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Randomized Trial of a Home Recovery Intervention Following Coronary Artery Bypass Surgery

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Abstract: For this study a randomized clinical trial was designed to test the effects of an early home recovery information intervention on physical functioning, psychological distress, and symptom frequency 1 month following coronary artery bypass graft surgery (CABG). Recovery outcomes were compared between two groups: those receiving an audiotape of information on expected physical sensations and their management (Cardiac Home Information Program [CHIP]) in addition to the usual care, and those receiving the usual cardiac discharge information protocol. A nonprobability sample of 180 patients (84 women and 96 men; mean age = 62 years) was equally distributed between the two study groups. When controlling for age, comorbidity, and cardiac functional status, the results showed positive effects on physical functioning in women and psychological distress, vigor and fatigue in men. Consistent with other studies, women had worse physical functioning and more symptom frequency than men. These findings indicate that the CHIP intervention is an effective method to prepare CABG patients for home recovery. © 2001 John Wiley & Sons, Inc. Res Nurs Health 24: 93–104, 2001

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In 1998 an estimated 367,000 patients were confronted with the consequences of coronary artery bypass graft (CABG) surgery (American Heart Association, 1999). Although discharge information is a standard part of care for CABG patients and often expensive and structured efforts are expended to teach how to provide such discharge information, little systematic evaluation has been done on the effect of this information on recovery outcomes. The content of standard discharge information for CABG patients was developed predominately for middle-aged men and was designed to be provided in the hospital, when the patient may not be emotionally or physically prepared to comprehend such information. The rising number of women and elders undergoing CABG and the trend toward early discharge of patients have resulted in a changing profile of recovering cardiac patients (Pashkow, 1993). Thus, patients have more

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acute physical recovery needs, and nurses have less time to address these needs using current CABG discharge approaches. Recently, non-face-to-face methods of preparing individuals for CABG home recovery have been developed, including telephone monitoring and follow-up (Beckie, 1989), videotapes (Mahler, Kulek, & Tarazi, 1999) and audiotaped messages (Moore, 1996a). This study provides empirical evidence about the effectiveness of an inexpensive, convenient audiotaped nursing information intervention specifically designed to enhance home recovery of men and women following CABG.

Recovery from CABG is associated with adverse psychological and physical functioning. The first month of recovery is particularly distressful; patients report anxiety, depression, anger, and mood swings (Gillis, 1983; King, 1985; Moore, 1994), fatigue, sleep disturbances, changes in bowel habits, changes in appetite, discomfort from chest and leg incisions, shortness of breath, and anginal pain (Dracup, 1982; Gillis, 1983; King & Parrinello, 1988; Moore, 1994). Recently, more information about needs specific to women's CABG recovery has been reported. The recovery of women is characterized by more shortness of breath, less activity, and more chronic illnesses than is observed in the recovery of men (Khan et al., 1990; Moore, 1995, 1996a, 1996b; Rankin, 1990). Moore found that women had breast discomfort. In addition, their social contexts for recovery differed from that of men. These contexts affected women's recovery trajectories, as they often did not have a spouse to care for them or the women themselves were caregivers of a spouse (Moore, 1995). It is particularly important to understand and facilitate women's home recovery following CABG because women have greater morbidity and mortality during the first year of recovery (Hussain et al., 1998) and lower physical and social functioning than men (Becker, Corrao, & Alpert, 1988; Moore, 1995; Wenger & Roberts, 1987).

Although discharge information is a standard part of care for both male and female CABG patients, there have been few evaluations of the effect of this information on recovery outcomes. Studies of CABG discharge information have focused predominantly on patient perceptions of the adequacy of the information provided in discharge teaching programs. Patients indicated that they want to know more about what to expect during the home recovery period, particularly information about activity restrictions, activity resumption, common signs and symptoms during recovery, incision care, and medications (Beggs et al., 1998; Flynn & Frantz, 1987; Hanish, 1993; Jickling & Graydon, 1997; Waitkoff & Umburgia, 1990). A large proportion of research on discharge information has been focused on long-term behavioral changes associated with coronary artery disease and risk-factor reduction. Several studies evaluating the effectiveness of CABG discharge information have shown that participation in cardiac discharge teaching increases patient knowledge (Marshal, Penckofer, & Llewellyn, 1986; Steele & Ruzicki, 1987) and improves compliance with cardiac risk reduction behaviors (Mahler et al., 1999; Scalzi, Burke, & Greenland, 1980).

Few researchers have assessed the effectiveness of discharge information on decreasing distress during the recovery period or enhancing the functioning of patients. Beckie (1989) found that a home telephone information intervention increased knowledge about recovery, coronary artery disease, and risk-factor modification and reduced anxiety. Gillis, Gortner, Shinn, and Tompkins (1993) and Gortner et al. (1988, 1990) reported that in-patient information combined with a telephone monitoring program increased physical functioning and self-efficacy following CABG. Moore (1996a) found that an audiotaped home recovery intervention containing preparatory information using concrete objective descriptions increased physical functioning but had no effect on psychological distress at 1 month following surgery. The participants in all these studies, however, were predominately or exclusively men; thus, little is known about discharge information to promote women's functional recovery following CABG. In addition, these studies included participants whose mean hospital length of stay was approximately 10 days; thus, findings from these studies may not be applicable to current CABG patients whose average length of stay is between 5 and 6 days (Weintraub et al., 1998). The study reported here is a replication of that of Moore (1996a) but with a sample containing sufficient numbers of women and current discharge hospital lengths of stay.

The intervention tested in this study is based on the theory of self-regulation (Johnson, 1999; Leventhal & Johnson, 1983), which posits that preparatory information to support physical and emotional functioning during stressful events should focus on the concrete, objective features of a stressful event rather than the subjective emotional features. Concrete, objective features are the physical sensations, temporal characteristics, environmental features, and causes of sensa-

tions, symptoms, and experiences. Behavioral instructions are suggested actions that an individual can use to reduce or manage a symptom experience, such as altering a usual routine or accessing additional resources. An individual's schemas (representations of health care situations) are influenced by this information in the following way: Patients relate concrete elements of the current experience to past experiences they have dealt with successfully. Expected and ''normal'' events are likely to cause less anxiety than uncertain, unexpected events (Leventhal & Johnson, 1983). Thus, this predictability and understanding promotes increased confidence in an individual's ability to deal with the present situation. This confidence allows the individual to choose and execute behaviors that facilitate recovery (Johnson, 1999).

There is considerable evidence that information interventions containing a combination of both the expected concrete, objective symptom experiences and behavioral instructions for managing those experiences have a significant impact on patient recovery following stressful illness events, including decreasing psychological distress and increasing physical functioning (Johnson, Christman, & Stitt, 1985; Johnson & Lauver, 1989; Johnson, Fieler, Jones, Wlasowicz, & Mitchell, 1997; Johnson, Nail, Lauver, King, & Keys, 1988; Melnyk, 1995; Moore, 1996a). These studies have included a wide range of patients, including those recovering from abdominal surgery, mothers of children unexpectedly hospitalized, and cancer patients receiving radiation therapy. The replication study herein builds on the previous work of Moore (1996a), indicating the effectiveness of an intervention based on the provision of concrete objective information for early home recovery of patients who have had CABG surgery.

The purpose of this study was to test the effect on male and female CABG patients of a discharge information intervention that included information about expected experiences during recovery from CABG and instructions for managing these experiences. Titled ''Cardiac Home Information Program,'' or CHIP, the intervention consisted of a 15-min audiotape for home use by patients and their family members during the first month after discharge. It was hypothesized that both women and men who participated in the CHIP intervention would have lower levels of psychological distress, higher levels of physical functioning, and fewer adverse symptoms than would women and men who did not participate in such a program.

METHOD

Sample

Patients who had had CABG surgery were recruited on a cardiac step-down unit at an 800-bed acute-care urban teaching hospital in Cleveland, Ohio. A convenience sample of 212 indviduals who had had CABG surgery were approached to participate in the study on their fourth or fifth postoperative day. In an effort to obtain sufficient numbers of women and minorities, every woman and every minority patient but only every fourth man meeting study criteria were approached. Criteria for inclusion were: (a) having had a first CABG surgery within the last 4 or 5 days; (b) being able to speak, read, and write English; (c) residing within a 90-mile radius of Cleveland; (d) being cognitively intact (as determined by the clinical opinion of the nurse caring for the patient); (e) being discharged to one's home; and (f) having no major complications from surgery such as myocardial infarction, pulmonary embolus, hemorrhage, or cerebral vascular accident.

Nineteen people (9 women and 10 men) refused participation. The reasons for refusal were: ''not interested'' (n = 9), ''just want to leave the hospital and forget about the surgical experience'' ($n = 3$), ''too tired'' ($n = 3$), ''already received enough information'' ($n = 2$), and ''too busy to be bothered'' ($n = 2$). Thirteen people (5 control and 8 experimental participants) did not complete the study. Reasons for not completing the study were: (a) inability to be reached for the final measurement point at 1 month ($n = 4$), (b) refusal at the 1-month measurement point ($n = 4$), (c) mortality (1 in the experimental group and 2 in the control group), and (d) unexpected discharge to a skilled nursing facility rather than to patient's home ($n = 2$). The overall attrition rate was 6.7%, resulting in a final sample of 180 participants, of whom 96 (53.3%) were men, and 84 (46.7%) women. Individuals who did not complete the study did not vary by age, race, or gender from those who completed it.

Demographic information about those in the sample is provided in Table 1. There were no significant demographic differences between the control and experimental groups at baseline. Men and women differed in several characteristics; however, these differences were equally distributed between the study groups. There were more minority women (15 African Americans and 1 Hispanic) than minority men (8 African Americans and 1 Asian). Men were more likely to

Table 1. Sample Demographics

	Control ($n=90$)	Experimental ($n=90$)
	$M \pm SD$	$M \pm SD$
Age (years)	63.2 ± 10.0	62.0 ± 10.8
Education (years)	13.5 ± 3.3	12.8 ± 3.0
# of Grafts	3.5 ± 1.0	3.3 ± 1.2
Length of stay	6.5 ± 2.8	6.0 ± 1.7
Comorbidity	1.2 ± 1.4	1.1 ± 1.2
	%	%
[a]NYHA		
I	32.2	35.6
II	26.7	22.2
III	26.7	28.9
IV	14.4	13.3
Marital status		
Married	62.2	71.1
Race		
Caucasian	88.9	83.3
African American	11.1	14.4
Asian/Hispanic	0	2.3
Employment		
Employed	41.1	51.1

[a]NYHA = New York Heart Association Class.

be married [χ^2 (5, $N = 180$) = 15.8, $p = .007$] and have had more vessels bypassed [t (178) = 3.0, $p = .012$]. Compared to men, women had greater comorbidity [t (178) = 2.9, $p = .005$], stayed in the intensive care unit longer [t (178) = 2.09, $p = .037$], and had worse presurgical cardiac functional status, as measured by the NYHA Classification Scale (Criteria Classification Committee of the New York Heart Association, 1973): t (178) = 2.1, $p = .04$.

Intervention Protocol

The Cardiac Home Information Program (CHIP) consists of a 15-min audiotaped message that describes the typical recovery experiences of CABG patients, including particular emphasis on physical sensations they may experience and suggested behaviors for managing these experiences. The intervention differs from standard approaches to CABG discharge information in that it contains symptom-linked information with the following characteristics: (a) it describes recovery experiences in concrete terms; (b) it contains contextual information about spatial and environmental properties (e.g., detailed explanation of incision dressing); (c) it includes the cause of the sensory experience (physical symptoms); (d) it provides a temporal orientation that gives the sequence in which events will be experienced and cues about when a particular event may begin and end; (e) it describes the experiences as typical or normal in the situation; and (f) it provides suggestions for managing recovery experiences. The content of the audiotape was developed through focus interviews with male and female CABG patients and was validated against the theoretical model by another nurse theorist/researcher familiar with the theory of self-regulation (Moore, 1994; Moore, 1996b). The same audiotape was used for both women and men; portrayals of recovery experiences unique to each gender were described as such on the audiotape. The audiotape was produced in a recording studio using a professional female voice, at a cost of $1.69 per audiotape. Figure 1 provides an example of the type of information on the audiotape.

I have talked with many patients like yourself about what recovery was like at home. I'm going to share some of the typical experiences of patients following cardiac surgery that you may encounter, and offer suggestions on how you can handle these experiences. This information is designed to give you an idea of what to expect and ways to manage your recovery at home…

During the first day or so at home, many patients describe sensations associated with their leg incisions. They describe the leg incision areas as not painful, but stiff. They mention the leg area as having feelings of pulling, burning or pinching, especially when they first get up to walk. Often these sensations are felt near the groin area of the incision, or only when the leg is in certain positions. This is because of the tension on the skin and muscles by the stitches when you move. Some of the tingling, again, may be due to healing of the incisions. Some patients said that it was helpful to "walk out" the morning stiffness or soreness. Wearing loose clothing like sweat pants also may prevent rubbing against the leg incisions. The leg incisions get better every day and are usually healed 4 weeks after surgery.

FIGURE 1 Sample of information on the CHIP audiotape.

Following random assignment, participants in the experimental group were given the audiotaped CHIP intervention and a tape recorder by a research assistant on the fourth or fifth postoperative day. They were encouraged to listen to the audiotape as many times as they felt necessary and were told that they could take the audiotape and recorder home with them. To assure that the participants listened to the audiotape at least once, the audiotape was played once in the hospital under the observation of the research assistant.

Both control- and experimental-group participants received the usual discharge instructions. These discharge instructions were provided by unit nurses and consisted of information about cardiac physiology, risk-factor modification, activity, diet guidelines, medications, and general recovery information in the form of videotapes, pamphlets, and one-to-one counseling.

Instruments

Psychological distress was measured using the Profile of Mood States [(POMS) McNair, Lorr, & Droppleman, 1981]. Measurements were taken of four negative mood states indicative of a person's psychological and emotional response to stressors: tension/anxiety (nine items), depression/dejection (15 items), confusion/bewilderment (seven items), and anger/hostility (12 items). Participants indicate the degree to which each adjective describes their feelings during the last week on a 5-point scale ranging from 1 = *not at all* to 5 = *extremely.* Subscale scores were obtained by summing the responses of the items in each subscale—the higher the score, the greater the psychological distress. A total score for the POMS was derived by summing the four negative mood scores. The reliability and validity of the POMS have been well established for use with cardiac surgical patients (Gortner et al., 1988; Gortner & Jenkins, 1990; Moore, 1996a). The subscale and total POMS scores used in this study had Cronbach's alpha coefficients of .87 for anxiety, .91 for depression, .69 for confusion, .89 for anger, and .95 for total POMS.

Physical functioning was measured using the physical subscale of the Sickness Impact Profile [(SIP) Bergner, Bobbitt, Carter, & Gilson, 1981). The physical subscale includes 45 items consisting of the ambulation, body-care movement, and mobility subscales. The SIP assesses the impact of illness on daily activities and behaviors. Items describing illness-related behavioral dysfunctions are verbally presented to patients, who indicate those items that describe their health at that time using a response format of ''yes'' or ''no.'' The items are then weighted and summed to form a total physical functioning score, with poorer functioning reflected in higher scores. The items on the scales are appropriate for both genders. The validity and reliability of the SIP have been established for measuring functional outcomes 1 month following CABG (Gortner et al., 1988; Moore, 1996a). In the present study the internal reliability coefficient of the SIP physical scale was .85.

Symptom frequency was measured in two ways. The Symptom Inventory (Artinian, 1993) is a 20-item checklist that measures symptoms specific to cardiac surgery recovery. Using a scale from 1 to 7, participants are asked to describe the frequency with which a given symptom occurred during the previous week. A total score is calculated by summing the item scores; scores can range from 20 to 140. In this sample the Cronbach's alpha coefficient was .78. Other measures of symptom frequency were obtained using the fatigue (seven items) and vigor (eight items) subscales of the Profile of Mood States (McNair et al., 1981) as described above. Consistent with other studies of early CABG recovery using the POMS (King, 1985; Moore, 1996a), the fatigue and vigor POMS subscales were conceptualized as representing physical rather than psychological symptoms related to early surgical recovery. The internal reliability coefficients for the fatigue and vigor subscales in the present study were .90 and .87, respectively.

Three covariates—age, presurgical cardiac functional status, and comorbidity—that have been shown to be associated with functional status following CABG (Allen, 1990) were measured. Presurgical cardiac functional status was measured using the New York Heart Association (NYHA) Classification (Criteria Classification Committee of the New York Heart Association, 1973). The NYHA Classification assigns participants to one of four ordinal cardiac functional classes (I–IV). The NYHA Classification has been found to be valid when compared to patients' physiological responses on a treadmill and has shown reproducibility (Goldman, Hashimoto, Cook, & Loscalzo, 1981). Comorbidity was measured using a weighted sum of secondary diagnoses (comorbid conditions) that reflect the functional burden of illness conditions (Charlson, Pompei, Ales, & Mackenzie, 1987). A weighted sum of comorbid conditions was abstracted from the medical record. Validity of the Charlson scale

has been supported through significant correlations of scores with 6-week hospital mortality, length of stay, and hospital charges (Deyo, Cherkin, & Ciol, 1992). An interrater reliability rating of .86 using Cohen's kappa was obtained in this study.

Procedures

Human subjects approval was obtained for study procedures. A clinical nurse–specialist on the step-down recovery unit daily prepared a list of eligible patients. Patients were approached for participation on their fourth or fifth postoperative day by a research assistant. Following an explanation of the study, patients gave their written consent to participate. Demographic and baseline data on outcome variables were collected prior to or on the day of discharge (approximately day 4–5) during face-to-face interviews that took approximately 45 min to complete. For purposes of sample description, patient data about number of grafts, number of days in ICU, and postoperative length of stay were collected from the participant's medical record. At completion of the baseline interview, a sealed envelope indicating group assignment (determined using a table of random numbers) was opened by the research assistant, and the experimental group participants then were given the audiotaped CHIP program and a tape recorder. Experimental- and control-group protocols were administered using the procedures described above.

Measures of outcome variables (psychological distress, physical functioning, and symptom frequency) were repeated 1 month following discharge in a 45-min telephone interview. This 1-month data collection period was chosen because the intervention was specifically designed to affect common recovery problems occurring during the first month of recovery and because patients would be expected to have achieved improvements in their physical and psychological functioning by this time (Moore, 1996a). Analysis of variance (ANOVA) and covariance (ANCOVA; controlling for baseline data and covariates of age, comorbidity, and presurgical cardiac functional status) were used to assess the effectiveness of the intervention for the total sample and for women and men separately. Because directional hypotheses were posed, one-tailed significance tests were used. Scores of all variables except the SIP physical scores were normally distributed. The SIP physical scores therefore were transformed using a square root function to reduce the asymmetrical distribution.

RESULTS

Recovery Outcomes

Total sample. All the POMS scales were highly correlated with each other and with the SIP physical functioning score. The POMS scales and SIP scores also were highly correlated with the symptom frequency scores. Table 2 displays the means, standard deviations, and results of analyses of covariance for the total sample. Mean scores did not differ between the two study groups at Time 1 (baseline). Time 2 results showed significant effects of the CHIP intervention on physical functioning (effect size = .31). Of the variables representing symptom frequency, a significant difference between the control and experimental groups was found on the vigor subscale (effect size = .33); no differences were found on the fatigue subscale or the Symptom Inventory. No significant differences in psychological distress were found between the groups. However, the effects of the CHIP intervention produced different results in women and men.

Women. Means, standard deviations, and results of analyses of covariance on psychological distress, physical functioning, and symptom frequency for women are shown in Table 3. When controlling for covariates, no differences in physical functioning, psychological distress, symptom frequency, or vigor or fatigue scores were found at Time 1 (baseline). At Time 2, controlling for baseline data and the covariates, ANCOVA results indicated significant differences between the experimental and control groups in women's physical functioning but no significant differences in psychological distress or symptom frequency.

Men. Table 4 reports the means, standard deviations, and results of ANCOVA in men for psychological distress, physical functioning, and symptom frequency. Mean scores adjusted for covariates did not differ between men in the experimental and control groups at Time 1. At Time 2 significant differences in psychological distress in men were found for the POMS subscales of depression, anger, and confusion, and for the total POMS when controlling for baseline data and covariates. Of the variables representing symptom frequency, men in the experimental group had significantly less fatigue and more vigor than men in the control group; no differences in the Symptom Inventory were found. In addition, no differences were found in physical functioning between men in the experimental and control groups.

Table 2. Means, SDs, and Results of ANCOVA for Total Sample

	TIME 1				TIME 2				ANCOVA	
	Control ($n=90$)		Experimental ($n=90$)		Control ($n=90$)		Experimental ($n=90$)		Controlling for Time 1 and Covariates	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*F*	*p*
Psychological distress										
Anxiety	11.4	(5.7)	11.6	(6.5)	6.3	(5.8)	6.5	(6.4)	.06	.40
Depression	8.7	(9.6)	9.4	(9.2)	4.6	(6.5)	4.7	(7.9)	.00	.48
Confusion	6.2	(3.9)	5.9	(4.1)	4.3	(2.8)	4.1	(3.9)	.00	.48
Anger	4.3	(5.2)	5.2	(6.7)	2.9	(5.2)	2.9	(5.6)	.39	.27
Total	30.5	(20.7)	32.2	(22.9)	18.2	(17.7)	18.1	(21.4)	.03	.43
Physical functioning										
[a]SIP Physical	5.90	(1.0)	5.7	(.9)	2.9	(1.5)	2.4	(1.4)	2.62	.05
Symptom frequency										
Symptom Inventory	56.1	(13.9)	55.8	(13.4)	40.8	(12.0)	40.5	(13.0)	.01	.47
Fatigue	13.5	(6.5)	12.6	(6.7)	6.5	(5.3)	5.2	(5.7)	1.80	.09
Vigor	9.8	(6.1)	9.9	(5.7)	14.6	(6.8)	16.7	(5.9)	4.83	.01

Note: All means and standard deviations are adjusted for covariates
[a]The SIP physical scores include the subscales of ambulation, body care and movement, and mobility and were transformed using a square-root function.

Additional Findings

Recovery differences by gender. Important gender differences existed in recovery outcomes at both measurement points. At Time 1 women had worse physical functioning ($M=5.96$, $SD=.90$) than did men ($M=5.67$, $SD=.95$): $F(1, 179)=4.0$, $p=.04$. This difference was not present after controlling for age, comorbidity, and cardiac functional status. No gender differences in psychological distress, vigor, fatigue, or symptom frequency were found at Time 1. In contrast,

Table 3. Means, SDs, and Results of ANCOVA for Women

	TIME 1				TIME 2				ANCOVA	
	Control ($n=42$)		Experimental ($n=42$)		Control ($n=42$)		Experimental ($n=42$)		Controlling for Time 1 and Covariates	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*F*	*p*
Psychological distress										
Anxiety	10.3	(5.4)	12.5	(7.3)	6.0	(6.1)	7.7	(8.0)	.18	.34
Depression	7.1	(8.8)	9.9	(9.9)	4.4	(7.3)	6.7	(10.6)	.48	.25
Confusion	5.9	(3.8)	6.7	(4.7)	4.0	(2.9)	5.2	(5.0)	1.62	.11
Anger	2.7	(3.7)	5.7	(8.3)	2.5	(5.6)	4.1	(7.4)	.03	.43
Total	26.0	(18.6)	34.8	(26.2)	16.9	(19.5)	23.8	(28.1)	.14	.35
Physical functioning										
[a]SIP Physical	6.0	(.9)	5.9	(.9)	3.4	(1.5)	2.8	(1.5)	3.50	.03
Symptom frequency										
Symptom Inventory	56.3	(15.3)	57.2	(16.0)	43.4	(13.5)	43.7	(10.1)	.01	.47
Fatigue	13.2	(12.5)	13.1	(14.0)	6.4	(5.6)	6.6	(6.7)	.05	.41
Vigor	10.4	(6.2)	9.4	(5.6)	14.9	(7.3)	14.8	(6.7)	.08	.39

Note: All means and standard deviations are adjusted for covariates.
[a]The SIP physical scores include the subscales of ambulation, body care and movement, and mobility and were transformed using a square-root function.

Table 4. Means, SDs, and Results of ANCOVA for Men

	TIME 1				TIME 2				ANCOVA	
	Control ($n=48$)		Experimental ($n=48$)		Control ($n=48$)		Experimental ($n=48$)		Controlling Time 1 and Covariates	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*F*	*p*
Psychological distress										
Anxiety	12.3	(5.7)	10.9	(5.7)	6.5	(5.6)	5.4	(4.3)	.27	.30
Depression	10.1	(10.0)	8.9	(8.6)	4.9	(5.7)	2.8	(3.6)	3.84	.03
Confusion	6.4	(4.1)	5.2	(3.4)	4.5	(2.9)	3.1	(2.3)	4.50	.02
Anger	5.7	(5.9)	4.8	(5.0)	3.3	(4.8)	1.8	(3.2)	2.90	.05
Total	34.5	(21.7)	29.3	(19.6)	19.3	(16.1)	13.2	(11.0)	3.20	.04
Physical functioning										
[a]SIP physical	5.8	(1.0)	5.5	(.9)	2.4	(1.3)	2.0	(1.3)	.44	.25
Symptom frequency										
Symptom Inventory	55.9	(12.7)	54.5	(10.6)	38.5	(10.1)	37.2	(9.8)	.15	.35
Fatigue	13.7	(5.4)	12.1	(6.3)	6.6	(5.0)	3.9	(4.3)	5.82	.01
Vigor	9.2	(6.1)	10.4	(6.3)	14.3	(6.4)	18.3	(4.5)	11.8	.00

Note: All means and standard deviations are adjusted for covariates.
[a]The SIP physical scores include the subscales of ambulation, body care and movement, and mobility and were transformed using a square-root function.

at Time 2, after controlling for age, comorbidity, and cardiac functional status, differences in physical functioning between women and men remained. Women had worse physical functioning ($M=3.12$, $SD=1.49$) than men ($M=2.19$, $SD=1.19$): $F(4, 179)=11.9$, $p=.001$. Women also had more symptom frequency as measured by the Symptom Inventory ($M=43.57$, $SD=15.4$) than men ($M=37.86$, $SD=9.8$): $F(4, 179)=4.0$, $p=.05$. No gender differences in psychological distress, fatigue, or vigor were found at Time 2.

Audiotape use. Participants listened to the audiotaped intervention an average of 3.3 times (SD = 2.87), ranging from once to as many as 20 times. They listened to the audiotape in the hospital, at home, and in the car. The audiotape was used most frequently in the hospital just before discharge and during the first few days at home. Although the number of times the audiotape was listened to did not differ between men and women, men listened to the audiotape more often after 2 weeks following discharge than did women: χ^2 (1, $n=90$) = 3.9, $p=.04$. All but 2 of the 90 participants said the audiotape helped them to learn what to expect during recovery. Participants made comments such as, ''It reduced worries,'' ''It was soothing,'' and ''It was reassuring.'' Ninety-five percent of the participants agreed that the audiotape increased their knowledge about the physical sensations to expect during recovery and provided them with useful suggestions to manage recovery experiences. In addition, 74% of the participants stated they used the suggestions given on the audiotape, and 99% of the participants stated they would recommend the audiotape to others. Frequency of listening to the audiotape was not correlated with psychological distress, physical functioning, or symptom frequency. Frequency of listening to the audiotape was weakly correlated with vigor ($r=.21$, $p=.05$).

DISCUSSION

Effects of the CHIP Intervention

It was hypothesized that women and men who participated in the CHIP intervention would have lower levels of psychological distress, higher levels of physical functioning, and fewer adverse symptoms. The hypothesis that men receiving the CHIP program would have less psychological distress than those not receiving the CHIP program was supported. In contrast, women receiving the CHIP program did not have less psychological distress than women not receiving the CHIP program. However, the ability of the CHIP intervention to affect psychological distress in even one gender is an important finding. In three of four previous studies evaluating the effects of discharge preparatory information during early

CABG home recovery, the interventions were not found to affect psychological distress (Gillis et al., 1993; Gortner et al., 1988; Moore, 1996a). These authors' explanations of their findings indicated that the preparatory information interventions tested may not have been of sufficient strength to change psychological distress following CABG. In a prior test of the CHIP intervention (Moore, 1996a), both women and men were included, and it is possible, given the findings of the current replication study (in which the intervention did not affect psychological distress in women but did in men), that the effects of the intervention on men in the earlier study may have been obscured by the lack of effects in women.

A possible explanation for why women's psychological distress was not changed in either the current or previous tests of the CHIP intervention may be that the preparatory information in the intervention focused on the physical sensations related to surgery and recovery and not on the psychologically distressing social situations occurring in women's lives during the recovery period, such as the inability to carry out caregiving responsibilities for a dependent family member or to care for themselves if they lived alone. These contextual social recovery needs of women during CABG recovery have been documented as differing from the dominant recovery concerns of men, which focus on physical comfort and functioning (Hawthorne, 1994; Moore, 1995). The social recovery needs of women may influence their psychological recovery more than their concerns about managing the physical sensations experienced during recovery. It may be that women need recovery interventions that include more than preparatory information; women also may need CABG home recovery interventions that comprise instrumental support, such as cooking, household cleaning, or grocery shopping services.

The positive effect of the CHIP intervention on men's psychological functioning is consistent with study results of Beckie (1989), who found that a supportive and educative telephone follow-up after discharge reduced anxiety at 6 weeks after CABG surgery. Although Beckie's telephone intervention was not based specifically on the provision of sensory information, the telephone intervention did focus on the patient's physical and functional recovery concerns. However, in Beckie's study several telephone calls were required over the 6-week period; thus, the telephone intervention was a more time-intensive and costly intervention for nurses to deliver than was the audiotaped intervention tested in this trial.

The hypothesis that individuals who received the CHIP program would function better physically than those who did not receive it was supported only in the results for women. This gender difference in the effectiveness of the CHIP intervention could be related to women having lower baseline levels of physical functioning than men, thus having a greater opportunity to improve. However, the effectiveness of the CHIP intervention in increasing women's physical functioning is an important finding because prior studies of preparatory home interventions for CABG patients have not included sufficient numbers of women to determine effectiveness in this gender (Gillis et al., 1993; Gortner et al., 1988; Moore, 1996a).

The current result in which the CHIP program had no effect on physical functioning in men differed from the findings in a previous trial of the CHIP intervention by Moore (1996a), which showed a significant effect by CHIP on physical functioning for both the male and female participants. However, gender-specific analyses of the intervention's effect were not conducted, and it is possible the positive effects of the CHIP intervention in this prior study may have resulted from changes in the women's physical functioning. Another explanation is possible for the current study's lack of effect in men: clinical studies of the effects of preparatory interventions consisting of concrete, objective information have shown that some patients in control groups function as well as those in the experimental groups, according to Johnson et al. (1997), who state that these patients appear to cope with health care experiences with relatively little difficulty and may be naturally inclined to cope with threatening experiences by focusing on the more objective aspects of the experiences and thus do not benefit from being provided with additional information of this type. Although studies testing the effects of interventions based on self-regulation theory have contained both women and men, gender-specific analyses of effectiveness have not been done. The gender differences found in this study suggest that men and women may respond differently to information interventions based on self-regulation theory and that the gender-specific effects of interventions based on concrete, sensory information should be examined further.

The hypothesis that individuals receiving the CHIP intervention would have less symptom frequency than those not receiving the CHIP intervention was supported in men on one of the measures of symptom frequency. The POMS

measure of vigor and fatigue indicated that more vigor and less fatigue were experienced by men after 1 month in the CHIP group. However, the broader measure of symptom frequency using the Symptom Inventory indicated no differences. This hypothesis was not supported in women; no differences were found on any of the measures of symptom frequency in women. For both genders it is possible that a measure of symptom *distress* would have been a better choice of outcome measure rather than a measure of symptom *frequency* because the CHIP intervention is aimed at symptom management (self-regulation) rather than a reduction in the occurrence (frequency) of symptoms. This notion is supported by previous findings of a test of preparatory information intervention in which concrete objective descriptions did not reduce the intensity of unpleasant sensations but rather decreased the distress associated with them (Johnson & Rice, 1974).

The significant changes found in men in the vigor and fatigue scales of the POMS suggest that the present investigators may have been in error in proposing that these scales were indicators of physical, rather than psychological, status following CABG surgery. Because significant differences were found in men in most other scales of the POMS (clearly representing psychological factors) and because no differences were found in physical functioning or symptom frequency, it is possible that these scales do represent psychological rather than physical dimensions of CABG recovery, as proposed by the authors of the POMS (McNair et al., 1981).

Understanding the mechanisms by which the CHIP information program affects changes in physical and psychological functioning and symptom frequency is important in building nursing science. In the self-regulation theory of coping, patients use schema to develop coping through two pathways (a parallel response model; Johnson et al., 1997). One pathway results in coping directed at emotional outcomes, and the other pathway results in coping directed at physical functional outcomes. The findings from this study support this parallel response model of coping, in that physical functioning and psychological functioning were affected by the CHIP intervention in different ways. It is interesting that the pathways were affected in women were different than those affected in men, a result that is difficult to explain. Studies to date have not shown (nor been designed to determine) gender differences in response to interventions containing concrete objective information. Further studies are needed to determine if women and men respond differently to preparatory information interventions based on concrete sensory terms. It also is possible that the gender differences found in this study were influenced by the well-documented different recovery trajectories of women and men recovering from CABG (Becker et al., 1988; Hussain et al., 1998; Moore, 1995; Wenger & Roberts, 1987). Because coping is a process occurring over time and because different recovery trajectories exist, it is recommended that future researchers measure physical and psychological outcomes at several points in early home recovery, for example, at 2-week intervals during the first 2–3 months.

In summary, the recent trend toward earlier discharge of patients has created a pressing need for discharge information interventions that effectively address CABG home recovery. There have been few trials of CABG home recovery interventions with sufficient power to assess their effectiveness for both women and men. Findings from this study suggest that the CHIP intervention aids home recovery of CABG patients and is effective in both women and men. Given the positive effects of the CHIP intervention in two experimental studies, the low cost of the intervention, and its acceptability to patients, it appears that the CHIP intervention is an effective and efficient method to prepare CABG patients for home recovery.

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