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Randomized Controlled Trial of Tailored Nursing Interventions to Improve Cardiac Rehabilitation Enrollment

Sylvie Cossette ▼ Nancy Frasure-Smith ▼ Jocelyn Dupuis ▼ Martin Juneau ▼ Marie-Claude Guertin

- ***Background:*** Short hospital stays for patients with acute coronary syndromes (ACSs) reduce the opportunity for risk factor intervention during admission. After discharge, cardiac rehabilitation can decrease the recurrence of coronary events by up to 25%. However, it remains underused.
- ***Objectives:*** The aim of this study was to determine whether a nursing intervention focused on individual ACS patients' perceptions of their disease and treatment would increase rehabilitation enrollment after discharge.
- ***Method:*** A total of 242 ACS patients admitted to a specialized tertiary cardiac center were randomized to either the intervention or usual care (n = 121 in both groups). The intervention included one nurse–patient meeting before discharge with 2 additional contacts over the 10 days after discharge (mean duration = 40 minutes per contact). The primary outcome was enrollment in a free rehabilitation program offered to all participants 6 weeks after discharge. Secondary outcomes included illness perceptions; family support; anxiety level; medication adherence; and cardiac risk factors including lack of exercise, smoking, body mass index, and diet.
- ***Results:*** The sample was composed of a majority of male, married workers who experienced a myocardial infarction or unstable angina without severe complications. The mean hospital stay in both groups was 3.6 days. There was a significantly higher rate of rehabilitation enrollment in the intervention group (45%) than in the control group (24%; p = .001). For the secondary outcomes, only the personal control dimension of illness perceptions was improved significantly with the intervention.
- ***Discussion:*** Progressive, individualized interventions by nurses resulted in greater rehabilitation enrollment, thereby potentially improving long-term outcome.

- ***Key Words:*** clinical trial · heart diseases · nursing care · randomized · rehabilitation

Cardiac diseases are the major causes of death and hospitalization in developed countries (Balady et al., 2007; Kotseva et al., 2009). Acute coronary syndromes (ACSs), including myocardial infarction and unstable angina, account for the majority of cardiac deaths and admissions (Stone, 2009). Revascularization, as well as other treatments and medications, have revolutionized the approach to ACS, with more patients surviving and most returning home sooner after the cardiac event. Aside from medication, modification of risk factors such as physical inactivity, smoking, diet, and stress remains crucial to reducing the risk of cardiac recurrence. As highlighted by Kotseva et al. (2009), "salvaging the acutely ischemic myocardium without addressing the underlying causes of the disease is futile; we need to invest in prevention" (p. 938).

Meta-analyses have shown reductions of 27% and 31% in all-cause mortality and cardiac mortality, respectively, as well as improvements in risk factors such as high blood pressure and cholesterol (total and low-density lipoprotein) with cardiac rehabilitation (Clark, Hartling, Vandermeer, & McAlister, 2005; Taylor et al., 2004). Such rehabilitation is now an integral part of many national guidelines on secondary prevention in cardiac patients in North America, Europe, and Australia (Arthur et al., 2010; Bairey Merz et al., 2009; Balady et al., 2007; Piepoli et al., 2010). However, only around 20%–25% of cardiac and ACS patients enroll in rehabilitation programs (Davies et al., 2008; De Angelis, Bunker, & Schoo, 2008; Mosleh, Kiger, & Campbell, 2009; Parkosewich, 2008; Wyer, Joseph, & Earll, 2001).

Previous studies have shown that rehabilitation enrollment is dependent on referral and other factors such as distance from home, transportation issues, schedule, and types of services offered (Grace et al., 2008). These factors can be addressed, at least in part, by organizational changes including automatic referrals and adaptation of rehabilitation programs to the needs of participants (Dalal, Zawada, Jolly, Moxham, & Taylor, 2010; Smith, Harkness, & Arthur, 2006). In

Sylvie Cossette, PhD, RN, *is Professor, University of Montreal, and Researcher, Montreal Heart Institute Research Center, Quebec, Canada.*

Nancy Frasure-Smith, PhD, *is Professor, McGill University, and Researcher, Centre Hospitalier de l'Université de Montréal and Montreal Heart Institute Research Center, Quebec, Canada.*

Jocelyn Dupuis, MD, PhD, *is Cardiologist, Montreal Heart Institute, and Associate Professor of Medicine, University of Montreal, Quebec, Canada.*

Martin Juneau, MD, FRCP, *is Cardiologist and Director of Prevention, Montreal Heart Institute Research Center, Quebec, Canada.*

Marie-Claude Guertin, PhD, *is Chief Statistician, Montreal Heart Institute Coordinating Center, Quebec, Canada.*

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addition, feeling too ill or too well, lack of interest (De Angelis et al., 2008), social isolation, lower education, and financial issues (Grace et al., 2008; Parkosewich, 2008) have been reported as barriers to rehabilitation enrollment.

However, patient-related factors also present substantial barriers to enrollment, and it is surprising, given the significant benefits of rehabilitation and the low attendance rates, that the effect of programs designed to change these factors has been examined in few intervention studies. Changes in patient-related factors that have the potential to increase rehabilitation enrollment include decreasing perceived barriers and improving perceived benefits from participation, increasing perceived personal control over the cardiac illness, increasing the perceived strength of professional endorsement of rehabilitation, and increasing the perception of the controllability of the disease and its cyclical nature.

Background

The literature includes only four randomized controlled trials (RCTs) aimed at increasing rehabilitation enrollment (Carroll, Rankin, & Cooper, 2007; Jolly et al., 1999; Suskin et al., 2007; Wyer et al., 2001). Three types of interventions were tested in these trials: automatic referrals, liaison, and a combination of the two. Automatic referrals are intended to standardize the referral process, targeting one of the fundamental reasons for low rehabilitation attendance. Liaison involves personal contact between patients and professionals (usually nurses) and is aimed at encouraging enrollment.

Drawing from 67 practice sites in the United Kingdom, Jolly et al. (1999) randomized 597 patients (19% women) to either an intervention or a control group. All patients had been hospitalized for an ACS or seen in a chest pain clinic. Over the yearlong study, general practice nurses delivered structured follow-up to patients, backed by the support of three specialized cardiac care nurses. The study found no differences between the control and experimental groups for the primary outcomes, including total cholesterol levels, blood pressure, 6-minute walk distance, body mass index (BMI), and smoking. However, a secondary outcome, the percentage of patients attending at least one rehabilitation session by the 1-year follow-up, was significantly higher in the intervention group (42% vs. 24%; $p < .001$). The authors did not report whether referral was part of usual care, making it impossible to determine if the increase in enrollment was due to the liaison component or referral.

A second RCT from the United Kingdom (Wyer et al., 2001) also showed significantly higher rehabilitation enrollment in the experimental group compared with controls (86% vs. 57%; $p = .0025$). All 87 postmyocardial infarction patients (13% women) enrolled in the study had a face-to-face interview with a rehabilitation nurse as part of the referral and liaison components of usual care. In addition, patients randomized to the experimental group received an intervention letter based on a nonspecified theory of planned behaviors. Intervention letters included sentences aimed at improving the patient's perceived control (e.g., it will be up to you), emphasizing the subjective norm (e.g., professionals recommend rehabilitation), and promoting specific attitudes toward rehabilitation (e.g., it improves recovery).

A third RCT involving liaison interventions showed a significant difference in rehabilitation enrollment in favor of the intervention group (35% vs. 23%; $p < .05$; Carroll et al., 2007). It was not specified whether there was rehabilitation referral in the usual care group. The study recruited patients (66% women) from five academic medical centers on the east ($n = 184$) and west ($n = 63$) coasts of the United States and was focused on patients without partners and those older than 65 years, because these individuals are at particular risk for poor health outcomes. The intervention was based on social support and self-efficacy enhancement and was provided by two master's-level nurses. Peer counselors provided home visits and telephone support over the 12-week study period. Self-reported enrollment in rehabilitation was measured at the 6-month follow-up.

A final RCT was reported by Suskin et al. (2007), who compared a personalized referral letter from the attending physician with a standardized cardiac rehabilitation referral letter. The study included 548 patients (32% women) who had been hospitalized for an ACS, angioplasty, or bypass surgery. Results showed a 58.2% rehabilitation attendance rate at 4 months after the index hospitalization in both groups (not significant).

In summary, three RCTs showed a significant increase in rehabilitation enrollment with intervention (Carroll et al., 2007; Jolly et al., 1999; Wyer et al., 2001) and one did not (Suskin et al., 2007). However, there were important differences among the interventions tested, and there is lack of evidence as to whether referral, liaison, or both act to increase rehabilitation enrollment. Only the studies by Suskin et al. (2007) and Wyer et al. (2001) provided enough information about usual care to determine that referral to rehabilitation was considered standard. Only one of these two studies (Wyer et al., 2001) demonstrated a significant increase in rehabilitation enrollment in comparison with the usual referral approach. Overall, as summarized by Gravely-Witte et al. (2010), there is clearly a dearth of RCTs evaluating the effect of interventions on enrollment.

Purpose

The goal of the Transit-CCU clinical trial was to evaluate the efficacy of the coronary care unit (CCU) transit nursing intervention on rehabilitation enrollment within 6 weeks of hospital discharge in patients hospitalized for an ACS.

Methods

Design

An RCT was used to test the hypothesis that patients in the experimental group would show greater rehabilitation enrollment within 6 weeks after hospital discharge after an ACS than would patients in the control group.

Participants

The study was conducted in adult patients hospitalized for a suspected ACS at the CCU or medical ward of a specialized cardiac hospital in Montreal, Canada. The study was reviewed and approved by the Research Ethics Board of the hospital and is registered at ISRCTN95784143.

Eligibility Criteria

The exclusion criteria included being discharged to a short-term rehabilitation center or to long-term care; inability to speak French or English; living more than 50 miles from the

rehabilitation center; having physical (e.g., terminal illness, hospitalization longer than 8 days, death before discharge), psychological (e.g., drug consumption, severe anxiety), or cognitive (e.g., dementia) problems; referred for surgery; already receiving regular outpatient follow-up (e.g., specialized clinics); previously completed a rehabilitation program; or having a final diagnosis other than ACS.

Intervention

The intervention was based on Leventhal's self-regulation theory proposing mechanisms to explain behavior changes beyond cardiovascular risk factor management (Cooper, Lloyd, Weinman, & Jackson, 1999; French, Cooper, & Weinman, 2006; Horne & Weinman, 1999; Petrie, Cameron, Ellis, Buick, & Weinman, 2002). According to the self-regulation theory, individuals' perceptions of their illness regulate their health behavior and risk factor management. The theory proposes that emotional and cognitive processes determine illness perceptions and, therefore, the plan of action during a health crisis. Illness perceptions include interrelated components such as identification of the disease (e.g., name, associated symptoms), presumed causes (e.g., risk factors), potential consequences (e.g., new medication), disease timeline (duration of the disease), and perceived control over the disease. On the basis of these illness perceptions, patients may or may not plan and engage in specific actions to reduce their risk factors, such as enrolling in a rehabilitation program. Interventions can be derived from the self-regulation theory. For instance, nursing interventions should attempt to reframe the more abstract representations of the event to more tangible ones. For example, recognizing and correctly interpreting chest pain as a tangible symptom of the disease are an essential prerequisite to taking appropriate action.

The intervention protocol was based on empirical evidence suggesting a progression in illness perceptions from the acute hospital episode to postdischarge (Cossette, D'Aoust, Morin, Heppell, & Frasure-Smith, 2009). The intervention included three encounters. The first was a face-to-face meeting that occurred before discharge (first encounter), the next was a telephone call at 3 days postdischarge (second encounter), and the third and final contact was either a telephone call or a hospital meeting at 10 days postdischarge (third encounter). A family member was invited to participate at any time point, but this was not mandatory. The goal of the first encounter was to address patients' (and family members') management of symptoms and physical activity after discharge, their understanding of the illness episode, and their concerns and worries.

The focus of the second encounter was the patient's clinical condition, including ability to manage the disease after discharge, and any other concerns including risk factor modification.

In addition to dealing with clinical and treatment issues, the focus of the third encounter was to address risk factor and lifestyle modification, including rehabilitation enrollment. This encounter occurred, on average, 10 days after discharge. For instance, the nurse inquired about any intention to modify commonly recognized risk factors such as exercise, diet, smoking, medication adherence, alcohol, overweight, and stress. The nurse also discussed patients' anticipated difficulties with risk factor modification to improve the perceived benefits and lower the barriers to entering rehabilitation. This topic was not introduced earlier in the program because it was thought that during the first days after an ACS, the focus should be on issues relating to clinical symptom management and recovery rather than on managing risk factors, which involves challenging profound and well-established patterns. Based on clinical experience, it was anticipated that by the third encounter, most postdischarge clinical concerns would be allayed and that patients would be more ready to accept the idea of attending a formal rehabilitation program.

Measures

The primary outcome was enrollment in the free-access rehabilitation program located near the hospital where the patients were recruited. For this study, enrollment was defined as having attended at least one rehabilitation session within 6 weeks of discharge (T3). Data on enrollment were collected in a computerized database that records all appointments in the rehabilitation program. A second, independent entry of data was also performed by the coordinating center.

Secondary outcomes included illness perceptions, family support, anxiety level, and medication adherence, as well as cardiac risk factors including lack of exercise, smoking, BMI, and diet. French or English versions of the scales were available depending on patient preference. A baseline questionnaire was completed in person before discharge (T1), and another telephone questionnaire was administered at 6 weeks postdischarge (T3) by a research assistant who was blind to the group assignment. Baseline sociodemographic and clinical variables were abstracted from the medical chart (e.g., diagnosis, procedures, antecedents and comorbidities, ejection fraction, laboratory results, medication, duration of hospitalization, weight, height, BMI, family history of cardiac disease) or were self-reported (e.g., employment status, education, living alone, driving a car, location of residence, smoking status).

Illness perceptions were assessed using the 38-item Revised Illness Perception Questionnaire (IPQ-R: Moss-Morris et al., 2002). Based on Leventhal's theory, the IPQ-R includes seven dimensions of illness perception. Higher scores on each dimension indicate that patients perceive the illness as more chronic than acute (seven items), report more negative consequences in their daily life (six items), report more control over their treatment (13 items), report more personal control (12 items), understand more about their illness (coherence; nine items), perceive the illness as more stable than cyclic (four items), and report more negative affective response to the illness (six items). Moss-Morris et al. (2002) reported acceptable reliability of the scale, with alpha coefficients ranging from .79 for the stable/cyclic dimension to .89 for the acute/chronic dimension. Test–retest reliability showed good stability over 3 weeks, with correlations ranging from .63 to .88, except for personal control, with a correlation of .46 over time. The 38 items of the scale explained 64% of the variance in the principal component analysis; each item represented its respective factor with a factor loading of .50 or more. Only a few items correlated >.50 with more than one factor. Concurrent and predictive validities were also demonstrated by Moss-Morris et al. In this study, alphas ranged from .48 for the stable/cyclic dimension to .88 for negative affective response at T1 and T3, respectively.

Patients' perceptions of the support provided by their family concerning their health situation were assessed using the 14-item Family Care Climate Questionnaire–Patient version (Clark & Dunbar, 2003). The score can vary from 14 to 70, with higher scores indicating higher perceptions of support. Clark and Dunbar (2003) reported Cronbach's alpha of .89 for the total score. Item-to-total correlations ranged from .44 to .83. Concurrent validity was assessed by examining correlation coefficients with related constructs. As expected, the Family Care Climate Questionnaire–Patient version was associated with higher emotional involvement of family, higher overall satisfaction with family support, and lower perceived criticism. In this study, the alpha coefficients at T1 and T3 were .87 and .85.

Anxiety was assessed using the 20-item state portion of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Ten items are worded negatively and 10 are worded positively (score reversed). The total score can vary from 20 to 80, with higher scores indicating more anxiety. Spielberger et al. (1983) reported internal consistency coefficients ranging from .86 to .95 and test–retest reliability coefficients ranging from .65 to .75 over 2 months. Spielberger (1989) reported a series of studies demonstrating the validity of the scale. In this study, the alpha coefficients at T1 and T3 were .93 and .94, respectively.

Medication adherence was assessed using the 4-item Self-Reported Medication-Taking Scale (Morisky, Green, & Levine, 1986). Respondents indicated whether they forgot (Item 1), omitted (Item 2), were careless (Item 3), or stopped their medication when feeling better (Item 4), both before being hospitalized (T1) and after hospital discharge (T3). Higher scores indicate lower adherence. Morisky et al. (1986) reported the validity of this measure of medication adherence for predicting blood pressure. In this study, alpha was .54 at T1 in patients who could respond to these items (i.e., they had been prescribed medication before being hospitalized; n = 191). Alpha was not calculated at T3 because of a lack of variability in response to Items 2 to 4 (i.e., many patients indicated they were not omitting, were not careless, and had not stopped their medication).

The Do You Have a Healthy Heart? scale (Program Acti-Menu, 2003) was used to assess physical activity. It asks the following question: "In general, how many days per week are you physically active for at least 30 minutes (walking, dancing, sports, workout, etc.; does not have to be a continuous 30 minutes)." The three possible answers include less than once a week, 1–2 times per week, and three to four times per week. For this study, answers were dichotomized at 0 = less than once a week and 1 = 1–2 times per week or more to avoid small cell size.

Healthy diet was assessed using the Are You Eating Healthy? scale (Program Acti-Menu, 2005). This scale has 20 questions including the consumption of fat (e.g., How often are you eating fast food or fried food [5 = *occasionally*, 2 = *about two times a week*, 0 = *at least three times a week*]?), as well as that of healthy foods (e.g., calcium and vitamins; e.g., How often are you eating vegetables [0 = *no vegetables*, 2 = *once in a while*, 5 = *twice a day*]?). Scores range from 0 to 100; higher scores indicate higher diet quality. No studies have yet established the validity of the scale, which was created for clinical purposes. In this study, the alpha coefficients were .71 at both T1 and T3. Smoking status was self-reported.

Sample Size

The sample size was based on being able to detect at least a doubling in the 15% rate of rehabilitation enrollment among ACS patients observed at the study hospital (Patenaude, Vanasse, & Verschuere, 2004). The detectable difference from 15% to 30% was thought to represent a clinically important improvement. To detect such an increase, the target sample size was set at 242 patients (121 per group), for a power of .80 and a two-sided alpha of .05.

Randomization and Blinding

Prior to being randomized, the eligible patients signed a consent form and filled out a baseline questionnaire that included sociodemographic information and self-report scales (T1). Randomization was carried out in advance by a statistician at the coordinating center. The study nurses were provided with a box of sealed opaque envelopes that they opened after each patient had completed the baseline questionnaire. Patients then were informed of their randomization assignment.

Patients assigned to usual care were told that the regular nurse would continue to provide their care until hospital discharge. They also were reminded that a research assistant would contact them by telephone roughly 6 weeks after discharge for the end-of-study questionnaire. For questions after discharge, they were encouraged to contact regular healthcare resources such as a telephone health hotline, their family physician or cardiologist, or emergency services.

Just after the hospital discharge, all patients in the study were referred to the rehabilitation center with a program including multifactorial and multidisciplinary interventions based on state-of-the art research and clinical guidelines (Bairey Merz et al., 2009; Balady et al., 2007; Hamm et al., 2011). The staff, blinded to their group assignment, phoned all study patients to invite them to enroll, and patients who accepted were scheduled for a first appointment within 6 weeks after discharge. In addition, patients in both groups were encouraged to call the rehabilitation center themselves at any time to schedule an appointment.

Statistical Methods

Sociodemographic and clinical variables were summarized as mean ± standard deviation for continuous variables and as count and percentage for categorical variables. As recommended by the Consolidated Standards of Reporting Trials statement (Moher et al., 2010), no statistical tests were performed to evaluate differences at baseline between groups. The chi-square test was used for the primary outcome (rehabilitation enrollment). Logistic regression was used to assess models adjusting for baseline variables (one baseline variable at a time) that were thought to influence the results, based on the literature (De Angelis et al., 2008; Grace et al., 2008; Parkosewich, 2008) or based on imbalances that were judged to be large enough to have potential clinical significance. Secondary outcomes expressed as a score at 6 weeks were analyzed using analysis of covariance models and including the baseline scores as a covariate. Secondary outcomes expressed as categorical variables (e.g., smoking) were analyzed using logistic regression models accounting for T1 corresponding variables.

Results

Participant Flow

As shown in Figure 1, of the total 4,802 patients evaluated, 3,800 were excluded based on the study criteria. An additional 301 refused to participate, and 459 were not included because of logistical issues (e.g., discharge hours), leaving a total of 242 patients as specified in the sample size calculation. Patients were recruited between October 3, 2006, and September 30, 2009.

Sample Description

The characteristics of the experimental and control groups are presented in Tables 1 and 2. The principal differences

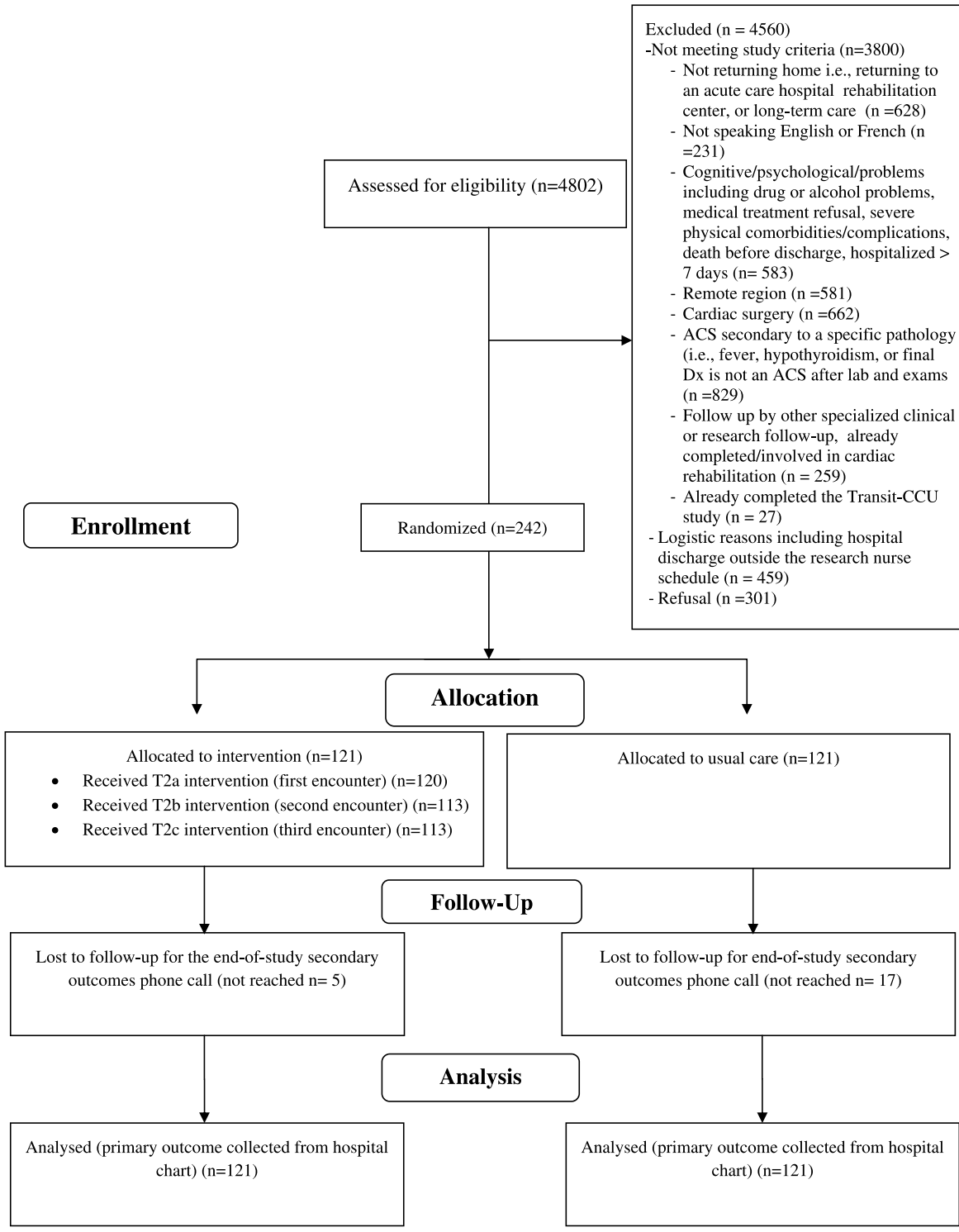

FIGURE 1. Consolidated Standards of Reporting Trials flow diagram for the Transit-CCU clinical trial. CCU = coronary care unit; Dx = diagnosis; ACS = acute coronary syndrome.

TABLE 1. Baseline Sociodemographic Characteristics

Characteristic	Experimental (*n* = 121)	Control (*n* = 121)
Age (years)	59.4 ± 10.5	59.4 ± 9.4
≥65 years old	38 (31.4)	36 (29.8)
Gender (male)	98 (81.0)	109 (90.1)
Working	75 (62.0)	75 (63.6)[a]
Education (≤high school)	64 (53.3)	51 (45.9)[b]
Lives alone	25 (20.7)	14 (12.3)[c]
Drives a car	105 (87.5)[d]	101 (91.8)[e]
Lives on Montreal island	78 (64.5)	77 (63.6)

Note. Data are presented as *M* ± *SD* or *n* (%).
[a]*n* = 118.
[b]*n* = 111.
[c]*n* = 114.
[d]*n* = 120.
[e]*n* = 110.

between the groups were that the control group included more men and fewer patients who lived alone. In terms of clinical characteristics and risk factors, the control group included more obese patients (BMI ≥30 kg/m^2) and those who were physically inactive. In contrast, hypertension was more common in the experimental group.

Intervention Description

Eighty-eight percent of the patients participated in all three planned encounters. The only patient who refused the first in-hospital encounter was in a hurry to go home, even though he had agreed to participate in the project. This patient phoned the nurse about 1 month after discharge to ask for information regarding cardiac-related issues. Therefore, all patients assigned to the intervention group had some form of contact with the project nurse. Spouses were invited to participate, but their presence was not mandatory. Sixty-nine spouses (57% of the experimental group participants) participated in at least one of the three encounters, with 41 in one encounter and only 10 involved in all three encounters. The mean ± *SD* number of minutes for the first, second, and third encounters was 37.3 ± 1.16, 31.4 ± 1.30, and 54.3 ± 2.41, respectively. The total number of minutes for the three encounters varied from 30 to 240.

At the first encounter, prior to discharge, almost half of the patients had worries about symptom management, including how and when to take nitroglycerine to reduce chest pain. Dealing with possible complications including hematomas, minor bleeding, or infection was also a concern for a majority of patients. Other worries included resumption of physical activities and use of other medications. Less frequently reported concerns were related to family, financial, or work. Most participants reported an adequate knowledge of their diagnosis either in specific terms (myocardial infarction) or using popular language (heart attack). Many participants wanted to modify their known risk factors, including diet (*n* = 101), exercise (*n* = 51), smoking (*n* = 38), and obesity (*n* = 34). These numbers were similar for the three encounters. The most common symptoms after returning home were fatigue, ecchymosis, coughing, dizziness, chest pain, and shortness of breath, as well as pain at the procedure site (brachial or radial site of entry). Based on the nurse's clinical judgment, interventions included teaching, emotional support (normalization, legitimization, listening, and reassurance), cognitive support (reframing, clinical advice, warnings, and suggestions), reinforcement of internal and external resources/strengths, and referral to external health resources when needed.

Primary Outcome

For the primary outcome, enrollment in the rehabilitation program, there was significantly higher enrollment in the intervention group (45%) than in the control group (24%; $p < .001$). The unadjusted odds ratio associated with the intervention was 2.56, 95% confidence interval [1.48, 4.43]. Variables with large enough differences to have clinical significance between groups (gender, living alone, BMI, physical inactivity, and hypertension) were included as covariates in the analyses of group differences in rehabilitation enrollment. Other variables suggested by the literature as possibly influencing enrollment were taken into account also, including accessibility issues (driving a car and distance from rehabilitation center), employment status, education, and prior cardiovascular disease. This significant effect remained after individually controlling for each of these covariates (all p values < .01).

The time between hospital discharge and the first rehabilitation enrollment visit ranged from 5 days to the end of the study period (42 days), with a mean of 20.04 days (±9.63 days). The time to rehabilitation enrollment did not differ between the groups ($M \pm SD = 20.44 \pm 6.21$ for the control group, $n = 29$, vs. 19.87 ± 10.11, $n = 54$, for the intervention group; $p = .80$).

Secondary Outcomes

The variable illness perceptions was the only secondary outcome that differed between the intervention and control groups (Table 3). However, the effect was seen for only one dimension of the IPQ-R (personal control), and although significant, the difference is small and possibly of low clinical importance. No other differences were found on the other dimensions of the IPQ-R, or family support, anxiety, medication adherence score, exercise, smoking, BMI, and healthy diet.

Discussion

This RCT was designed to evaluate the effect of a progressive, tailored nursing intervention on rehabilitation enrollment in ACS patients by 6 weeks postdischarge. Results showed an almost doubling of enrollment by the experimental group compared with the control group. These results are in line with three of the four published RCTs evaluating rehabilitation enrollment after a liaison type of intervention. As in this study, the interventionists in these three trials were bedside practice nurses or nurses supervising practice nurses or peers. Moreover, because the literature demonstrates that referral is a basic prerequisite for enrollment in rehabilitation (Grace et al., 2008), this study demonstrates that a nursing intervention can provide a significant benefit beyond simple referral.

TABLE 2. Baseline Clinical Characteristics

Characteristic	Experimental (n = 121)	Control (n = 121)
Diagnosis		
Q-wave MI	27 (22.3)	30 (24.8)
Non-Q-wave MI	43 (35.5)	43 (35.5)
Unstable angina	51 (42.1)	48 (39.7)
First PTCA (first; % yes)	98 (85.2)	107 (90.6)
Entry site		
Radial (left or right)	68 (69.4)	69 (64.5)
Femoral (left or right)	30 (30.6)	38 (35.5)
Any stent (standard or medication)	93 (76.9)	103 (85.1)
Prior CVD (bypass, PTCA, ACS)	51 (42.1)	58 (47.9)
% Ejection fraction (n = 137)	50.8 ± 10.3	52.7 ± 10.1
Number of risk factors (range = 0–7)	3.02 ± 2.3	3.26 ± 1.4
Diabetes	27 (22.3)	30 (24.8)
BMI (% ≥30 kg/m^2); n = 206)	38 (36.9)	52 (50.5)
Smoking	45 (37.2)	48 (39.7)
Hypertension	83 (68.6)	66 (54.6)
Dyslipidemia	93 (76.9)	101 (83.5)
Family history of cardiac disease	43 (35.5)	51 (32.1)
Exercise less than once a week	38 (31.6)	47 (40.2)
HDL (mmol/L; n = 187)	1.0 ± 0.3	1.0 ± 0.4
LDL (mmol/L; n = 187)	2.7 ± 1.0	2.7 ± 1.0
Triglycerides (mmol/L; n = 187)	1.9 ± 1.8	1.8 ± 1.4
Days of hospitalization from emergency admission to CCU discharge	3.5 ± 1.4	3.8 ± 1.6
Number of medications at discharge	7.9 ± 3.0	7.2 ± 2.2
Clopidogrel	113 (93.4)	113 (93.4)
Acetylsalicylic acid	121 (100)	121 (100)
Statin	115 (95.0)	115 (95.0)
Beta-blocker	106 (87.6)	105 (86.8)
ACE inhibitor	68 (56.2)	78 (64.5)
Angiotensin receptor antagonist	12 (9.9)	9 (7.4)
Calcium channel blockers	28 (23.1)	24 (19.8)
Nicotine replacement therapy	15 (12.4)	14 (11.6)

Note. Data are presented as $M \pm SD$ or n (%). MI = myocardial infarction; PTCA = percutaneous transluminal coronary angioplasty; CVD = cardiovascular disease; ACS = acute coronary syndrome; BMI = body mass index; HDL = high-density lipoprotein; LDL = low-density lipoprotein; ACE inhibitor = angiotensin converting enzyme inhibitor.

From a theoretical point of view, the present intervention was based on Leventhal's self-regulation theory, focusing on the modification of the perceptions of the illness (i.e., improving perceived control and encouraging a positive attitude toward rehabilitation). A small but significantly greater increase was found in perceived personal control in the experimental group than in the usual care group, suggesting one potential explanation for the increase in rehabilitation enrollment. However, this difference was small and may not reflect the program's impact on rehabilitation enrollment. In addition, none of the other dimensions of illness perception showed any differences between groups. It is possible that the illness perceptions measure was not sensitive enough to capture changes or that other mechanisms were involved in the program's success. It is also possible that the link between the theory behind the intervention design and the day-to-day practice of the intervention was not strong enough to bring about changes in illness perception. In addition, the intervention was individualized based on the specific needs and concerns of the patients, resulting in a variety of activities in the delivery of the intervention. Extensive data concerning the description of the intervention remains to be analyzed to possibly tease out the links between the content of the intervention and changes in illness perceptions. However, the decision was made not to focus on encouraging rehabilitation enrollment until after discharge, during the third

TABLE 3. Effect of the Intervention on Secondary Outcomes at 6 Weeks

	Experimental, Unadjusted *M* ± *SD*		Control, Unadjusted *M* ± *SD*		Experimental, Adjusted *M* ± *SE*	Control, Adjusted *M* ± *SE*	
	Baseline	6 weeks	Baseline	6 weeks	6 weeks	6 weeks	*p*[a]
Illness perceptions (*n* = 219)							
Chronic timeline (vs. acute)	20.89 ± 4.70	20.88 ± 4.74	20.96 ± 4.80	19.88 ± 5.81	20.90 ± 0.39	19.86 ± 0.41	.070
Negative consequences	20.08 ± 3.83	18.79 ± 4.27	19.89 ± 4.13	18.54 ± 4.45	18.74 ± 0.36	18.59 ± 0.38	.78
Personal control	24.07 ± 3.62	23.96 ± 2.82	24.20 ± 3.81	23.24 ± 3.42	23.99 ± 0.26	23.21 ± 0.27	.041
Treatment control	20.15 ± 2.71	19.50 ± 2.59	20.32 ± 2.88	19.59 ± 2.42	19.52 ± 0.23	19.56 ± 0.24	.89
Illness coherence	20.08 ± 3.29	20.29 ± 2.90	20.00 ± 3.69	20.39 ± 2.86	20.28 ± 0.27	20.40 ± 0.28	.75
Timeline cyclical (vs. stable)	11.17 ± 2.65	10.39 ± 0.32	10.70 ± 3.12	9.95 ± 2.70	10.32 ± 0.22	10.03 ± 0.23	.37
Negative emotional representation	17.75 ± 4.46	15.75 ± 5.02	17.96 ± 4.98	15.29 ± 5.53	15.52 ± 0.42	15.55 ± 0.44	.96
Family support	56.46 ± 6.82	57.21 ± 6.49	55.51 ± 7.92	57.25 ± 5.97	57.08 ± 0.56	57.38 ± 0.59	.72
Anxiety	39.01 ± 11.89	30.32 ± 10.96	36.79 ± 11.31	29.83 ± 10.66	29.88 ± 0.92	30.32 ± 0.96	.74
Medication adherence score ≥1	39/91 (42.9)	13/91 (14.3)	36/82 (43.9)	14/82 (17.1)	n/a	n/a	.63
Exercise less than once a week	35/108 (32.4)	21/108 (19.4)	41/102 (40.2)	18/102 (17.6)	n/a	n/a	.54
Smoking (% yes)	33/107 (30.8)	14/107 (13.1)	22/103 (21.4)	7/103 (6.8)	n/a	n/a	.40
BMI (% ≥30 kg/m^2)	34/90 (37.8)	31/90 (34.4)	39/81 (48.1)	31/81 (38.3)	n/a	n/a	.18
Healthy diet	62.30 ± 14.85	75.72 ± 12.67	62.83 ± 13.77	74.77 ± 13.25	75.84 ± 1.13	74.64 ± 1.19	.47

Note. Data for categorical variables are presented as *n* (%), and denominators vary due to missing data. *n* = 219 for IPQ-R, family support, and anxiety scores. *n* = 185 for healthy diet score. BMI = body mass index; IPQ-R = Illness Perception Questionnaire; ANCOVA = analysis of covariance; n/a = not applicable.
[a]Control for T1 corresponding variable using ANCOVA for continuous variables or logistic regression for dichotomous variables.

encounter. Taking the illness trajectory into account in determining the focus of the intervention may have been one factor contributing to the success of the intervention. Therefore, as in previous studies, the active ingredient or mechanisms by which the intervention resulted in the desired outcome remains to be studied.

No effect of our program was found on cardiac risk factors, including lack of exercise, smoking, BMI, and diet. These results were not surprising given the timing of entry into rehabilitation for both groups—ranging from 5 to 42 days after hospital discharge. The study intervention was aimed at motivating patients to enroll in rehabilitation with general counseling interventions and was not targeted specifically on risk factor modification. Risk factor modification requires specific specialized evidenced-based interventions such as motivational interviewing and cognitive behavioral strategies (Bairey Merz et al., 2009) and was not used in this study. General counseling interventions were retained to enhance enrollment in a rehabilitation center available free of charge at the study hospital for post-ACS patients. The aim of the present project was not to duplicate the interventions provided in the rehabilitation center. Instead, the goal was to increase the willingness of patients to enroll in rehabilitation.

Study Limitations

The major limitations of most RCTs involve external validity. In this study, generalizability to the CCU population is limited because study inclusion was limited to a small proportion of the general CCU population. However, only ACS patients were included, whereas patients awaiting conorary artery bypass graft surgery and those with other illnesses were excluded because rehabilitation issues for these groups differ. Few women were enrolled in the study (*n* = 35, 15%), whereas 25% of the patients evaluated for eligibility were women. Slightly more women than men were ineligible because of physical incapacities (too ill) or because the final diagnosis was not an ACS. Second, rehabilitation is highly dependent on the availability and proximity of a rehabilitation center. These centers are becoming increasingly more available, but are not always free of charge, and the schedule may not be convenient for all patients, which may interfere with enrollment (Juneau, Desgagné, & Poirier, 2010). Third, rehabilitation enrollment does not mean adherence. This study was focused on the effect of a nursing intervention program on enrollment, defined as at least one visit to the rehabilitation center. No data were collected on continued program attendance, long-term outcomes such as impact of the program on mortality or other complications, or cost-effectiveness of the program. These types of outcomes should be evaluated in future studies. Finally, a formal knowledge transfer process was not included, and the adoption of the intervention by CCU nurses was not assessed after the study was over. Knowledge transfer, that is, application of study findings in clinical practice, is a challenging issue that needs particular consideration.

Conclusion

This study adds to the literature by testing a progressive intervention tailored specifically to patients' clinical and

psychological trajectories after a cardiac event. The approach used offers a clinical pathway to address the major worries that patients face after a cardiac event. Nurses are on the frontline of providing care to cardiac patients and need such findings on which to base their practice and clinical judgment. This study is an example of how scientific knowledge, combined with clinical expertise, can contribute to better patient outcomes. ▼

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Corresponding author: Sylvie Cossette, PhD, RN, Montreal Heart Institute Research Center, R-223, 5000, Bélanger est, Quebec, Canada H1T 1C8 (e-mail: Sylvie.cossette.inf@umontreal.ca).

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