you do provide permission, it would be much appreciated if you could send me a “clean” electronic version as well. Please let me know if you have any questions, and thank you in advance for your consideration of this request.

Kind regards,

Codie

Codie Rouleau, M.Sc.
YES.

Tavis

On Apr 3, 2017, at 10:48 AM, Codie Rouleau - [redacted] wrote:

Hi Tavis,

Please respond to indicate whether you give permission for the manuscripts below to be included in my dissertation.

Thank you!
Codie

Codie Rouleau, MSc
Doctoral Candidate

Dear co-authors:

As previously discussed, several manuscripts you recently contributed to will form the basis of my dissertation work which I am defending in a few weeks, on May 4. I am preparing a manuscript-style dissertation in which the individual manuscripts will be included as chapters in the thesis document. I am required by the Faculty of Graduate Studies to document that all co-authors have provided permission for the manuscripts to be included in my dissertation.

Please reply to this email within the next two weeks to indicate whether you give permission for me to include the following two manuscripts in my doctoral dissertation (as applicable):


Rouleau, C. R., King-Shier, K. M., Tomfohr-Madsen, L. M., & Campbell, T.S. Results from a randomized feasibility trial of motivational interviewing to promote enrolment in outpatient cardiac rehabilitation.


I will ensure to obtain appropriate copyright permissions from the journals.

Please do not hesitate to contact myself or Tavis if you have questions.

Kind regards,
Codie

---

Codie Rouleau, MSc
PhD Candidate

[Blacked out text]
Codie Rouleau

From: Kathryn King-Shier  
Sent: March 1, 2017 12:24 PM  
To: Codie Rouleau  
Subject: Re: Permission to Include Manuscript in my Dissertation

Hello Codie;
I agree that you should include the two manuscripts listed below in your doctoral dissertation.

Kathryn King-Shier, RN, PhD, FESC  
Professor and Guru Nanak Dev Ji DIL Research Chair  
Faculty of Nursing and Department of Community Health Sciences  
University of Calgary

---

From: Codie Rouleau  
Sent: March 1, 2017 12:20 PM  
To: Kathryn King-Shier; Lianne Tomfohr; Ross Arena; Simon Bacon; Tavis Campbell  
Subject: Permission to Include Manuscript in my Dissertation

Dear co-authors:

As previously discussed, several manuscripts you recently contributed to will form the basis of my dissertation work which I am defending in a few weeks, on May 4. I am preparing a manuscript-style dissertation in which the individual manuscripts will be included as chapters in the thesis document. I am required by the Faculty of Graduate Studies to document that all co-authors have provided permission for the manuscripts to be included in my dissertation.

Please reply to this email within the next two weeks to indicate whether you give permission for me to include the following two manuscripts in my doctoral dissertation (as applicable):


My dissertation will be added to the institutional repository at the University of Calgary and the Library and Archives Canada. Here are links where you can access further information about where the material would be published: (1) University of Calgary Theses Repository – The Vault http://theses.ucalgary.ca/ and (2) Library and Archives Canada http://collectionscanada.gc.ca/obj/s4/f2/frm-nl59-2-e.pdf.

I will ensure to obtain appropriate copyright permissions from the journals.

Please do not hesitate to contact myself or Tavis if you have questions.

Kind regards,
Codie

---

Codie Rouleau, MSc
PhD Candidate
Clinical Psychology
University of Calgary
Agree with Ross.
Sandeep

Hello Codie. Yes with great pleasure. Talk to you soon. Ross

On Mar 1, 2017, at 2:20 PM, Codie Rouleau wrote:

Dear co-authors:

As previously discussed, several manuscripts you recently contributed to will form the basis of my dissertation work which I am defending in a few weeks, on May 4. I am preparing a manuscript-style dissertation in which the individual manuscripts will be included as chapters in the thesis document. I am required by the Faculty of Graduate Studies to document that all co-authors have provided permission for the manuscripts to be included in my dissertation.

Please reply to this email within the next two weeks to indicate whether you give permission for me to include the following two manuscripts in my doctoral dissertation (as applicable):


Rouleau, C.R., King-Shier, K. M., Tomfohr-Madsen, L. M., Bacon, S. L., Aggarwal, S., Arena, R., & Campbell, T. S. The Rationale and Design of a Brief Motivational Intervention to Promote
Enrollment in Cardiac Rehabilitation Following Acute Coronary Syndrome: The UPBeAT-CR Study. Manuscript submitted for publication.

My dissertation will be added to the institutional repository at the University of Calgary and the Library and Archives Canada. Here are links where you can access further information about where the material would be published: (1) University of Calgary Theses Repository – The Vault http://theses.ucalgary.ca/ and (2) Library and Archives Canada http://collectionscanada.gc.ca/obj/s4/f2/frm-nl59-2-e.pdf.

I will ensure to obtain appropriate copyright permissions from the journals.

Please do not hesitate to contact myself or Tavis if you have questions.

Kind regards,
Codie

---

Codie Rouleau, MSc
PhD Candidate
Clinical Psychology
University of Calgary
Codie Rouleau

From: Lianne Tomfohr
Sent: March 1, 2017 12:53 PM
To: Codie Rouleau
Subject: Re: Permission to Include Manuscript in my Dissertation

Codie,

You have my permission to use both.

I am still working on editing your paper, I’m sorry for the delay!

Lianne

From: Codie Rouleau
Date: Wednesday, March 1, 2017 at 12:20 PM

Subject: Permission to Include Manuscript in my Dissertation

Dear co-authors:

As previously discussed, several manuscripts you recently contributed to will form the basis of my dissertation work which I am defending in a few weeks, on May 4. I am preparing a manuscript-style dissertation in which the individual manuscripts will be included as chapters in the thesis document. I am required by the Faculty of Graduate Studies to document that all co-authors have provided permission for the manuscripts to be included in my dissertation.

Please reply to this email within the next two weeks to indicate whether you give permission for me to include the following two manuscripts in my doctoral dissertation (as applicable):


My dissertation will be added to the institutional repository at the University of Calgary and the Library and Archives Canada. Here are links where you can access further information about where the material would be

I will ensure to obtain appropriate copyright permissions from the journals.

Please do not hesitate to contact myself or Tavis if you have questions.

Kind regards,
Codie

--

Codie Rouleau, MSc
PhD Candidate
Clinical Psychology
University of Calgary
Dear Codie,

Thank you for your email. If you would like to use your own article in a book or thesis that you are writing, no permission is needed, but the source of the journal article should be given. Please see this guide for further information: http://authorservices.taylorandfrancis.com/sharing-your-work/ and http://authorservices.taylorandfrancis.com/wp-content/uploads/2015/07/guide-for-reusing-content.pdf

Please do let me know if anything should be unclear or you have any further queries.

Best wishes,
Carolina

Dr. Carolina Bergfors
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From: Codie Rouleau
Sent: 24 August 2016 14:44
To: Bergfors, Carolina
Subject: Submission to Disability & Rehabilitation - TIDS-07-2016-012

Dear Dr. Bergfors,

I recently submitted a manuscript to your Disability & Rehabilitation, entitled "A Qualitative Study Exploring Factors That Influence Enrollment in Outpatient Cardiac Rehabilitation." (TIDS-07-2016-012)

This manuscript represents a portion of my dissertation work and, as such, I will be required to include the manuscript in my submitted dissertation.

If my manuscript is accepted by your journal, I was wondering how I might go about obtaining the necessary copyright permissions to include this work in my dissertation. The dissertation will be added to the institutional repository at the University of Calgary and to Library and Archives Canada. I know that the article is not yet accepted but I wanted to start this permissions process early.

Thank you in advance for the assistance.

Kind regards,
Codie

Codie Rouleau, MSc
PhD Candidate
Clinical Psychology
University of Calgary

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Codie Rouleau

From: Simon Bacon
Sent: March 5, 2017 11:39 AM
To: Codie Rouleau
Subject: Re: Permission to Include Manuscript in my Dissertation

Codie
My apologies. Yes, I consent and good luck.
Simon

Codie Rouleau
Sent: March 5, 2017 11:11 PM
To: Simon Bacon
Subject: FW: Permission to Include Manuscript in my Dissertation

Hi Simon,

Hope you’re having a good weekend.

I wanted to follow up with you regarding my previous email, as I’ve heard from all the other co-authors. When you have a moment, could you please let me know whether you are OK with me including the methods paper as a chapter in my dissertation?

Thank you in advance!

Codie

Codie Rouleau, M.Sc.
Clinical Psychology Ph.D. Candidate
University of Calgary

Codie Rouleau
Sent: March 1, 2017 12:21 PM
To: Kathryn King-Sher <ksherr@mail.ualberta.ca>; Lianne Tomfohr <lianne.tomfohr@ualberta.ca>; Ross Arena <rarena@mail.ualberta.ca>; Simon Bacon <sbacon@mail.ualberta.ca>; Tavis Campbell
Subject: Permission to include Manuscript in my Dissertation

Dear co-authors:

As previously discussed, several manuscripts you recently contributed will form the basis of my dissertation work which I am defending in a few weeks, on May 4. I am preparing a manuscript-style dissertation in which the individual manuscripts will be included as chapters in the thesis document. I am required by the Faculty of
Graduate Studies to document that all co-authors have provided permission for the manuscripts to be included in my dissertation.

Please reply to this email within the next two weeks to indicate whether you give permission for me to include the following two manuscripts in my doctoral dissertation (as applicable):


I will ensure to obtain appropriate copyright permissions from the journals.

Please do not hesitate to contact myself or Tavis if you have questions.

Kind regards,

Codie

---

Codie Rouleau, MSc
PhD Candidate
Clinical Psychology
You have my permission, as well.

G'Day Codie. I'm still in Australia...currently Monday afternoon! 😊

You have my permission to use this manuscript in your thesis.

K

Kathryn King-Shier, RN, PhD, FESC
Professor and Guru Nanak Dev Ji DIL Research Chair
Faculty of Nursing and Department of Community Health Sciences

Hello Committee,

As I prepare for my final stretch of dissertation writing (due in 2.5 weeks on April 13), I have two favours to ask:

1. In my previous email to you about author permissions, I forgot to request your permission to include our trial results manuscript in the dissertation. Please respond to this email to indicate whether you give permission for me to include the following manuscript in my doctoral dissertation:


Thank you,

Codie
Appendix B: Conceptual Diagrams
Figure B.1. Conceptual diagram of the Health Action Process (HAPA) stage-based model of behaviour change. Reproduced from http://userpage.fu-berlin.de/health/hapa.htm with permission from Dr. Ralf Schwarzer, Freie Universität Berlin.
Figure B.2. The connection between motivational interviewing and stage-based models of behaviour change. Reproduced with permission from: Jackson, C. (2015). Motivational Interviewing Approach [Training handout]. The Institute for Individual and Organizational Change/IFIOC, Spokane, WA.
APPENDIX C: Intervention Protocol
MOTIVATIONAL INTERVENTION PROTOCOL
The UPBeAT-CR Study: Understanding and Promoting Health Behaviour Change Amid Transition to Cardiac Rehabilitation

INTRODUCTORY REMARKS
This protocol is meant to supplement Miller, W.R. & and Rollnick, S. (2013). Motivational Interviewing (Third Edition). Helping People Change. Guilford Press and content from “Advanced Motivational Interviewing Training Workshop” (2015, June). Hosted by the Institute for Individual and Organizational Change, Spokane, WA. The protocol has been created in order to assess the feasibility of an orientation session that incorporates a motivational interviewing (MI) communication style when interacting with patients referred to outpatient cardiac rehabilitation (CR). Efforts should be made to standardize the intervention across patients. However, the intervener must be flexible enough to follow the patient otherwise there is the potential of pushing for change, which would have the predictable effect of eliciting resistance, and reducing the probability of change. All example quotes listed in the protocol are used to demonstrate key points and need not be followed verbatim.

GENERAL MOTIVATIONAL INTERVIEWING PRINCIPLES

- **Adopt a stance of equipoise** – a conscious, intentional decision not to use one’s professional skills to influence a patient toward making a specific change. You can be invested in the person and the process, but not the outcome. Avoid the “righting reflex” to give advice or opinions.

- **Strategically reflect empathy (how patient feels) vs. direction (what patient wants)** – depending on patient’s type of talk and readiness for change. Reflecting empathy will lead to longer sessions. If a reflection of direction elicits resistance, revert back to empathy.

- **Responding to negative affect** – Ask open-ended question “How you are feeling about that?” Also can incorporate affect into reflection that instills hope, e.g., “One of the things you mentioned before is you’ve been feeling discouraged and guilty, which can make it seem pretty urgent to make these changes. At the same time, this suggests to me that we need to tie this to something that matters to you most” or “in the past you’ve felt that sense of ___ from work, it might be time to consider how to be strategic in finding other ways to cultivate a sense of satisfaction in your life” then frame CR as part of a plan to derive or generate satisfaction.

- **Respond to resistance talk** (external focus) with empathic reflection, “you feel.”

- **Respond to sustain talk** (internal focus) with direction reflection, “you want.” Remember there is always change talk embedded in people’s complaints/concerns.

- **Use reflections > questions** whenever possible. (e.g., “what options are you considering?”) could be phrased as “you’ve got some ideas about what would be helpful.”

- **Patient should be doing most of the talking** – focus on their ideas, goals, thoughts, barriers, solutions. Ask “anything else? What else?” Tell me more about that.”
**Summary statements** link together reasons for change over a session or time.

**Avoid “I” statements** – Use “you” statements instead. The focus should always be on the patient, not you the clinician. This is not a relationship-based therapy.

**Promote autonomy** - “I’m not here to convince you one way or the other, it’s really up to you. Rather, I’m here to explore your thoughts and desires more fully so you can make an informed decision about whether you want to pursue cardiac rehab at this time.”

**Encourage patient to ask questions** - “I’m probably going to ask for your feedback throughout the meeting to make sure we’re on the right track with what would be most helpful to you. Please stop me if you don’t understand something or if you have a question.” This is meant to respond to qualitative feedback that patients sometimes felt overwhelmed by the amount and type of information that had been given about CR.

**Providing information** – In situations where information might help the patient make changes, strategies include:

- Never provide unsolicited information/advice.
- Use the elicit-provide-elicit sequence.
- Incorporate information into reflective statements (e.g., “you just want your sense of pride back, and you know that working with someone one-on-one to address your weight concerns would help get you there.”).
- Always present a menu of options and emphasize multiple paths to patient’s desired goals.
- Avoid using “you.” Other people find that... what sometimes happens is that...”
- Focus on what the patient wants to know.
- Avoid jargon and offer small amounts of info.
- If you don’t know the answer, it’s fine to say so.

**If patient asks for advice** – provide qualifiers and permission to disagree.

“If you want my opinion, I can certainly give it to you, but you’re the one who has to make up your mind in the end.”

I. Developing Rapport

This phase is designed to engage the patient in a collaborative working relationship, to help develop a good “first impression” of CR, to attend to the potential psychological distress of the patient, and to invite input from family/peers.

- **Attend to emotional and physical context.** In addition to the content covered here, it is essential to develop rapport through nonverbal behaviour (e.g., eye contact) and aspects of the physical environment (e.g., ensuring a private space). Pay attention to the patient’s demeanor and reflect feelings throughout the meeting. Examples:
“After going through the treadmill test, I expect that you’re feeling pretty worn out.”

“I’m sorry you’ve been kept waiting. I can imagine that you’re impatient to get home.”

- **Introduce self and purpose of session.**

  “Hi, my name is ____. During our meeting today, my goal is to work with you to discuss whether the program could be of benefit to you and — if so — in what ways. I generally follow the structure of asking about (1) what might be important to you in the program (or in your recovery in general), (2) any obstacles you might see to doing the program. That is my agenda — anything else you feel is important to cover today?

  Before we start, I want to remind you that what we say here doesn’t leave the room, so you can use this time in whatever way you choose.”

- **Invite support from significant others (if at appointment)**

  “Before we get started, I have heard from some people that they appreciate having a significant other, such as a spouse or family member, be part of this discussion — to have another set of ears, to have someone to help come up with ideas, and someone to provide emotional support. Is there someone with you at the appointment today that you would like to invite in?”

  If yes:
  
  - Explain that the significant other can play a valuable role by providing emotional support, identifying problems that might interfere with treatment goals, and participating in activities with the patient that are consistent with heart health goals.
  
  - Throughout the session, reinforce positive comments made by the significant other about the patient’s current change efforts (e.g., exercise, other health behaviour change since the cardiac event). Discuss future ways in which the patient might benefit from the significant other’s efforts to facilitate change.

*Adapted from: Treatment Improvement Protocol (TIP) Series, No. 25. Center for Substance Abuse Treatment. Rockville (MD): Substance Abuse and Mental Health Services Administration (US); 1999.*

**II. Clarifying and Building Importance**

This phase is designed to elicit the patient’s anticipated benefits of CR, as well as their goals/values — the “what/why” of behaviour change—and to develop a clearer understanding of the patient’s perspective. Avoid the urge to progress to planning, problem-solving, and overcoming obstacles without spending adequate time actively listening to the patient’s views about what he/she ultimately wants. This phase should be covered with every patient, even those who state they have high intentions to join CR. However, the amount of time spent in this phase will vary depending on readiness to change, with less
time needed for patients with a greater level of readiness to change. This is also the opportunity to
address any knowledge gaps about what the CR entails, with careful attention to delivering information
tailored information to the patients’ needs using a motivational interviewing stance.

- **Express affirmation re: coming to first appointment and solicit first impressions.**

  “So, you came to this doctor’s appointment today and did the treadmill testing... tell me how that
  went...”

  Reflect ambivalence as applicable: e.g., “Despite the fact that it wasn’t something you were
  looking forward to, and I’m sure you have a lot of appointments to manage, you still came
  which suggests to me that you’re really invested in your heart health.”

- **Assess knowledge about CR and, AS NECESSARY, impart knowledge**

  - **Elicit what the patient knows about the cardiac rehab program:**

    “We know that people come here with a range of knowledge and experiences about cardiac
    rehab. Some people received a pretty good description from their cardiologists. Others may
    have had friends or relatives tell them about the program. If it’s ok with you, I’d like to find
    out a bit more about what you know about the role of cardiac rehabilitation for people living
    with heart disease.”

    Use reflective listening and paraphrase.

  - **Ask if there is anything more the patient would like to know about the program.**

    “Is there any other information I can provide you with?”

  - **With patient’s permission, provide additional reasons why CR is important and/or
    clarify misconceptions.**

    For example: “Can I share a little bit more about the program that other people have found
    helpful to know about?” Incorporate facts about CR that relate to what patient is looking
    for. See some examples in Box 1.

**Box 1. Facts about CR that might be of interest to patients**

- **Recommended as gold-standard treatment** by major health organizations and cardiologists. So
  important that everyone with a cardiac event is referred to the program in Calgary.

- **Tailored supervised exercise** – e.g., some assistance with monitoring your exercise so you know that
  it’s helping your heart; someone to be available when you’re exercising to make sure you’re safe

- **Motivation/accountability/support** – e.g., someone or something to keep you accountable, to help
  you set and monitor your goals.
- **Longevity/reduced risk of recurrence** – e.g., something that research shows helps people live longer and reduces the chances of this happening to you again, so that you can do XX with your life. People who completed CR were 40% less likely to die than people who did not complete CR when followed up at least 1 year later. Dose-response relationship - 1% decrease in mortality with each additional session attended.

- **Opportunities for learning and information** – e.g., information that is novel, that is tailored to your own risk factors so that you can take control over getting better sooner.

- **Improved fitness and general functioning** – e.g., something that will help you get your energy back, help with your other health conditions, to be able to do [activity] again.

- **Access to specialist providers and services** – e.g., one-on-one support from people who specialize in recovering people from heart problems, a service where there is close and long-term monitoring of your health and medications.


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- **Elicit patient’s interpretation, understanding, and response.**

  “What are your thoughts on this information?
  “I wonder what this all means to you.”

- **Assess and build importance.** Below are several options for enhancing patients’ perceptions about the benefits they will receive from CR. There is no need to use all of these strategies.

  - **Assess:** “Based on what you know about the CR program, how important is it for you to attend at this point in your life?”

  - **Expand on importance.** Keep the patient talking by exploring their values/goals. Continue clarifying until you have an idea of the specifics of what’s important to them (e.g., “Why is this important to you?” “What would your life look like on a day-to-day basis if you get this benefit from CR?”)

  - **Provide affirmation (not praise).** Strategically reinforce strengths/behaviors/thoughts in relation to the patient’s goals or values. (e.g., instead of “I’m proud of you,” say “you knew coming to this appointment would give you the information you need to make an informed decision”). Consider using “Some Characteristics of Successful Changers” from Miller & Rollnick (2012).
• **Use importance ruler.** Ask “Why are you at a ___ and not a [lower number]?” with the goal of having the patient express what is motivating them to achieve.

  Instead of a scaling question, can reflect “It sounds like this is something like a ___ (e.g., 9/10) importance for you. What makes it so important?”

• **Look back.** Highlight the negative perceptions about current situation, increased perceived risk, and highlight possibility of being better again.

  “What were things like before learning about the heart condition, when things were going well? What was life like back then?” “How have things changed for you since learning you have heart disease?”

• **Look forward:**

  “If you’re able to get things under control with your heart health, what do you envision your life looking like five years from now?”

• **Respond to types of talk.** Reflect and evoke change talk. Rescue change talk from sustain talk by reflecting back what the patient wants.

• **Ellicit values.** You will generally hear goals/values embedded within the patient’s dialogue; reflect these values back (e.g., “You’re looking for a way of getting your autonomy back.”)

  - For patients who present as highly motivated to attend CR, it can be helpful to spend some time discussing how CR participation is tied to their values.

  - This is especially pertinent for patients who come across as primarily motivated by negative effect (e.g., fear of recurrence), whose motivation might decline over the next few weeks as the shock of the cardiac event subsides.

  - For example: “I can appreciate that you’re signed up and ready to go to CR. You know that you want to make lasting changes, and keep up this motivation over time. Would it be ok if we spend a few minutes talking about what’s important to you more broadly in life so you’re sure that what you’re doing is consistent with your values?”

• **AS NECESSARY: For patients with low importance:**

  • **Assess others’ importance.**

    “What number do you think a significant other (such as a spouse) might give? Why might that number be so high?”
• Use an overstated/amplified reflection.

“Maybe this is the best we can hope for right now.”

“You’re not really interested in taking on these changes related to your heart health right now. You might be happier just going on as before.”

“Your heart condition hasn’t caused any real difficulties for you.”

“There’s really no room for improvement...your health couldn’t possibly improve more than what it’s at right now.”

• Incorporate elements of CR program into patient’s values/goals (as applicable) using reflective statements.

Components of CR that are commonly seen as important to patients are listed above in Box 1. For example:

“You want _____ [restate ultimate goals/values]. It’s almost like if you had _____ [element available in CR], that’s something you might be interested in.”

“The beauty of this program is that it [serves ___ [patient-identified need]]... can I tell you more about that?”

• Summarize change talk and values.

III. Building confidence and evoking a change plan

The goal of this phase is to elicit the behavioural targets—the “how”—for change that are consistent with the person’s goals and values. The decision to move on to this phase should be guided by the patient, including increased change talk and commitment talk (I will, I’m going to, I plan on, I know I will, I’m ready), and diminished sustain talk. It may be helpful to ask:

“Would it make sense to consider how you might go about [making XX change], or is that getting ahead of things?”

“I wonder what you might decide to do.”

“I am wondering, given what we’ve talked about, where you would like to go from here... What do you think our next step should be?...Would you be interested in working together on a plan? It is entirely up to you.”

If the patient is not ready to make a plan, empathize with the challenges of initiating behavior change, then move to “Summarize the session.”
a. Assess confidence in ability to attend CR

- "I wonder what concerns you might have about being able to attend the CR program." Alternatively, can use a confidence ruler such as "On a scale from 0 to 10, where 0 is not at all confident, and 10 is very confident, how confident are you in your ability to attend cardiac rehab?"

- If patient has difficulty expressing barriers (e.g., nothing’s going to get in the way), consider gauging patients’ difficulties with the common difficulties noted in Box 2. “Some people have told me they have trouble with... How do these apply to you?” Also focus on strategies for maintaining their commitment to change (i.e., ensuring their intentions translate to CR participation in the long-run).

**Box 2: Common Barriers to CR Enrolment and Potential Solutions**

Concerns about exercise

- Note that the program will be individualized to the patient’s own needs and physical level. Convey that you will work with people who care about making a realistic exercise plan that works for your own circumstances, and is safe for your heart.

- Emphasize staff expertise. “Would it be ok if I told you a little bit about the staff here? E.g., average person has been working here for several years, training in kinesiology/exercise science, you can contact them by phone or email any time if you notice the exercise routine isn’t working for you”

- Emphasize that OK to miss and reschedule due to illness or physical symptoms. Can be put “on hold” if need longer periods of absence during rehab.

- Discuss that rehab team is right there during exercise – if you feel unpleasant physical symptoms during exercise (e.g., chest pain, shortness of breath), your rehab team will be right there. Just let them know that you’re feeling unwell, and they will work with you to deal with any symptoms, and adjust your exercise prescription as needed.

- Explain that certain symptoms (e.g., angina) during exercise can be prevented by taking your cardiac medications regularly as prescribed by your doctor, by doing a warm-up before your exercise, and by following the exercise prescription that will be given to you.

- For patients with other medical conditions (e.g., cancer arthritis), explain availability of a nurse and physician to consult. Oftentimes other conditions are manageable through CR, and exercise/lifestyle changes can benefit multiple conditions.

Distance and transportation

- Discuss patient’s consideration of options for support from friends or family members for rides to appointments.

- Explain the availability of the home-based CR program in which patients do not need to come to the CR center, as well as the availability of two sites within the city.

- Discuss the availability of public transportation options the patient might not have considered (e.g., the CR center’s proximity to light rail transit station and bus stop, and free
transportation services for people with disabilities in the city).

- Discuss the possibility of missing exercise on days when weather conditions (e.g., snow) make it unsafe to travel to your exercise appointments, and that these appointments are typically offered to be “made up”

Financial considerations

- Explain funding structure of the CR program - “This is a not for profit so that all the user fees go into running the program and no profits are banked. Ideally 100% of cost would be covered and in fact I know the staff would love to give the program for free.”

- Discuss the fee waivers that are available.

Scheduling conflicts (e.g., employment and other responsibilities)

- Emphasize program flexibility in terms of scheduling (e.g., different exercise times, days, locations available). Discuss availability of the home-based program that can be completed at any time of day with regular follow up support by phone. Some people come to 1 or 2 in-person sessions then switch to home program, for example.

- Discuss the possibility of postponing CR until come up with alternate arrangements

- Explain that some people find it helpful to return to job on a part-time basis at first and gradually work up to full-time hours after a cardiac event.

- Discuss options of talking with the employer’s human resources department, union representative, or EI office regarding time off to attend.

- Discuss availability of a letter from the CR program physician to the employer explaining what CR is and why it’s important.


b. Build confidence - Evoke targets from the patient.

i. Reflect resistance.

“So as long as you’re so busy, a demanding treatment might not be right for you.”

“On the one hand, you want to do something that will help, but on the other hand, life is hectic right now and it’s been hard to find the time.”

ii. Assess, affirm and incorporate strengths. Reflect strengths throughout the discussion (e.g., “You’re optimistic...that’s a real strength for you. You don’t get stuck in thinking how bad things are, and instead you ask what you can do to make things better.”)

iii. Use elicit-provide-elicit sequence to brainstorm ideas

Page 9 of 11
1. **Elicit patient’s ideas:** Allow patients to problem-solve. Get them to elicit potential solutions using the following possible questions/strategies:

   - “I have some ideas that have worked for other people, but what really matters is what will work for you. Nobody knows you better than you do, so I wonder what you think it would take for you to be able to make it here. What ideas have you thought of? Are there any ways you know about that have worked for other people?”

   - **Other open ended questions.** “You have to be pretty creative/strong/resourceful to find a way around that. I wonder how you could do it.” “What are smaller steps you have thought of that would get you closer to your goal?”

   - **Review past successes.** “What things have you managed to do that you weren’t really sure at first you’d be able to do?”

   - **Hypothetical thinking.** “Suppose you did succeed and were looking back on it now. What most likely is it that worked?”

   - **Use response to confidence ruler.** If the patient provides a high number (>5), ask “why are you at a (e.g., 7) and not 0?” with the goal of eliciting information about what the patient considers to be his/her skills. If the patient provides a low number (≤5), ask “What do you think it would take to get you to a higher number?” with the goal of eliciting the skills. What else might move you to a higher number?

   - **If patient gets stuck (“Yes but...”), move along.** “That’s fine, let’s not get too stuck on one ideas. What else could you do?”

2. **Provide ideas:** Ask permission to give feedback/advice. Provide a menu of options representing ways the person might pursue change.

   - **Ask permission and emphasize multiple courses of action.** “There are usually multiple possible courses of action, you’ll be the best judge of what works for you. Would it be ok if I tell you about what’s worked for other people?”

   - **Use anecdotes/story telling about similar patients who has similar barriers but overcome them.** “Your experience reminds me of someone I saw a few weeks ago. He was a man/woman like yourself, but had a 90% blockage. He was relatively young, working as a manager at a big engineering company...what he found helpful was x, y, z [provide a menu of options]. What are your thoughts about that?”
Consider a realistic time scale. Use SMART goals. For some patients, now might not be the best time to start rehab.

Use other interventions as appropriate (e.g., problem-solving, assertiveness, CBT, voicing commitment to others, self-monitoring, solicit support from others, reminders, scheduling)

3. Elicit reaction. Evaluate possible alternatives and select most optimal.

"Which one suits you the best?" "What makes the most sense to you?"

Convey willingness to reexamine. "If things don't work out, there will be other options that might work."

c. Reflect commitment talk & strengthen commitment – “what might help you strengthen your commitment to this plan?”

IV. Summarize the session.

a. Patient summary: Before we end, I'd like to take a moment to hear what, if anything, you got out of today's session. Allow patient to summarize. Good, I'm glad you found that helpful.

b. Provider summary: Provide a broad summary of what transpired in the session (e.g., repeat reasons for concern, new information developed, patient's plans for change, perceived consequences of change vs. not changing). “Do I have it right? What have I missed?”

c. Provide CR program contact information for if patients require follow-up information or support with getting to CR. “Thank you again for your time today. Have a good evening/day/morning!”
Appendix D: Supplementary Analyses
For ANCOVA analyses in Chapter 4, assumptions were tested regarding independence, linearity, normality, homogeneity of variance and regression, multicollinearity and, for logistic regression, case-to-variable ratios and linear relationships between the independent variables and log odds (Meyers et al., 2013; Tabachnick & Fidell, 2013). Between-group variance for intention, concerns about exercise, exercise-self-efficacy, and illness perception violated homogeneity of variance (Levene’s tests, $p < .05$). To rule out the potential influence of unequal variances on study results, all models were re-tested using Welch and Brown-Forsythe $F$-tests which are robust to homogeneity of variance violations (Field, 2013), and yielded the same pattern of primary and secondary outcomes as outlined in Table 4.2. Normality assumptions were also violated for all outcome variables in ANCOVA models (Shapiro-Wilk test, $p < .05$). Homogeneity of regression was violated for the BACR Practical Barriers scale, such that there were different slopes between groups on the covariate CR recommendation strength ($p = .014$); removal of this covariate from the ANCOVA model did not change the strength or nature of results obtained. Due to variance ratios less than 10:1 and similar samples sizes between groups, as well as two-tailed tests and corrected outliers (Tabachnick & Fidell, 2013), we had further confidence that the models were robust to these violations.
Table D.1

The Impact of a Brief Motivational Intervention on Primary and Secondary Outcomes Based on Results from Non-Covariate-Adjusted Analyses (n = 96)

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<th>Dependent variable</th>
<th>Intervention (n = 47)</th>
<th>Control (n = 49)</th>
<th>F-test for Group</th>
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<td><strong>Raw Means, $M (SD)$</strong></td>
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<td>Intention</td>
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<td>5.68 (2.11)</td>
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<td>Perceived Necessity (BACR)</td>
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<td>.040</td>
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<td>Concerns about Exercise (BACR)</td>
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<td>.050</td>
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<td>Practical Barriers (BACR)</td>
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<td>Perceived Suitability (BACR)</td>
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<td>3.15 (1.59)</td>
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<td>.903</td>
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<td>Total Barriers (CRBS)</td>
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<td>1.81 (0.63)</td>
<td>1.98</td>
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<td>Exercise Self-Efficacy (MSES)</td>
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<td>77.53 (16.41)</td>
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<td>Illness Perception (BIPQ)</td>
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<td>34.43 (15.17)</td>
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<td>.002</td>
</tr>
<tr>
<td>Social Support (ESSI)</td>
<td>26.75 (6.33)</td>
<td>27.57 (6.36)</td>
<td>0.40</td>
<td>.526</td>
<td>.004</td>
</tr>
<tr>
<td>CR Adherence$^a$</td>
<td>18.07 (7.70)</td>
<td>15.67 (8.78)</td>
<td>6.68</td>
<td>.012</td>
<td>.078</td>
</tr>
<tr>
<td><strong>Enrolled in CR, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Enrolment</td>
<td>43 (91.5)</td>
<td>39 (79.6)</td>
<td>2.58</td>
<td>.108</td>
<td>2.76 (0.79, 9.51)</td>
</tr>
</tbody>
</table>

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. No covariates included.

$^a$ n = 81 (excluded 15 home-based program participants from analysis)
Table D.2

The Impact of a Brief Motivational Intervention on Primary and Secondary Outcomes Based on Non-Imputed, Non-Winsorized Dataset (n = 96)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>n</th>
<th>Intervention (Estimated Marginal Means, M (SE))</th>
<th>Control (Estimated Marginal Means, M (SE))</th>
<th>F-test</th>
<th>p</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>93</td>
<td>6.65 (0.24)</td>
<td>5.68 (0.23)</td>
<td>8.44</td>
<td>.005</td>
<td>.088</td>
</tr>
<tr>
<td>Perceived Necessity (BACR)</td>
<td>90</td>
<td>21.72 (0.46)</td>
<td>20.26 (0.44)</td>
<td>5.07</td>
<td>.027</td>
<td>.057</td>
</tr>
<tr>
<td>Concerns about Exercise (BACR)</td>
<td>92</td>
<td>5.12 (0.40)</td>
<td>6.49 (0.40)</td>
<td>5.99</td>
<td>.016</td>
<td>.065</td>
</tr>
<tr>
<td>Practical Barriers (BACR)</td>
<td>91</td>
<td>5.34 (0.44)</td>
<td>5.51 (0.43)</td>
<td>0.08</td>
<td>.776</td>
<td>.001</td>
</tr>
<tr>
<td>Perceived Suitability (BACR)</td>
<td>93</td>
<td>3.10 (0.24)</td>
<td>3.22 (0.23)</td>
<td>0.12</td>
<td>.729</td>
<td>.001</td>
</tr>
<tr>
<td>Total Barriers (CRBS)</td>
<td>92</td>
<td>1.67 (0.08)</td>
<td>1.77 (0.08)</td>
<td>0.74</td>
<td>.392</td>
<td>.009</td>
</tr>
<tr>
<td>Exercise Self-Efficacy (MSES)</td>
<td>93</td>
<td>80.04 (1.87)</td>
<td>77.17 (1.85)</td>
<td>1.17</td>
<td>.283</td>
<td>.013</td>
</tr>
<tr>
<td>Illness Perception (BIPQ)</td>
<td>91</td>
<td>34.93 (1.81)</td>
<td>34.14 (1.83)</td>
<td>0.09</td>
<td>.762</td>
<td>.001</td>
</tr>
<tr>
<td>Social Support (ESSI)</td>
<td>91</td>
<td>27.18 (0.85)</td>
<td>27.12 (0.84)</td>
<td>&lt;0.01</td>
<td>.960</td>
<td>.003</td>
</tr>
<tr>
<td>CR Adherence*</td>
<td>78</td>
<td>18.32 (1.30)</td>
<td>13.27 (1.30)</td>
<td>7.43</td>
<td>.008</td>
<td>0.09</td>
</tr>
<tr>
<td>CR Enrolment</td>
<td>96</td>
<td>43</td>
<td>49</td>
<td>2.73</td>
<td>.098</td>
<td>3.12 (0.81, 12.05)</td>
</tr>
</tbody>
</table>

Note. Analyses were conducted on raw dataset excluding 4 study non-completers. 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.

*Excluded home-based CR patients.
Table D.3

*The Impact of a Brief Motivational Intervention on Primary and Secondary Outcomes Based on Intention-to-Treat Sample (n = 100)*

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Intervention (n = 50)</th>
<th>Control (n = 50)</th>
<th>F-test for Group</th>
<th>p</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Marginal Means, M (SE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td>6.49 (0.24)</td>
<td>5.67 (0.24)</td>
<td>5.82</td>
<td>.018</td>
<td>.058</td>
</tr>
<tr>
<td>Perceived Necessity (BACR)</td>
<td>21.37 (0.46)</td>
<td>20.33 (0.46)</td>
<td>2.47</td>
<td>.119</td>
<td>.026</td>
</tr>
<tr>
<td>Concerns about Exercise (BACR)</td>
<td>5.20 (0.37)</td>
<td>6.45 (0.37)</td>
<td>5.56</td>
<td>.021</td>
<td>.056</td>
</tr>
<tr>
<td>Practical Barriers (BACR)</td>
<td>5.35 (0.40)</td>
<td>5.47 (0.40)</td>
<td>0.05</td>
<td>.830</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Perceived Suitability (BACR)</td>
<td>3.05 (0.22)</td>
<td>3.18 (0.22)</td>
<td>0.16</td>
<td>.688</td>
<td>.002</td>
</tr>
<tr>
<td>Total Barriers (CRBS)</td>
<td>1.69 (0.08)</td>
<td>1.80 (0.08)</td>
<td>0.89</td>
<td>.348</td>
<td>.009</td>
</tr>
<tr>
<td>Exercise Self-Efficacy (MSES)</td>
<td>78.59 (2.14)</td>
<td>77.09 (2.14)</td>
<td>0.24</td>
<td>.625</td>
<td>.003</td>
</tr>
<tr>
<td>Illness Perception (BIPQ)</td>
<td>34.62 (1.71)</td>
<td>35.12 (1.71)</td>
<td>0.04</td>
<td>.839</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Social Support (ESSI)</td>
<td>27.35 (0.78)</td>
<td>27.15 (0.78)</td>
<td>0.03</td>
<td>.858</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>CR Adherencea</td>
<td>17.34 (1.29)</td>
<td>13.27 (1.33)</td>
<td>4.69</td>
<td>.033</td>
<td>.056</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Enrolled in CR, n (%)</th>
<th>Wald χ²</th>
<th>p</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR Enrolment</td>
<td>43 (86.0)</td>
<td>1.38</td>
<td>.241</td>
<td>2.05 (0.62, 6.83)</td>
</tr>
</tbody>
</table>

*Note. Analyses include all patients who enrolled in the study including 3 participants assigned to the intervention arm who did not receive the intervention, and 1 participant assigned to the control condition who completed the study after already enrolled in CR. 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. Covariates included age, sex, CESD-10 score, and CR recommendation strength. a n = 85 (44 in intervention, 41 in control; excluded home-based program participants from analysis)*
Table D.4

Exploratory Correlational Analyses Examining the Association between Intervention Characteristics and Outcomes (n = 47)

<table>
<thead>
<tr>
<th>Trial Outcomes</th>
<th>Duration</th>
<th>CEMI</th>
<th>Timing</th>
<th>Perceived Influence</th>
<th>Location</th>
<th>Partner Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to Attend CR</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Necessity (BACR)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concerns about Exercise (BACR)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical Barriers (BACR)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Suitability (BACR)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total Barriers (CRBS)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise Self-Efficacy (MSES)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Illness Perception (BIPQ)</td>
<td>r</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Support (ESSI)</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CR Adherence</td>
<td>r</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
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</tr>
<tr>
<td>CR Enrolment</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. CR = cardiac rehabilitation, 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, CEMI = Client Evaluation of Motivational Interviewing scale.

\(^a\)n = 41, Excluded home-based CR patients
\(^b\)M = 43.35 minutes (SD = 10.10), Range = 26.33 to 68.03 minutes
\(^c\)Intervention timing relative to educational classes that are offered before the CR program, where 1 = intervention completed before educational classes (n = 28) and 2 = intervention completed after educational classes (n = 19)
\(^d\)Based on questionnaire item, “How much did the interview session influence your decision about participating in cardiac rehabilitation?” (1 = not at all, 4 = a great deal).
\(^e\)Where 0 = home visit (n = 8) or university (n = 7), 1 = CR clinic (n = 32)
\(^f\)Where 0 = no partner present during motivational interview (n = 37), 1 = partner present during motivational interview (n = 10)