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Abstract

Title of Dissertation: The Role of the Spouse and Marital Satisfaction in the Recovery of the Coronary Bypass Patient

Dana Robin Hill, Doctor of Philosophy, 1989

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Department of
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Despite the dramatic increase in the number of coronary artery bypass graft (CABG) surgeries performed over the last decade, several studies have shown that significant numbers of patients do not benefit from CABG with respect to longevity. It is possible, however, that they benefit from improved quality of life.

Considerable research has suggested that social support, including support from a marital partner, plays a role in the quality of life, both in terms of physical and emotional well-being. To examine the role of the spouse and the marital relationship in the recovery of the coronary bypass patient, a study was conducted to test the following hypotheses: 1) that a positive marriage would have beneficial effects on the patient's perceived physical recovery from coronary bypass surgery, independent of the patient's medical status and 2) that the surgery would have deleterious effects on the couple's sexual relationship, but have beneficial effects on their marital relationship.

Sixty male patients and their spouses were evaluated several days before surgery and seven months after surgery.

Perceived physical recovery was defined as number and type of cardiac symptoms endorsed by the patient, scores on the basic and intermediate activities of daily living Functional Status Questionnaire, and frequency of and satisfaction with sexual relations. Marital factors assessing the quality of the marital relationship, communication and display of affection were assessed as well.

Results indicated that marital factors did predict a significant increment in variance accounted for in the prediction of the intermediate activities of daily living score. Some medical x marital interactions also provided some evidence for hypothesis one. Results for hypothesis two showed that sexual frequency as reported by both patients and their spouses declined. Patients reported a significant improvement in two of the five marital scores over time, whereas spouses reported being significantly less satisfied on two of the five scales. The results suggest that marital factors may well play a role in the recovery of the coronary bypass patient, and that surgery may have differential effects on patients' and spouses' perceptions of the marital relationship.

Dedication

This project is dedicated to my husband, Yee Yan Lee who has tirelessly supported me in every way throughout my school. Thank you for being my rock, taking care of me, and for the love and support that has kept me going.

**THE ROLE OF THE SPOUSE AND MARITAL SATISFACTION
IN THE RECOVERY OF THE CORONARY BYPASS PATIENT**

by

Dana Robin Hill

Dissertation submitted to the Faculty of the
Department of Medical Psychology Graduate Program of
the Uniformed Services University of the Health Sciences
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy 1989

Dedication

This project is dedicated to my husband, See Yan Lam, who has tirelessly supported me in every way throughout graduate school. Thank you for cooking, taking me out to dinner, cleaning, walking the dog, letting me cry on your shoulders, and just generally being a wonderful kind of guy. You are the best partner anyone could have.

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Coronary heart disease and stroke kill more Americans than all other causes of death combined. Nearly one million deaths are attributed to these diseases each year. In addition, the economic costs of cardiovascular diseases are tremendous, with an estimated 50 billion dollars spent in 1982 for treatment and lost output due to disability (American Heart Association, 1982).

The primary cause associated with cardiovascular disease is atherosclerosis, a disorder in which the inner layer of the arteries becomes thickened by fatty deposits called atheromas. These deposits narrow the affected arteries and cut off blood flow to the heart tissue. The decreased blood flow and consequent reduced oxygen supply cause damage to the tissue. The process of the narrowing of the arteries is thought to begin early in life and seldom produces symptoms until it is well advanced. This silent disease may then suddenly show itself in the form of angina, heart attack, stroke, or sudden death (U.S. Department of Health, Education, and Welfare, 1978).

Science has made important advances in the prevention and treatment of these diseases. Risk factors associated with the development of cardiovascular disease have been identified; these include smoking cigarettes, elevated blood cholesterol, elevated blood pressure, diabetes, obesity,

increasing age, being male, strong family history of premature arteriosclerosis, sedentary lifestyle, and a stressful lifestyle. Once an individual's risk factors are identified, modification of those amenable to change is recommended to help reduce the risk of cardiovascular disease (U.S. Dept. of Health, Education, and Welfare, 1978).

Individuals who have developed atherosclerosis to an advanced stage have several choices of treatment. Two frequently employed treatment modalities include medical management and coronary artery bypass graft (CABG) surgery. A comparison of the two forms of treatment has been the subject of much research interest; the reader is referred to several articles for a review of this topic (CASS Principal Investigators, 1983; Soloff, 1978; Braunwald, 1978; Hultgren, Takaro, Detre, & Murphy, 1978). CABG is conducted to improve the blood supply to the heart when narrowed coronary arteries reduce the flow of oxygenated blood. Generally, the saphenous vein from the patient's leg is used to construct a detour around a blocked coronary artery. One end of the vein is attached to the blocked artery just beyond the occlusion, and the other end of the vein is attached to the aorta. The internal mammary artery from behind the breast is sometimes used in place of, or in combination with, the saphenous vein (American Heart Association, 1982).

An estimated 200,000 patients underwent CABG in the

U.S. in 1984. The number of CABG's performed in the U.S. has increased dramatically in the last 10 years, with 57,000 being done in 1975 to 184,000 in 1983 (NHLBI Request for Proposal no. NHLBI-HC-86-04, 1986). CABG surgery has become second only to cholecystectomy as the most common major elective operation in the U.S (Stanton, Jenkins, Goldstein, Salm, Klein & Aucoin, 1985).

The success of CABG surgery has been evaluated with respect to reduction in mortality, relief of symptoms, exercise tolerance, and rate of graft closure for bypass patients. For the most part, CABG surgery has been shown to result in substantial relief of incapacitating symptoms, decreases in mortality for patients with left main disease or three vessel disease), and increases in exercise tolerance (Mullins & Lipscomb, 1977; Gunning, 1979; Braunwald, 1978; McIntosh & Garcia, 1978; Miller & Dodge, 1977; Loop, Sheldon, Lytle, Cosgrove, & Proudfit, 1981). However, the Coronary Artery Surgery Study (CASS Principal Investigators, 1983), a prospective study, has shown that surgical treatment does not have an additional advantage over medical management in reducing mortality in patients with less severe angina or asymptomatic patients with a history of myocardial infarction.

Medical outcomes such as those described above (e.g. decreased symptoms and improved exercise tolerance) are of great importance in evaluating the efficacy of coronary bypass surgery. However, evaluation of recovery from any

surgery should include a more comprehensive list of outcomes, especially psychological and behavioral variables which are important in evaluating the quality of life that a patient has after surgery. With increasingly large numbers of coronary bypass surgery procedures being done in this country, it is important to evaluate both the short and long term recovery of these patients with respect to physical status as well as sexual functioning, role functioning (work, social participation, family role), and psychological and emotional functioning.

Quality of Life after CABG Surgery

The clinical trials that have compared CABG surgery to medical treatment have generally shown surgical treatment to significantly reduce angina but not prolong life in many patient subgroups (Peduzzi & Hultgren, 1979; Varnauskas, Olsson, Carlstrom, & Karlsson, 1982; CASS Principal Investigators, 1983). Thus, it would seem critical to evaluate the quality of patients' lives after CABG surgery. A number of studies have been conducted to examine the quality of life of coronary bypass surgery patients, and these studies will be reviewed, beginning with retrospective studies and later, the prospective studies.

Early retrospective studies done with open heart surgery patients in general found mixed results with respect to adjustment after surgery. Blachly & Blachly (1968) evaluated the emotional and vocational status of 263 heart surgery patients with a questionnaire sent through the mail.

Sixty-four per cent of patients were women; 36% were men. These patients had a variety of procedures done, with the greatest number having heart valve surgery. The researchers found that over one-third of the patients felt that their "nerves were worse off" than before the operation.

Forty-one per cent felt that they were unable to work. Yet, the majority of patients felt their outlook on life was better. Lucia & McGuire (1970) also used a questionnaire to evaluate heart surgery patients an average of three years after the surgical procedure. Female patients comprised 61% of the sample; males, 39%. Approximately half of these patients had either a mitral or aortic valve replacement, and the other half had a mitral commissurotomy.

Approximately 74% of the patients were able to do more than they could prior to surgery. Most patients experienced a greatly reduced level of concern about their health, and 70% had the same family and job responsibilities as they did preoperatively. In light of the different results obtained by the Blachly and Lucia studies, Frank, Heller, & Kornfeld (1972) conducted a study to assess adjustment in patients after their cardiac surgery. Seven hundred ninety two patients who were members of Mended Hearts, a support group organization for heart surgery patients, responded to the questionnaire. Sixty-six per cent of patients were female. The majority of these patients had valvular disease. The results indicated that the majority of patients were improved on several dimensions of adjustment, including

gains in activity level, job performance, and overall emotional status. Despite the general optimism reported by patients, anxiety, sometimes of an extreme nature, was noted before surgery, and psychiatric symptoms were common in the immediate postoperative period. However, the studies were prone to bias since they used retrospective designs, and included samples of patients who received valvular surgery rather than just coronary bypass surgery. Heart valve patients represent a group who have had to adjust to longstanding chronic cardiac illness. CABG patients are not typically burdened with the physical limitations and associated psychological adaptations that come with valvular disease (Kornfeld, Heller, Frank, Wilson, & Malm, 1982).

Later studies done specifically with CABG patients examined the quality of life of these patients after surgery. Most often, return to work has been used as a principal index of the quality of life. However, as LaMendola & Pellegrini (1979) note, failure to return to work can no longer be equated with an unsatisfactory quality of life, just as return to work should not be assumed necessarily to reflect an improved quality of life. Return to work is probably influenced by a number of factors (such as job satisfaction and amount of physical labor), not just whether the person feels physically able to do the work.

Zyzanski, Stanton, Jenkins, & Klein (1981) surveyed 949 Mended Hearts members using a questionnaire on medical and psychosocial outcomes. The Mended Hearts members

included people who had coronary bypass surgery as well as valve surgery. The majority of the patient sample was male (75%). The authors were interested in identifying major social and psychological barriers to complete recovery, comparing bypass and valve patients on their psychosocial and medical outcome variables, and finally, determining if the frequency of psychosocial problems in this group of patients is strictly a function of the severity of biomedical problems. The following were used in assessing the medical outcome of these patients: a) hospitalization since surgery; b) perceived experience of severe and recurrent symptoms of their heart condition in the past month and c) experience of 3 or more days of bed rest in last month. To assess the psychosocial aspects of recovery, the authors developed items on psychological and affective changes, social adjustment changes, current emotional state, and current social network. Zyzanski and his colleagues found that over half of the patients (51%) had experienced rehospitalization in the average 3 and a half year interval since surgery, but over 90% were currently free of heart related chest pain, dyspnea, and other disability requiring bed rest. Although the majority of patients were doing well medically, there were subgroups who were identified as being significantly more likely to experience postoperative medical complications. They included: patients who were forced to retire, who reported Type A behavior (assessed by the Jenkins Activity Survey) and women with multiple

bypasses. These same groups also showed worse psychosocial outcomes even after controlling for seven medical variables. Specifically, women with multiple bypasses felt worse off currently than they did the year before surgery as compared to male bypass patients or females with valve surgeries. Also, those who were clearly identified as Type A or who were intermediate on the scale also experienced more negative emotional changes as compared to those who were classified as Type B's. In addition, those who were forced to retire experienced significantly more negative emotional changes than did those who were currently working or those who chose not to work. With respect to social adjustment, those suffering the most negative changes in personal relationships with spouse, family, and coworkers were those who were forced to retire, females with high school education, and males with college education. No differences were found in social adjustment between bypass and valve patients.

Zyzanski and colleagues found that medical problems were correlated with poorer psychosocial outcomes. They also found that other factors, including gender, type of surgery, level of education, forced retirement, and the Type A behavior pattern were associated with poorer psychosocial outcomes even after statistically controlling for the impact of physical health problems.

LaMendola & Pellegrini (1979) also examined a group of coronary bypass patients after their surgery. The

majority of patients was male (83%). They called for a broadening of the definition of "quality of life" by examining the patient's social situation, perceived physical limits, and various aspects of the work situation, rather than just post-operative employment status. They interviewed 95 patients 6 months to 3 years after their surgery about the patients' work status, social situation, and perceived physical limits. The researchers found that retirement rates were high in this group of patients, particularly for those over 55. Retirement rates were slightly lower for the younger patients, but still exceeded U.S. rates for their age groups. Few patients saw themselves as physically limited, and for those who wanted to work, 79% were working after their surgery. When patients were asked who helped the most during their recovery, patients rated the spouse as the most helpful throughout the entire recovery. Patients were also asked what helped them the most in their recovery, and the authors found that those who valued either physical activity or affiliative experiences were more likely to see themselves as having no physical limits. Those who stated rest was most helpful tended to view themselves as physically limited. The findings that positive affiliative experiences were related to lower levels of perceived physical limitations and that the spouse was rated as the most helpful person during the recovery strongly suggest that the spouse plays a critical role in the recovery of the

patient.

A number of prospective studies have been conducted with coronary bypass surgery patients in recent years. Jenkins, Stanton, Savageau, Denlinger, & Klein (1983) evaluated the benefits of CABG in 318 patients before and six months after surgery. Male patients comprised 84% of the sample. The investigators examined various aspects of functioning including biomedical, psychoneurological, physical, occupational, roles, social, family, sexual, emotional, and attitudinal variables. They found improvement on most factors. Angina was relieved for the majority of patients, and disability days were decreased by 80%. Seventy-five per cent of this patient group returned to work. Fatigue, anxiety, depression, and sleep problems declined from before surgery to six months after surgery. In addition, there were significant increases in scores of vigor and well-being. Ratings of satisfaction concerning marriage, family interactions, social life, and sexual functioning were similar before and after surgery. In general, the results of this study showed an optimistic picture of adjustment by six months after surgery.

Kornfeld, Heller, Frank, Wilson, & Malm (1982) examined 100 CABG patients before and after surgery. A unique aspect of this study was that the patients were followed for four and a half years. Patients were assessed just before surgery, and 9 months, 3 1/2 years, and 4 1/2 years after surgery. At the 4 1/2 year follow up, 23

patients (23%) had died. The majority of the survivors had less angina and greater exercise capacity, and felt substantial improvements in the quality of their lives. They noted a reduction in anxiety and depression and improvement in family and job roles. Sexual relations, however, tended to decrease. In general this study found overall improvement in the quality of life for surviving CABG patients.

Other studies have not found such favorable results. Gundle, Reeves, Tate, Raft, & McLaurin (1980) interviewed 30 patients before and 1-2 years after coronary bypass surgery. Eighty five per cent of the patient sample was male. Although these patients showed reasonably good physiological outcome (defined by reaching their predicted exercise tolerance on the treadmill), a high proportion of patients reported experiencing significant psychological and social problems at follow-up. For example, 57% complained of sexual dysfunction (principally impotence), and 83% were unemployed. The authors noted that a number of other problems were reported including low self-esteem, constricted social life, and lack of pleasure from close relationships. In addition, a small number of patients revealed persistent dependency needs, serious distortions of body image, and symptomatic depression. Unfortunately, no percentages are reported for these latter problems, so it is hard to know how common these problems were.

To understand the poor psychosocial outcomes on this

group of patients, Gundle and colleagues conducted some analyses to determine the relationship between three pre-operative variables and five post-operative outcomes. The pre-operative variables included duration of cardiac symptoms (angina), Type A behavior pattern, and pre-operative status of employment and sexual functioning. The five post-operative outcome variables included: overall psychosocial adaptation as measured by the Adaptive Balance Profile, psychosocial adjustment to current illness as measured by the Psychosocial Adjustment to Illness Scale, employment, sexual function, and scores on the Symptom Checklist-90, a psychiatric symptom inventory. Gundle et al (1980) found employment at follow-up to be significantly related to shorter duration of pre-operative angina, Type A behavior pattern, and pre-operative employment. Sexual functioning at follow-up was significantly related to a shorter duration of angina pre-operatively and being sexually functional pre-operatively.

Finally, despite the correction by surgery of coronary insufficiency in this group of thirty patients, psychosocial functioning was poor, as defined by sexual functioning, work status, and adaptation to life. One factor that may have partially explained these results is that this group of patients was primarily from a lower socioeconomic group who were mostly blue collar workers. However, even among those who had less physically strenuous work, there appeared to be a reluctance to return to work

which the authors speculated was due to a self-image of being damaged.

More recently, Langeluddecke, Fulcher, Baird, Hughes, and Tennant (1989) conducted a prospective study which examined quality of life in 89 Australian CABG patients. Their primary interest was to identify psychological and psychosocial impairment before and after CABG. Patients were seen two days prior to surgery, and six and twelve months after surgery. They found that just prior to surgery, one third of patients had clinically significant levels of depression or anxiety, but by six months after surgery, the symptoms were greatly reduced. Psychosocial adjustment was considerably impaired before surgery, with domestic and vocational functioning most severely affected. But by six months after surgery, vocational and domestic functioning had improved significantly, and these changes were maintained at the 12 month assessment. With regard to marital functioning, almost half of the patients reported pre-surgically a worsening in their relationship since the onset of their illness. A small percentage (7%) reported that their marriages had improved since illness. Twelve months after surgery, the majority of patients (84%) had rated their marriages as significantly improved. With regard to sexual functioning, over half of patients reported decreased sexual interest and attributed it to coronary heart disease. Twelve months later, 84% of patients noted increased sexual interest, but the majority of these

patients still felt there was reduced sexual interest as compared to before illness. Frequency of sexual activity was rated as diminished prior to surgery by over half of the patients. Twelve months later, approximately half of the patients reported an increase in the frequency of sexual activity, 42% noted no change, and 8% reported decreased frequency of sexual relations. Again, although half of the patients noted increases in sexual activity, about one third of the sample reported continued impairment in sexual relations. Although there was some modest improvement in sexual functioning, there remained a significant number of patients who continued to report impairment in interest and frequency of sexual activity.

Mayou (1986) reviewed some of the prospective studies on quality of life after CABG. He included the following areas: a) limitations of activity; b) social functioning which included studies on work, leisure and social activities, and family and marital functioning; c) mental state; d) satisfaction; e) expectations; f) and behavioral risk factors.

Mayou concluded that the preponderance of research suggests that CABG patients are much less limited physically after surgery. With respect to work, most studies have found a reduced number of patients returning to work, numbers that are lower than the national averages (matched for age). In general, most patients have not significantly changed their social and leisure activities after surgery

even though they are physically more comfortable.

Marital functioning in CABG patients and their spouses has received surprisingly little attention. Mayou and Bryant (1987) found that a third of patients felt improved intimacy with their wives one year after surgery; over 50% rated it the same, and 9% of patients felt intimacy with their wives was worse. Jenkins, Stanton, Savageau, Denlinger, & Klein (1983) found that the majority of patients did not report any changes in their marital relationships; of those who did report changes, the numbers were evenly divided among those with improved marital relations and those with decreased marital adjustment. Langeluddecke, Fulcher, Baird, Hughes, & Tennant (1989) found that 84% of patients felt that their marital relationship had improved, while 15% reported no change, and 1% noted deterioration in their relationship. Thus, the preponderance of research suggests that a significant percentage of patients feels that their marital relationships improved after surgery. Perhaps an experience such as major surgery makes people more aware of their mortality and makes them appreciate their spouses and families even more than they used to.

With regard to sexual functioning, the results have been somewhat disappointing. A number of studies have shown decline in sexual functioning, particularly in frequency of sexual relations. For example, Kornfeld, Heller, Frank, Wilson, & Malm (1982) compared sexual frequency for patients

With regard to mental state, results have depended to some extent on the kinds of measures that were used. Improvement on self-report scales have been found for depression, fatigue and lack of vigor. Other studies using standard interviews have found a significant subgroup of patients to be clinically anxious or depressed before the surgery as well as up to one year after surgery (Mayou, 1986).

Satisfaction with surgery, although rarely asked in studies, appears to be very high for CABG patients, according to those studies reviewed by Mayou. A large majority of patients stated they would undergo surgery again, knowing what they know now. However, Mayou reported that other studies show that most patients' expectations are not realized, particularly for work and sexual functioning.

Finally, there are few studies which have examined changes in risk factors for coronary heart disease. There is some suggestion that patients reduce smoking, and increase their physical activity levels. How long these changes are maintained is not clear.

The most recent study on quality of life in coronary bypass patients examined the predictor of dispositional optimism (Scheier, Matthews, Owens, Magovern, Lefebvre, Abbott, & Carver, in press). Scheier and his colleagues hypothesized that dispositional optimism (assessed by a self-report scale that they developed) would have broad beneficial effects on the patient's quality of life, mood,

before surgery and nine months later, and found that while 67% were sexually active at least once a week before surgery, only 38% were sexually active once a week nine months later. Eleven per cent reported no sexual activity prior to surgery, and 31% reported no sexual activity nine months later. Gundle, Reeves, Tate, Raft, & McLaurin (1980) noted in their small sample that 22 of 30 patients were sexually functional, but by 12-24 months later, only 11 of the 30 patients were sexually functional. At follow-up, 57% of patients noted sexual dysfunction, mostly impotence. Two studies found that the majority of patients maintained the same level of satisfaction or frequency in sexual relations, with the remaining patients divided between those who reported improvement and those whose sexual relations had deteriorated (Jenkins, Stanton, Savageau, Denlinger, & Klein, 1983; Horgan, Davies, Hunt, Westlake, & Mullerworth, 1984). Langeluddecke, Fulcher, Baird, Hughes, & Tennant (1989) found that 85% of their patient sample reported increased sexual interest at the one year follow-up, and 49% reported increased sexual frequency, 42% per cent no change, and 8% declined in sexual frequency. Although a significant percentage noted increased frequency at the follow-up, almost one third stated that they continued to have some impairment in their sexual functioning. Overall, results from these studies suggest that sexual functioning does not improve as much as one would expect, given that the patient's physical functioning is in general, improved.

and rate of recovery. They also expected that optimism would affect the choice of coping strategy used in dealing with the stress of surgery. Specifically, they expected optimists to be more likely to use problem-focused coping strategies, and less likely to use denial and emotion-focused coping strategies. Results showed that optimism was significantly correlated with the use of problem-focused coping strategies and negatively correlated with the use of denial strategies. They also found that optimism was associated with a faster rate of recovery while in the hospital, as well as a faster return to normal activities once home. Moreover, when quality of life was assessed six months after surgery, optimism was found to be significantly related to the overall QL score. These findings are particularly interesting in light of the fact that all analyses were adjusted for medical status of the patient (extensiveness of patients' surgery, severity of patients' coronary artery disease, and their standing on the major risk factors for coronary heart disease). Thus, the variable of optimism accounted for variance in the dependent measures, independent of the medical factors.

In general, research on the quality of life after coronary bypass surgery has improved in scope and methodology in recent years. The definition of "quality of life" has been broadened to include aspects of life besides return to work. Prospective studies have been conducted, and patients have been followed for longer periods of time.

Although it is important to include repeated measures and to assess a broader variety of variables to measure the quality of life of these patients, statistical analyses are frequently inadequate since they do not take into consideration the potential relationship between the many variables and the effect of the repeated measurement.

The studies cited above have in general examined a range of factors which are thought to influence a patient's recovery from coronary artery bypass surgery. One area that has not been discussed is the area of social support and the marital relationship, and their potential relationships to recovery from bypass surgery. First, a brief review of research on social support and its relation to health will be presented; then, research on a special aspect of social support, the marital relationship, and its relationship to health will be discussed.

Social Support and Health

In the last fifteen years, there has been tremendous enthusiasm for research on social support. The construct of social support has been defined in several ways. For example, Cohen & Syme (1985) define support as "resources provided by others". Brownell & Shumaker (1984) define social support as "an exchange of resources between at least two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient."

A number of the early studies done in this area concluded that social support was beneficial with respect to

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a wide range of health outcomes (Cobb, 1976; Cassel, 1974). More recently, Shumaker & Brownell (1984) discussed the possible direct, indirect, and interactive effects that social support may have on mental and physical health. Social support may have direct effects on recovery from illness for example, by helping patients with medical regimens or seeking health care. In addition, social support may enhance self-esteem or one's mood or behaviors that promote health and thus increase resistance to illness. Indirectly, social support may promote well-being by reducing the number and severity of stressful life events. For example, social support from others may affect one's appraisal of a potential stressor by redefining the problem as a challenge. Social support is also thought to have interactive effects on physical and mental health. For example, support may buffer the negative effects of stressful life events by facilitating our recognition and use of coping resources.

In a review on social support, stress, and the buffering hypothesis, Cohen & Wills (1985) consider the processes by which social support can have a beneficial effect on health. The first model, called the buffering model, proposes that support is beneficial primarily when one is under stress, that is, support protects or buffers the individual from the negative influences of stressful events. The second model, called the main effects model, suggests that support is helpful whether or not the person

is under stress. Cohen & Wills (1985) conclude that there is evidence for both models. Social support measures which tap the degree of a person's integration in a social network provide some evidence for the main effect model, while measures which assess the perceived support which is responsive to the needs associated with stressful events provide evidence for the buffering model.

Despite the popularity of the notion that social support is beneficial to one's health, there is still much we do not know, including what social support is and is not, how it operates (i.e., mechanisms or pathways that might link social support to health outcomes) and what are its real and potential short and long term effects (Shumaker & Brownell, 1984). Consequently, investigators have suggested that there is a need for more systematic and rigorous research in the area of social support (Brownell & Shumaker, 1984; Thoits, 1982; Berkman, 1984; Coyne & DeLongis, 1986).

The relationship between social support and recovery from illness is one area that bears directly on the thesis of the present study. In a review on the role of social support in adaptation and recovery from physical illness, Wortman & Conway (1985) note that results from some of the longitudinal studies in this area show support for such a relationship (Funch & Marshall, 1983; Berle, Pinsky, Wolf, & Wolff, 1952) while others either show no evidence for a relationship between social support and recovery from physical illness (Revenson, Wollman, & Felton, 1983) or

mixed results (Garrity, 1973).

In addition, the initial enthusiasm for social support brought with it intervention studies designed to facilitate a patient's recovery from illness, and the majority of these studies suggest that support does facilitate recovery (see Broadhead, Kaplan, James, Wagner, Schoenbach, Grimson, Heyden, Tibblin, & Gehlbach, 1983; DiMatteo & Hays, 1981 for reviews).

Unfortunately, we still do not know very much about how support facilitates recovery from illness. One area of research that may provide us with some insights is the research on marital relationship and health.

Marriage and health. Marriage is one of the most basic and special connections among individuals. Coyne & DeLongis (1986) point out that marital status is often accepted as a partial or complete measure of support, and whether or not marriage partners have a high quality marital relationship determines whether or not they are scored as having confidants. The majority of studies which have compared the married to the unmarried on mental and physical health outcomes have shown that married people are happier, less inclined to suicide, in better physical health, less likely to be institutionalized for mental illness or other forms of aberrant behavior and have lower rates of mortality (Andrews & Withey, 1976; Pearlin & Johnson, 1977; Gove & Hughes, 1980; Carter & Glick, 1970; Ortmeyer, 1974; Thiel, Parker, & Bruce, 1973). However, although there are a number of

studies which find a positive relationship between marital status and mental health, Gove, Hughes, & Style (1983) note that the relative magnitude of this relationship, as compared to the strength of the relationship of other variables related to mental health, is not known. Several studies suggest that the relationship between marital status and mental health is probably due mostly to the quality of the marriage and not marriage per se. Being married could expose individuals to stressors not encountered by the unmarried. Gove, Hughes, & Style (1983) found that happily married people were better off than unhappily married people with respect to psychological well-being.

Other studies suggest that the quality of the marital relationship impacts on psychological and mental health. Brown (1981) examined the role of the spouse in a study on coping with a variety of life events and role strains. For the great majority the spouse was the key confidante, and for those who had a confiding marital relationship, they showed the lowest levels of distress (as measured by the Psychological Distress Scale), higher levels of self esteem (as measured by the Rosenberg Self-Esteem Scale), and lower levels of anxiety and depression (assessed by the Hopkins Symptom Checklist). One other interesting finding is that if individuals did not have a confiding marital relationship, other confidante relationships were not found to be effective substitutes.

Lowenthal & Haven (1968) studied the impact of having

a confidante on adaptation over a three year period in a community resident aged population in the San Francisco area with respect to psychiatric status, general morale, and well-being as compared to peers their own age. Psychiatric status was based on evaluations made by three psychiatrists who reviewed records of the subjects. Morale was assessed by a cluster analysis of answers to 8 questions; those whose scores fell below the median were labeled depressed, while those whose scores were above the median were labeled satisfied. A final measure of adaptation was a question on the subject's opinion as to his relative deprivation- that is, whether he thought he was better off than his age peers. The independent variables in this study were levels of social interaction and number of social roles the individual reported. They also grouped the subjects on another variable- the current presence or absence of a confidant. They found that those who rated high on degree of social interaction were less likely to be psychiatrically impaired, felt young compared to their age peers, and were more likely to be classified as satisfied on the morale category. Those individuals who were classified as having a higher number of social roles were also less likely to be evaluated as psychiatrically impaired, more likely to view themselves as younger compared to their peers, and were more often categorized as satisfied on the morale dimension. The authors did some further analyses to look at the effect of having a confidant on the three measures of adaptation.

They found that the maintenance of a stable intimate relationship was more closely associated with good mental health and high morale than was role status or high social interaction. In addition, the loss of a confidant had a more negative impact on morale but not on mental health than did a decrease in the other two social measures. Also, the effects of the loss of social roles or a decrease in the level of social interaction on adaptation was considerably lessened if the person had a confidant. In this sample, men were most likely to report their wives as their confidants, and women were more likely to report a child or another relative as their confidant. At least for the men in this sample, the marital confidante relationship proved to be a significant factor in their morale, mental health status, and feelings compared to their age peers.

Research on the Chronically Ill: Conceptual and Methodological Issues

The importance of the marital and family situation in the recovery of patients has been the subject of investigation in a number of studies. Since the bypass patient is a person who not only experiences major surgery, but also suffers from the chronic illness of heart disease, it is useful to review some of the research on patients with chronic illness and their social environment. In a review of conceptual and methodological issues on research with the chronically ill, Lichtman, Taylor, & Wood (1985) emphasized that patients should be viewed as part of several social

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systems, all of which may be affected by the illness. The most notable social system is the patient's immediate family. Health care statistics show that two out of every three families will have to cope with some form of cancer in a family member, and virtually everyone will have to deal with a family member with some kind of chronic illness.

A number of issues of the patient's health and recovery are influenced by the fact that he or she exists within marital and family systems. For example, studies have found that patient's adherence to medications can be improved by the family's support and encouragement (Davis, 1968; Becker, 1976). Adherence to other treatment strategies such as maintenance of smoking cessation and losing weight and adhering to a healthy diet can also be profoundly influenced by support from significant others in the family and work situation (Brownell, Heckerman, Westlake, Hayes, & Monti, 1978; Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986; Coppotelli & Orleans, 1985).

Just as patients are influenced by those around them, they in turn influences the lives of others as well. Treatment of illness can drain the family economically, since medications, surgery, and rehabilitation programs can be quite costly and are not always completely covered entirely by insurance policies. Illness and its treatment can also have other influences on the relationships of those closest to the patient. Conflicts focused upon the

patient's diet, medication, and physical activity are commonly reported in the literature (Bilodeau & Hackett, 1971; Skelton & Dominian, 1973; Sikorski, 1985). The patient's illness and/or early recovery can change the nature of the relationship between husband and wife. For example, patients often become more dependent on their spouses at least temporarily and may also become less influential in decisions made about the family (Michela, 1981). Patients often resent the overprotectiveness of their wives (Adsett & Bruhn, 1968; Bilodeau & Hackett, 1971). Another aspect of the marital relationship that can be influenced by a patient's illness and early recovery is sexual functioning. For example, patients who have experienced a heart attack often report that they are afraid to resume sexual activity because they fear the effects of sexual activity on the heart and its functioning. In addition, spouses will often refuse to participate in sexual relations because they are afraid that sex will cause a heart attack, or worse, sudden death, in the patient, so they see refusal to engage in sex as a way of protecting him or her (Bloch, Maeder, & Haissly, 1975; Skelton & Dominian, 1975; Kavanagh & Shepherd, 1977). The disruption of the sexual relationship has the potential of creating tension in the marriage, unless the couple does not view sexual relations as vital to their marriage. Chronic illness and its treatment often produce a need in the patient as well as other family members to talk more about the illness.

Depending on whether the patient and other family members are able to communicate in a supportive manner, issues such as the success of the medical treatment, whether the illness will recur, and whether other family members will be subject to the same disease process (e.g. through heredity or physical contact or exposure to the same lifestyle risk factors) can be difficult to discuss but important in coping with the illness (Wortman & Dunkel-Schetter, 1979; Wellisch, 1979).

Thus, Lichtman and her colleagues (1985) suggest that in doing research with the chronically ill, one should examine not only the patient's reaction to illness and treatment, but also examine the impact of the illness on other family members. Also, it is important to examine family members' perspectives on the patient's illness as well as the patient's perspectives to get a broader picture of chronic illness and its treatment.

Probably the most important family member affecting the patient is the patient's spouse. Several studies have recently been conducted to examine the impact of either chronic illness or surgery on the spouse as well as other studies conducted to look at the role of the spouse in the patient's recovery. These will be reviewed to provide support to the idea that the spouse plays a critical role in the patient's recovery.

The Impact of the Spouse on the Patient's Recovery

Understanding the needs of the family, especially

those of the spouse, is vital to the care of the coronary bypass patient. Unfortunately, there are very little data on the spouse of the CABG patient even though it appears that characteristics of spouses such as their attitudes and expectations, as well as the quality of the marriage appear to be important factors in the recovery of the patient. There is some literature on the role of the spouse of the MI patient, and this will be reviewed since MI patients and CABG surgery patients have the same type of disease (coronary artery disease) and the same type of rehabilitative goals.

Three studies (Goble, Adey, & Bullen, 1963; Wynn, 1967; & Skelton & Dominian, 1973) showed that wives of MI patients experienced considerable anxiety around the time of the patient's heart attack, and that more support, explanation, and discussion may have helped to alleviate the anxiety. Mayou, Foster, & Williamson (1978) found that wives of MI patients were still experiencing considerable psychological distress one year after their husband's hospitalization. A number of studies have found that wives of MI patients exhibit an overprotective attitude toward the patient (Wynn, 1967; Skelton & Dominian, 1973; Mayou, Foster & Williamson, 1978; Croog & Fitzgerald, 1978; Wishnie, Hackett, & Cassem, 1971), and this attitude may affect the patient's rehabilitation adversely (Miller & Brewer, 1969).

One of the most frequent concerns expressed by wives of MI patients is anxiety over the patient's level of

physical activity. Klein, Dean, Wilson, & Bogdonoff (1965) found that the wife's perception of her husband's capacity for physical activity was potentially harmful and recommended that the wife be included in discussions about activity before the patient is discharged from the hospital. Taylor, Bandura, Ewart, Miller, & Debusk (1985) examined the effects of wives' involvement in their husband's treadmill exercise performance. They compared wives who did not observe their husbands perform the treadmill test (3 weeks after an MI), wives who observed their husbands during the test, and wives who observed their husbands and also participated in the test themselves. Wives' final ratings of confidence in their husbands' capacity to perform physical activities was significantly higher in those women who observed their husbands and also participated themselves. In addition, only those wives who walked on the treadmill rated their husbands' cardiac and physical efficacy to a level comparable to their husbands' ratings. This finding suggests that the wife's perception of her husband's physical capacity can be modified and reflect a judgment more consistent with the patient.

Sikorski (1985) conducted a study in which spouses were interviewed two to three weeks after their husbands were discharged from the hospital in order to understand the concerns and the level of knowledge of wives of CABG patients. The wives' greatest concerns related to the amount, type, and time of resumption for specific

activities. Wives also expressed concerns about, and lacked knowledge of, their husband's future heart problems, prognosis, surgical success, behavioral fluctuations including depression, and potential for recurrence of blocked arteries. Although they had excellent knowledge about coronary risk factors, wives still expressed concerns about their husbands' weight, diet, and the preparation of meals that were low in cholesterol and sodium. It appears that this level of knowledge is not sufficient to allay concerns or anxieties, but specific instructions and plans should accompany discussions about risk factors and other issues related to recovery to put the knowledge into action. Certainly, the wives' concerns could have a strong impact on the patient's development and maintenance of a healthy lifestyle in the recovery period. Thus, once again, it appears that it would be extremely important to include spouses of CABG patients in discussions with the medical staff.

Other studies have strongly suggested the usefulness of involving the spouse in cardiac rehabilitation and risk reduction. Gilliss (1984) compared patient's and spouse's subjective stresses of coronary bypass surgery around the time of surgery by using a self report life event scale. They found that spouses reported significantly more stresses around the time of hospitalization than did the patients. Spouses frequently reported that waiting for surgery was very stressful, that they felt a lack of control of hospital

events, and felt a lack of privacy which prevented them from being able to cry. Spouses also complained that they felt uninformed and wanted to know what they should do if patients developed difficulties at home. Both patients and spouses felt that access to the attending surgeons was too limited. Finally, both patients and spouses expressed concerns over well-meaning friends who provided them with misinformation about recovery. Patients and spouses often became anxious when their experiences did not match those of their friends. Others became angry and withdrew from these friends.

Gilliss (1984) also examined the recovery period six months after surgery and found it was a mixed experience. Although both patient and spouse were typically very glad for the return home, spouses were often frightened of the care-taking responsibilities. Patients experienced pain and difficulty moving around. The early days of recovery at home proved to be the most difficult for the spouse, as they worried that the patient might develop problems or overextend himself and they would not know how to remedy the situation. Spouses and patients reported conflicts over when the patient could resume various forms of physical activity. For those couples who had this kind of conflict, there seemed to be a pattern to the resolution: as the patients were testing themselves, spouses were accumulating evidence that the patient was no longer fragile. In addition, the spouses often reported that once the patients

had returned to work for a day or two, they stopped worrying. Another major source of proof that the patient was doing well was the evaluation from the physician at the six weeks follow up. The couple often approached this visit with high hopes and lots of questions, but unfortunately, were generally dissatisfied. The contact with the physician was often with a resident, a physician whom they were not familiar with, and in addition, the visit itself was very brief, usually less than 15 minutes. Although a preliminary study, Gilliss' (1984) research does provide some valuable information on the kinds of stresses identified by CABG patients and their spouses, and how they dealt with the stresses.

Another study examining the influence of the spouse was conducted by O'Connor (1983). She examined the physical and psychosocial functioning of 30 male coronary bypass surgery patients before and three months after surgery. She found that although patient's perceptions of their health had improved after their surgery, there was little improvement in physical and psychosocial functioning, and in addition, vocational functioning declined. But the relevant finding in this study is that the patient's postoperative perception of health depended on the number of bypass grafts and the spouse's/family's fear of patient's injury. Specifically, patients tended to have better perceptions of their health when they had more bypass grafts and when their spouses/families did not have any fear that

the patient might injure himself. These results suggest that the patient's view of his health is related to how others close to him, (i.e. his wife and family) view him and his health.

In a recent study, Kulik & Mahler (1989) investigated the relationship of naturally occurring social support from the spouse and pre-operative anxiety and post-operative recovery of male coronary bypass patients. They hypothesized that CABG patients with more spouse support in the hospital or more positive marital relationships would be less anxious before surgery and have faster and smoother recoveries compared to those with little in-hospital spouse support and/or poorer marital relationships. In addition, Kulik and Mahler hypothesized that patients who viewed their marriages more positively might be more sensitive to the frequency with which their spouses visited them, and consequently, be more distressed by their lack of visits and more happy when they did visit. On the other hand, the investigators predicted that patients with less satisfying relationships would neither benefit as much from spousal hospital visits nor suffer from the lack of spousal visits. When the patients were divided into groups based on the overall quality of their marital relationship (good or bad) and on whether they received high or low spouse support (defined by number of hospital visits), they found that married patients who received more frequent hospital visits took less pain medication and recovered more quickly than

did the low support patients. The perceived quality of the marital relationship was not a significant factor.

More recently, Langeluddecke, Tenannt, Fulcher, Baird, & Hughes (1989) examined the impact of coronary bypass surgery on the patient's spouse. They followed the spouses of 65 Australian CABG patients both before and 12 months after surgery to assess psychological symptoms and psychosocial impairment. Depression was assessed by the Centre for Epidemiological Studies Depression Scale. Anxiety was assessed using the Spielberger State Trait Anxiety Scale. Psychosocial impairment was measured using the Psychosocial Adjustment to Illness Scale (PAIS). They found that approximately one-third to one-half of the spouse group had clinically significant depression or anxiety symptoms just prior to surgery. Twelve months later, there was a significant improvement in their levels of depression and anxiety symptoms.

Prior to surgery, there was also a significant impairment in the spouse's psychosocial functioning, particularly for psychological distress and recreational functioning. Vocational, domestic, and sexual functioning were somewhat less negatively affected, and extended family relationships were generally not affected at all. At twelve months, the global PAIS scores had improved significantly. Nevertheless, several areas did not improve significantly, including sexual and domestic functioning.

Waltz, Badura, Pfaff, & Schott (1988) investigated

the role of marital factors on the psychological response to the illness in a group of almost 400 heart attack patients and their wives, followed for five years. They posited that when a person undergoes a serious event like a heart attack, that emotionally close marriages can provide a sense of coherence and security which will facilitate the evaluation of what has happened and its implications. A lack of security and coherence in the marriage, on the other hand, may hinder effective coping and thus be predictive of psychological distress. Waltz and colleagues assessed couples at two weeks, 6 and 12 months, 3.5-4 years, and 5 years after the heart attack. They assessed the couple's perceptions of negative aspects of their marriage using a 12 item scale that included frequency of marital conflict, negative changes in the marriage, and lack of common interests and friends. They also assessed positive aspects of the marriage with the intimate attachment scale, composed of 19 items. This scale included items on love and affection, sexual compatibility, and confiding behavior, among others.

The researchers found that marital conflict was associated with elevated anxiety, and marital intimacy was inversely related to depressed mood. To assess anxiety following the heart attack, patients were divided into four groups: Group 1: good health and low conflict; Group 2: good health and high conflict; Group 3: poor health and low conflict; and Group 4: poor health and high conflict. They

found that group 4 had the highest anxiety ratings across all measurement periods.

To assess depression after the heart attack, the researchers conducted a similar set of analyses, but this time used marital intimacy rather than marital conflict. Again, they divided the patients into four groups based on their health and intimacy scores. Results showed that the poor health/low intimacy group had the highest levels of depression across all time periods. Waltz and colleagues concluded that the processes associated with depressed mood and elevated anxiety may be influenced by the marital relationship. They suggest that high intimacy marriages can provide confiding opportunities and can help the patient to maintain self-esteem while recovering from a heart attack. On the other hand, unsupportive marriages marked by high conflict are associated with increased levels of anxiety.

Thus, a number of studies do suggest that the marital relationship plays an important role in a patient's recovery from heart disease and coronary bypass surgery (Michela, 1981; Adsett & Bruhn, 1968; Kavanagh & Shepherd, 1977; Gilliss, 1984; O'Connor, 1983; Kulik & Mahler, 1989; Langeluddecke et al, 1989; Waltz et al, 1988). Not surprisingly, the patient typically feels his or her spouse is the most significant person during his recovery. (LaMendola & Pellegrini, 1979). Due to the spouse's central role in the patient's recovery, it would appear important to examine the impact of the patient's surgery on the spouse,

and to also understand the impact of the spouse and the marital relationship on the patient's perceived physical recovery. Thus, a study was conducted to examine the role of the spouse and the marriage in the recovery of the patient.

In order to understand the influence of the spouse on the patient's perceived physical recovery, it is important to assess not only specific characteristics about the spouse but also to examine the relationship between spouse and patient. Therefore the present study assessed the level of marital adjustment (as reported by each member of the couple) and related that to the patient's perceived physical recovery at seven months post surgery. Seven months was chosen to represent a time interval representative of early recovery, where events such as return to work have generally occurred, and increased physical activity has been well underway. It is also frequently a time point which has been used in a number of other studies. In addition, mechanisms by which the marital relationship can facilitate recovery in the patient were assessed, and included the use of physical affection and positive communication. These mechanisms were expected to improve the patient's mood and desire to maintain healthy habits thus facilitating physical recovery. In the context of an ongoing longitudinal study, patient and spouse were seen just before surgery and were sent self-report questionnaires approximately seven months after surgery for

the follow-up assessment. Perceived physical recovery was assessed using three outcome variables: ability to perform everyday activities (assessed by the Functional Status Questionnaire), number of cardiac symptoms (assessed by self-report items on cardiac symptoms), and frequency of and satisfaction with sexual relations (also assessed by self-report items on sexual activity). In addition to examining the impact of the marriage on the patient's physical recovery, another goal was to assess the impact of surgery on the couple's marital and sexual relationship, from the patient's and spouse's perspective.

Hypotheses

Hypothesis 1: Effects of the marital relationship on perceived physical recovery

It is hypothesized that a positive marital relationship has beneficial effects on the patient's perceived physical recovery, independent of major medical factors that might affect the outcome measures. Specifically, good marital adjustment should promote recovery and have beneficial effects on the patient's sexual functioning, activities of daily living, and cardiac symptoms, assessed seven months after surgery. This hypothesis is tested using multiple regression procedures. To examine more specifically the contributions of marital adjustment and other marital factors (communication and

affection) to the patient's perceived physical recovery, a series of regression analyses are conducted. It is hypothesized that the psychosocial variables- marital adjustment, communication, and display of affection- will contribute uniquely to the perceived physical recovery outcomes.

Hypothesis 2: The Psychosocial Impact of Surgery

Another purpose in this study is to examine the impact of the surgery itself on the couple's marriage and sexual functioning. Specifically, the question is raised as to whether the surgery has beneficial or deleterious effects on marital and sexual functioning as perceived by each member of the marital dyad. Based on the review of the literature in this area, I proposed that surgery would have deleterious effects on sexual functioning for patients and spouses, but beneficial effects on marital functioning. Repeated measures of analyses of covariance were conducted to determine whether the participants' perceptions of their marital and sexual relations changed from the pre-surgical to the post-surgical time points.

Method

Overview

The study was conducted in two sessions. The first session was conducted in the patient's home, and a semistructured interview was used with the patient. The spouse was given a booklet of questionnaires and asked to complete it during the patient interview. The second session was conducted approximately seven months after the patient's discharge from the hospital. The second session was conducted by mailed questionnaires. Both spouse and patient participated in the second session.

Subjects

Participants were recruited from the list of patients at the Washington Hospital Center and the George Washington University Medical Center who were undergoing coronary artery bypass graft surgery. Spouses of these patients were also asked to participate. The participants in this study represent a subgroup of patients who participated in a National Heart Lung and Blood Institute longitudinal study on predicting adaptation to coronary artery bypass surgery. The NHLBI study investigated the contributions of a broad range of psychological and biobehavioral variables to adaptation to coronary artery bypass surgery. The roles of stress, mood states, coping, cognitive functioning, and demographic characteristics in contributing to recovery and

the quality of life after surgery were examined. In the NHLBI study, data were collected from patients, spouses, staff, and patient records prior to and after surgery, six to seven months, and one to two years after surgery. The criteria for selection of patients included the following: (1) the patient must have been between 30 and 70 years of age; (2) the surgery must have been their first CABG operation; (3) no other cardiovascular surgery was being conducted at the time of their CABG operation; and (4) they must have been English speaking. Additional criteria for this study (not required in the NHLBI protocol) were that the patient be male and have a spouse who was willing to participate in the study. Sixty couples participated in the the present study.

Procedure

Session I. The first session was conducted two to five days prior to the surgery, in the patient's home with the spouse present. Data were collected by means of a semistructured interview with the patient and self-administered questionnaires for patient and spouse. The researcher explained that the study was being conducted to determine what kinds of experiences patients and their spouses were having with surgery, how they both felt about these experiences, and how they were handling them. The researcher also explained that she was interested in the patient's general health and mood. In addition, the investigator told the patient and spouse that she would

contact them again in about seven months. Both patient and spouse were asked to complete an informed consent form (see Appendix A for copy of informed consent form).

The spouse was then asked to complete a set of questionnaires which contained questions on demographic information, sexual activity, and dyadic adjustment (see Appendices B, C, and D for specific items). After the spouse was given the booklet, the interview with the patient was begun. During the one and a half hour long interview, information was obtained on demographics and cardiac symptoms, in addition to other areas (see Appendices B and E for the interview items). The patient also completed a battery of questionnaires after the interview which included items on sexual activity, dyadic adjustment, and ability to perform activities of daily living (see Appendices C, D, and F for individual items and scales).

Session II. The second session was conducted approximately seven months after surgery by mail. Both patient and spouse received questionnaires in the mail to complete and return to the investigator. The packet of questionnaires included items on cardiac symptoms, sexual activity, affectionate behavior, nature and content of the couple's communication, and ability to perform activities of daily living (see Appendices G, H, I, J, and F for specific items and scales).

Dependent Measures used in the Study

Demographic information. Each subject was asked to provide background demographic information including gender, age, race, education, religion, occupational status, and number of years married. The background information was used primarily to describe the sample of participants.

Dyadic Adjustment Scale (DAS). The DAS is a 32 item self-report inventory developed by Spanier (1976) to assess the quality of marriage and other similar dyads. Four components of dyadic adjustment have been identified: dyadic satisfaction, dyadic cohesion, dyadic consensus, and affectional expression. An overall score of dyadic adjustment can also be obtained, with a range from 0 to 151. Cronbach's coefficient alpha was used to estimate the reliability of the overall scale, and was found to be .96. The total scale and its components have sufficiently high reliability. Validity for this scale has also been established (see Appendix D for copy of scale).

Sexual activity. These self-report questionnaire items were developed specifically for this study to assess the frequency and overall satisfaction of the couple's sexual relations. In session one, patient and spouse were asked about the frequency of their sexual relations over the past year, during a typical month (current), and a typical month prior to the patient's illness. In addition, their current and past satisfaction with their sexual relations in general

and their satisfaction with the frequency of relations in particular were assessed. In session two, participants were asked to report whether they had resumed sexual activity since the surgery, and if so, how frequently and how satisfied they were with their sexual relations. In addition, participants were asked if they had been concerned about whether sexual activity would be harmful to the patient's health, and if the patient had any difficulty attaining or maintaining an erection (see Appendices C and H for specific items).

Communication questions. To understand more about the nature of the couple's communication and how it might affect recovery variables, questions were asked regarding the content and the process of their time together, with emphasis on their conversations. These questions were derived from another study by Shumaker and Shapiro (1982) on children with cancer. The internal reliability of the nine item instrument was assessed using the coefficient alpha statistic, and was found to be 0.76 (see Appendix J for copy of scale).

Measure of affectionate behavior. This brief questionnaire assesses nonsexual affectionate behaviors in an intimate relationship. This measure was developed by Juan Florez and was cited in the Handbook of Marital Interventions (L'Abate & McHenry, 1983). This instrument was included because physical demonstration of affection is thought to be an important aspect of the couple's

relationship and should be related to the degree of marital satisfaction. In addition, the cohort of subjects under investigation represent an aging group whose sexual activity has often declined. Thus, demonstration of affection in other ways becomes an important factor in assessing the quality of the marriage. The internal reliability of the instrument was assessed using the coefficient alpha statistic, and was found to be 0.66 (see Appendix I for copy of scale).

Measures of Perceived Physical Recovery

Cardiac symptom checklist. This scale was developed to assess the occurrence of symptoms related to heart disease, their frequency, and their intensity. Symptoms listed included: angina, dyspnea (shortness of breath), fatigue, and ability to concentrate. The scale was administered to the patient in the interview during session one as well as in a self-report questionnaire format of session two (see Appendices E and G for individual items).

Functional Status Questionnaire. This self-report scale was used at both sessions to assess the level of difficulty the patient had with various physical activities (see Appendix F for scale). The questionnaire yields two scales of activities of daily living (ADL): one, a basic ADL score and two, an intermediate ADL score. The basic ADL score includes items such as being able to feed and dress oneself. The intermediate ADL scale includes items on more vigorous activities such as walking a few blocks and lifting

heavy objects. The scores for both subscales range from 0 to 100, with 100 representing maximal functional ability. Jette, Davies, Cleary, Calkins, Rubenstein, Fink, Kosecoff, Young, Brook, & Delbanco (1986) report the reliability and validity of the instrument. The reliability of the basic activities of daily living scale, using coefficient alpha, was reported as 0.79, and for the intermediate scale, 0.82.

Medical Information. In order to describe the sample's medical status and control for medical variables in the analyses, data related to the surgery were collected from the patient's medical chart. Medical data were grouped according to five main categories: a) cardiac morbidity; b) co-morbidity; c) peri-operative complications; d) post-operative complications; and e) surgical data. The medical variables in this study were selected based on the recommendations of the principal investigators in the NHLBI Post CABG studies as well as the recommendations of a consultant cardiologist on this study (see Appendix K for list of medical variables assessed from patient's chart).

The cardiac morbidity data included items on patient's history of angina, myocardial infarction, cardiac arrest, arrhythmias, valve problems, and hypertension as well as the New York Heart Association Functional Classification (I-IV). Ejection fraction, a measure of left ventricular function, was also assessed as part of the cardiac morbidity data. Unfortunately, approximately one-third of patients' hospital records were missing data on

this variable. With the exception of the angina status classification, all of the other cardiac morbidity data were dichotomous (i.e., the event or condition had occurred or not).

Co-morbidity data included items on the patient's history of diabetes, stroke, arthritis, cancer, and neurological problems. Again, these data were scored as dichotomous events (i.e., either present or not present). Peri-operative complications which were assessed from the medical charts included MI, edema, and cerebrovascular accident or stroke. These were also assessed on a dichotomous basis. Assessment of post-operative complications included stroke, respiratory failure, renal failure requiring dialysis, edema, incisional infection, heart failure, and reoperation. These data were also dichotomized. Information on the surgery itself included total surgery time, number of grafts constructed, type of grafts used (saphenous vein only vs. internal mammary artery only vs. both), number of hours in the surgical intensive care unit, and the COMA scores, which are indices of immediate recovery from surgery. When the distribution of the medical variables was examined, it was clear that certain categories of variables had very few events e.g., almost no one had any peri-operative or post-operative complications. Consequently, these data were not included in the final medical scales which were used as covariates. In order to reduce the large number of variables to a more

manageable number, three scales were created which were ultimately used as medical covariates. The cardiac morbidity scale included the items on history of myocardial infarction and history of cardiac arrest. The co-morbidity scales included the items on history of diabetes, stroke, arthritis, cancer, neurological problems, and hypertension. The surgical status scale included the items on number of hours in surgery, number of grafts done, number of hours in the surgical intensive care unit, length of hospital stay, and history of valve problems. A fourth medical variable, angina status (assessed by the New York Heart Classification Levels I-IV), was used as a separate covariate.

Results

Data Analysis Strategy

In order to characterize the sample at baseline, a description of the participants including demographic, medical, and psychosocial variables is presented. Following this are repeated measures analyses describing the impact of surgery on the physical functioning dependent measures. Next, analyses examining each research hypothesis are presented. For the first hypothesis, regression analyses are described which assess the relationship between marital factors and perceived physical recovery outcomes. For the second hypothesis, a series of repeated measures analysis of covariance is presented to describe the impact of surgery on sexual and marital functioning. The SAS statistical software system was employed in these data analyses. Missing data were treated in the following manner: When a variable was composed of a sum of several items (e.g., a DAS subscale) and was missing 20% or less of the items, the missing data points were replaced by the participant's mean value on the remaining subscale items. If more than 20% of the items were missing, the participant was deleted from that set of analyses. The only exception to this rule was in the series of regression analyses, where all missing values were replaced by the group mean for that dependent variable.

Sample recruitment and retention

All patients who met eligibility criteria (N=106) during the period from March, 1987, to December, 1988, were asked to participate in the study. Of the 106 eligible patients, 84 (79%) agreed to participate. Of those who agreed to be interviewed, one person died before the interview, one was deleted because he did not undergo CABG after all, and two patients were unable to complete the interview due to family difficulties. Thus, eighty patients were interviewed in the initial presurgical assessment. Of these, 20 (25%) were lost to the study over the seven month followup period due to: lack of spouse participation or inadequate spouse data (N=5), inadequate patient data (N=7), death (N=1), patient not receiving CABG due to kidney problems (N=1), patient refusing to participate in the follow-up (N=1), and finally, patients being moved from the Washington Hospital Center to Washington Adventist Hospital (N=5). The final sample consisted of sixty patients who were followed over an average period of 7.08 (SD=1.44) months, and sixty spouses who were followed over an average of 7.02 (SD=1.50) months.

Pre-surgical Status: Sample Characteristics

Demographics. Table 1 presents the percentages, means, and standard deviations for the demographic characteristics of the study sample. The cohort of patients was a middle-aged group of males with some college education. They had

been married, on the average, thirty years. Approximately half of the patients were employed part time or more at the time of surgery; the remainder were either retired, on medical leave, or unemployed. Of those employed, 36.7% had blue collar jobs, and 63.3% had white collar jobs. The majority of patients was Caucasian.

Patients' spouses tended to be somewhat younger, with less education than the patients. Approximately half of the spouses were employed full or part time; the remainder classified themselves as homemakers.

Marital measures. 1. Dyadic Adjustment Scale (DAS). Table 2 presents pre- and post-surgical means and standard deviations for the four subscale and total scores for patients and spouses on the DAS. The data in Table 2 are based on only those patients who had data at both time points (i.e., pre-surgically and post-surgically), thus accounting for the reduced N. The means of three of the DAS scales (affectional expression, dyadic cohesion, and total dyadic adjustment) closely resemble those reported by Spanier (1976), while the scores on marital consensus and satisfaction are lower in the present study (49.50 vs. 57.9; 38.26 vs. 40.5, respectively). Overall, patients rated themselves as moderately satisfied and well-adjusted with their marriages pre-surgically. Spouses reported similar ratings on the four DAS subscales as did patients at time one, indicating satisfaction with their marriages.

2. Sexual activity measures. Tables 3-5 present the means, standard deviations, and percentages of the sexual activity items assessed pre- and post-surgically for patients and spouses. Where measures were repeated, the data represent only those participants who had complete data across all time points. Patients rated their sexual relationship as moderately satisfying (both before illness and before surgery) and also noted they would prefer more frequent sexual relations. Patients reported an average frequency of sexual relations as 4-5 times per month.

Spouses rated their sexual relationships as moderately satisfying both before the patients' illnesses and just before surgery. Unlike patients, the majority of spouses were satisfied with the frequency of sexual relations. Spouses reported an average frequency of sexual relations as 5-6 times per month.

Medical indices. Table 6 presents the means, standard deviations, and percentages for the pre-operative and peri-operative data that were assessed from the patients' medical charts. In general, somewhat less than half of the patients had suffered from an MI, and less than half had been diagnosed with hypertension. Approximately 30% had a history of arrhythmias, and less than 15% had been diagnosed with diabetes. The vast majority of patients suffered from angina. Using the New York Heart Association Functional Classification, over eighty per cent of the bypass patients

were classified as level I or II, levels which indicate less severe impairment from angina. Overall, this group of patients was a relatively healthy group. Regarding their operation, patients spent on the average three hours in surgery, had three bypass grafts, and spent a little over one day in the surgical intensive care unit.

Cardiac symptoms. Table 7 presents the percentages of patients who reported cardiac-related symptoms measured pre- or post-surgically. These items were assessed as either present or not present over the past month. Pre-surgically, over two-thirds of the patients reported angina and by the post-surgical assessment, this number had decreased significantly. Pre-surgically, about one-half of patients reported dyspnea symptoms, which was somewhat less prevalent post-surgically. Approximately half of the patients attributed their fatigue to heart disease. Concentration was a problem for about one-fourth of the patients. Fatigue and concentration problems were more prevalent at post-surgical follow-up. In addition to examining the individual cardiac symptoms, pre-surgical and post-surgical scales on the total number of symptoms were devised, each with a range from 0 to 4 (M 's = 1.97 and 1.77, respectively).

The Functional Status Questionnaire. Table 8 shows pre- and post-surgical means and standard deviations for the two activities of daily living (ADL) subscales (both basic and intermediate) that the Functional Status Questionnaire yields. The basic ADL subscale includes items such as being

able to eat, dress, and bathe oneself. The intermediate ADL subscale includes items on more vigorous activities such as walking several blocks and participating in strenuous sports. The scores for both subscales range from 0 to 100, with 100 indicating maximal functional ability. At the pre-surgical assessment patients scored high, on the average, for the basic activities of daily living subscale. However, they scored considerably lower on the intermediate ADL subscale.

The Impact of Surgery on Physical Functioning: Repeated Measures Analyses of Variance

The main reason for patients undergoing coronary artery bypass graft surgery is to improve their physical status. It was expected then, that the scores on number of cardiac symptoms and abilities to perform activities of daily living would improve as a function of the surgery. Repeated measures analysis of variance were conducted, with time as the independent variable and activities of daily living and number of cardiac symptoms as the dependent measures. Changes in individual cardiac symptoms were also assessed over time, using chi square analyses for matched pairs (Fleiss, 1981). These were used to test whether the proportion of patients with individual symptoms was different from the pre-surgical assessment to the post-surgical assessment. This type of chi square analysis takes into account the fact that assessments are from the same person. Repeated measures ANOVA's indicated that patients

did not differ significantly on basic activities of daily living between pre-surgical and post-surgical assessments. However, patients showed a significant improvement in the intermediate level of activities of daily living by the six month followup $F(1,45) = 39.61, p < .0001$). This latter scale includes items on vigorous activities.

Four cardiac related symptoms were assessed dichotomously (present or not present) pre-surgically and post-surgically. The analyses chosen were chi squares for matched pairs with dichotomous outcomes. A significant effect was found for the presence of angina, such that patients were less likely to have angina post-surgically ($\chi^2(1, N=53) = 23.04, p < .001$). No differences were found for dyspnea. Unexpectedly, fatigue was significantly worse at followup: ($\chi^2(1, N = 53) = 5.26, p < .025$), and there was a trend for patients to have more difficulty concentrating ($\chi^2(1, N = 52) = 3.68, p < .06$). In summary, patients were less likely to have angina at followup, and more likely to have fatigue and concentration problems at followup. In addition, a scale was created to assess the number of self reported cardiac symptoms. The four items were simply added to create the score on the cardiac symptoms scale. This was done separately for the pre-surgical and post-surgical symptoms. Repeated measures ANOVA's on these scales resulted in no significant effects for time.

Specific Tests of Study Hypotheses

Hypothesis 1: Effects of the marital relationship on perceived physical recovery. Hypothesis 1 predicted that, independent of the patient's medical status, a positive marital relationship would have beneficial effects on the patient's perceived physical recovery. A series of regression analyses was used to test Hypothesis 1. These analyses examined the unique contribution of the marital factors to predict the patient's perceived physical recovery at follow-up. The dependent measures were the perceived physical recovery items which included: total number of self-reported cardiac symptoms (angina, dyspnea, fatigue, and concentration problems), scores on the basic and intermediate activities of daily living, and frequency of and satisfaction with sexual relations. Specifically, for each dependent measure of physical recovery assessed at follow-up, a multiple regression analysis was conducted three times. First, the patient's age, pre-surgical value for the dependent measure, and scores on the cardiac morbidity, comorbidity, surgical status scales, and angina status score were entered into the regression equation. The second regression procedure was conducted by adding to the original set of predictors, the marital factors, which included the total dyadic adjustment score, the communications questionnaire score, and the score on the affection scale. The third regression procedure was

conducted by adding the medical x marital interaction terms to see if medical factors might operate differently across varying levels of the marital factors. With the three regression procedures completed, it was then possible to test for the significance of the increment in variance accounted for by the marital factors and the interaction terms in the prediction of the perceived physical recovery variables. The test of significance was the F test. Of the patient analyses, only one showed a significant contribution from the marital factors on the dependent variable, that of the intermediate activities of daily living score, $F(3,49) = 3.99$, $p < .025$. Regression analyses were also used to assess the unique contribution of marital factors on the spouses' ratings of sexual relations. Marital factors did not contribute significantly any unique increment in variance accounted for in spouses' ratings of sexual frequency or in sexual satisfaction, $p = n.s.$

The medical x marital interaction terms did contribute some unique variance in the overall prediction of patients' report of sexual frequency, $F(15,34) = 1.93$, $p < .06$. Of the fifteen interactions in the model, three were statistically significant: surgical status x total dyadic adjustment, $F(1,34) = 7.54$, $p < .01$; age x marriage, $F(1,34) = 4.35$, $p < .05$; and age x communication, $F(1,34) = 5.32$, $p < .03$. Interaction factors did not contribute any unique variance in the prediction of the other dependent measures as rated by patients (number of cardiac symptoms, sexual

satisfaction, basic ADL, intermediate ADL) nor for the spouses' ratings of sexual frequency and satisfaction.

To understand the nature of the interactions, the following procedures were conducted. For the surgical status x total dyadic adjustment interaction, we divided patients (using a median split) into two groups based on their surgical status, thus creating a better surgical status group and a worse surgical status group. We then examined the correlation between sexual frequency and marital adjustment for each surgical status group, and converted the correlation coefficients to z scores. Next we tested the significance of the difference between the correlation coefficients as recommended by Hayes (1981, p. 466-467) and compared the result to the normal curve. The Pearson correlation coefficient for sexual frequency and marital adjustment for the better surgical status group was $r=0.18$, $p=n.s$; for the worse surgical status group, $r=-0.38$, $p>.14$. We found a significant difference between better and worse surgical status groups ($Z=1.63$, $p<.05$), suggesting that there was a significantly different relationship between sexual frequency and marital adjustment for the two surgical status groups.

For the age x total dyadic adjustment interaction, patients were divided into two groups: those less than 60 years old and those over 60 years old. The Pearson correlation coefficient between sexual frequency and marital adjustment for the younger patients was $r=.31$, $p>.12$; for

the older patients, $r = -0.36$, $p > .12$. Results showed a significant difference between the two groups ($Z = 2.00$, $p < .02$), again suggesting a different relationship between sexual frequency and marital adjustment for younger and older patients.

For the age x communication interaction, the relationship between sexual frequency and communication score was not significantly different for older and younger patients. This suggests that the relationship between sexual frequency and communication score is complex and difficult to tease apart.

Hypothesis 2: The Psychosocial Impact of Surgery.

Hypothesis 2 concerned the impact of surgery on marital and sexual functioning. The specific dependent measures for marital functioning were the scores on the Dyadic Adjustment consensus, satisfaction, affectional expression, dyadic cohesion subscales, and the total DAS score. The sexual functioning dependent measures were the frequency of sexual relations in a month and the ratings of sexual satisfaction on a 1 (very satisfied) to 4 (very dissatisfied) scale. Repeated measures analyses of covariance were conducted, with age and the medical status variables as covariates. When patients were asked to rate the frequency of sexual relations across the three time points (before illness, a few days before surgery, and seven months after surgery), results indicated that patients reported a significant decrease in the frequency of sexual relations, $F(2, 68) =$

13.95, $p < .001$. Tukey's HSD post hoc test showed that the differences between the ratings assessed before illness and seven months after surgery were significant ($p < .05$), as were the differences between ratings assessed just before surgery and seven months after surgery, $p < .05$. There was no significant difference in ratings of sexual frequency assessed before illness and just before surgery. The covariate of age was significantly related to the frequency of sexual relations, $F(1,29) = 7.97$, $p < .01$. With respect to patient ratings of sexual satisfaction, there was no significant effect for time or for any of the covariates ($p = n.s.$). Patients rated themselves as relatively satisfied across the three time periods. Spouses showed similar results, such that sexual frequency was reported to be significantly diminished over time, $F(2,68) = 11.89$, $p < .001$. Tukey's HSD post hoc test also demonstrated significant differences among all three time points for ratings of sexual frequency, $p < .05$. Patient's angina status was also significantly related to the spouses' report of sexual frequency, $F(1,29) = 4.18$, $p < .05$. There was no significant effect for time or for the covariates on spouses' reports of sexual satisfaction. Tables 3 and 4 list the unadjusted means and standard deviations for patients' and spouses' ratings on sexual frequency and satisfaction.

Another factor which was evaluated just before surgery and seven months after surgery assessed whether patients and spouses were satisfied with the frequency of

their sexual relations (e.g., if they wanted sexual relations more often, if they were satisfied, or if they wanted sex less often). Since no one indicated that they would like to have sex less frequently, the responses were collapsed into dichotomous categories, a "satisfied" category, and a "want sex more often" category. Chi square analyses for matched pairs with dichotomous outcomes (Fleiss, 1981) were used to test whether the proportion of patients who wanted sex more often and the proportion of patients who were satisfied with the frequency of sexual relations were different at the presurgical assessment as compared to the postsurgical assessment. There were no significant differences in the numbers who wanted sex more frequently from the pre-surgical time to the post-surgical time ($p=n.s.$), for either patients or spouses.

Repeated measures ANOVA's were conducted, comparing patients' perceptions about sexual frequency and satisfaction to that of their spouses'. Satisfaction with sexual relations and frequency of sexual relations were treated as dependent measures with time and type of subject the independent variables. The purpose of these analyses was to assess the time x patient-spouse interaction. There were no significant differences between patients and spouses at any of the time points for the satisfaction variable. For the sexual frequency variable, there was a significant effect for time, such that patients and spouses, on the whole, showed a decline in the number of times they had

sexual relations in a month ($F(2,140) = 25.55, p < .001$). There were no significant time x type of subject interaction effects.

In addition, chi square analyses for matched pairs were conducted to compare patients' and spouses' ratings of satisfaction with frequency of sexual relations for each time point. Results indicated that patients were significantly more likely to want sexual relations more often than their wives when asked before surgery ($\chi^2(1, N = 44) = 11.25, p < .001$), and seven months after surgery ($\chi^2(1, N = 42) = 6.67, p < .01$). When asked whether they had resumed sexual relations by the seven month follow-up, 82% of patients and 85% of spouses reported that they had. Couples were also asked when they had resumed sexual activity, whether they had been concerned about the effects of sexual activity on the patient's health, and the percentage of time they had noted any erectile problems. Patients reported that they had resumed sexual activity on the average between six weeks and two months after surgery; spouses' reports did not differ significantly from patients', $t(81) = 1.04, p = n.s.$ Spouses were significantly more concerned about the effects of sexual activity on the patient's health than were patients, $t(94) = 2.02, p < .05$. Still, both patients and spouses rated their level of concern low (M 's = 1.37 and 1.71, respectively, on a one to four scale where one is no concern). Finally, both spouses and patients estimated that erectile problems occurred from 20-25% of the

time they engaged in sexual relations. There were no differences between spouses and patients in their estimates of frequency of erectile difficulties ($p=n.s.$).

The second part of hypothesis 2 involved the effects of surgery on marital functioning, which was assessed pre- and post-surgically using the four subscale scores and the total score of the Dyadic Adjustment Scale. Repeated measures ANCOVA's were conducted on the DAS scores, with age, medical status, and pre-surgical value of the dependent measure used as covariates. For patients, results were not demonstrated that there was a significant improvement in their scores on affectional expression and dyadic cohesion over time, $F(1,35) = 3.84$, $p<.05$, and $F(1,45) = 7.43$, $p<.009$, respectively. The covariate of angina status was related to the dyadic cohesion score, $F(1,40) = 3.75$, $p<.06$. There were no significant differences in patients' scores on the consensus, satisfaction, or total dyadic adjustment scales. However, a different pattern of results emerged from the spouses' results. The repeated measures ANCOVA's showed that spouses were significantly less satisfied with their marriages seven months after surgery, $F(1,53) = 28.95$, $p<.001$. They also scored worse post-surgically on the total dyadic adjustment score, a measure of the overall quality of the marriage, $F(1,35) = 5.64$, $p<.023$. Interestingly, there was a trend for spouses to rate their marriages as more cohesive at the seven month follow-up, $F(1,51) = 3.56$, $p<.06$. Table 2 presents the unadjusted means and standard

deviations for patient and spouse ratings on the Dyadic Adjustment Scale, assessed at both time points.

A series of repeated measures of analysis of variance was conducted to compare patients to spouses on the four DAS subscales and the total score at both time points. The independent variables included time (pre-surgical and post-surgical) and type of subject (patient or spouse). The dependent measures were the four DAS subscales and the total DAS score. The purpose of this series of analyses was to assess the time x patient-spouse interaction. There were no significant interaction effects; that is, there were no significant differences between patients and spouses at varying points in time. There was a significant trials effect of time. Results showed that overall patients and spouses rated dyadic cohesion as significantly better at seven months after surgery, $F(1,99) = 7.46, p < .01$.

It should be noted that, missing data were a problem, particularly for the sexual activity items. In order to understand whether the results are specific to those patients with complete data, as compared to those who had missing data, a series of t-tests was conducted, comparing these two groups on marital adjustment, marital satisfaction, age, level of intermediate ADL, and number of grafts. In addition, t-tests were run with spouses on all but the medical variables. There were no significant differences between the groups on any of the variables measured.

Discussion

The purpose of this study was to examine the impact of the marital relationship on the patient's perceived physical recovery from coronary artery bypass graft surgery, and to assess the impact of surgery on the couple's marital and sexual relationship, both from the patient's and spouse's perspectives.

Physiological Effects of Surgery

Results of the study indicated that the bypass surgery itself had some significant effects on the patient's physical recovery. On the positive side, seven months after surgery we found that patients were much less likely to experience angina and were more able to perform vigorous activities of daily living. These results are supported by other studies that have assessed the impact of the bypass surgery on physical functioning (Jenkins, et al. 1983; Mayou, 1986; Kornfeld, Heller, Frank, Wilson, et al. 1982). However, on the negative side, patients complained more about fatigue during the seven month follow-up, and they tended to complain more of difficulty concentrating at that time as well.

The main indication for bypass surgery is angina, so one would expect that angina is relieved after surgery. Since angina is often the symptom that prevents patients from performing vigorous activities and since angina was

relieved in these patients, it is not surprising that they significantly increased their abilities to do vigorous activities. The negative results are somewhat more difficult to explain. If patients are feeling less angina and are better able to move around vigorously, why should they feel more tired? One possible explanation is that they are simply more active, and push themselves physically more than they used to do, because they are less bothered by the chest pain or pressure. Another possibility is that they are still recovering from surgery, and do not yet have the level of energy that is generally an index of complete recovery. Another explanation is that the increase in fatigue may be mediated by an increase in depression. Common symptoms of depression include lack of energy and feeling more tired than usual. Difficulty concentrating is also often associated with depression. Unfortunately, this possible relationship between depression and fatigue and difficulty concentrating cannot be tested in this study, since depression was not assessed at the seven month time point. This relationship does seem plausible, since at least one study has found an increase in depression in significant subgroups of patients after surgery (Mayou & Bryant, 1987). In addition, other studies have reported increases in fatigue and concentration problems as well (Mayou & Bryant, 1987; Horgan, Davies, Hunt, Westlake, & Mullerworth, 1984).

The concentration problems reported by patients may

also be related to neuropsychological deficits that have been reported as a function of surgery. A review on the neuropsychiatric outcome of coronary bypass surgery suggests that delirium, hypoxic-ischemic syndrome, seizures, encephalopathy, and focal deficits occur in a significant subgroup of patients (Mayou, 1986). Using the Wechsler Adult Intelligence Scale, one study found that CABG patients, early after surgery, did have abnormalities in attention span and concentration as compared to general surgical patients. However, when patients were retested, these declines disappeared by six to eight weeks after surgery (Raymond, Conklin, Schaeffer, Newstadt, Matloff, & Gray, 1984). Another study found that coronary bypass patients who reported cognitive deterioration were not found to have reduced functions as assessed by neuropsychological tests. Rather, they found that those who reported higher levels of cognitive impairment had higher levels of depression as well as higher levels of state anxiety, suggesting that self-report of cognitive difficulties may reflect more the mood state of the patient rather than actual cognitive changes (Newman, Klinger, Venn, Smith, Harrison, & Treasure, 1989).

Hypothesis 1: Marital Factors and Recovery

The first hypothesis concerned the relationship between marital functioning and the patient's perceived physical recovery. Specifically, we predicted that a positive marital relationship would have beneficial effects

on the patient's recovery from coronary bypass surgery, independent of the patient's medical status. This relationship was tested using multiple regression procedures.

Results from the multiple regression procedures are only partially supportive of hypothesis 1. We initially wanted to test whether the marital factors would predict a significant increment in variance in the perceived physical recovery variables, above and beyond that variance explained by medical and age factors. We were also interested in whether interactions between the medical and marital factors would account for significant increments in variance for the physical recovery variables. Of those analyses conducted on the patient data, only the regression procedure examining the intermediate activities of daily living showed a significant increment in variance accounted for by the marital factors of dyadic adjustment, affection displayed, and communication. The regression procedures predicting basic activities of daily living, sexual frequency and satisfaction, and number of cardiac symptoms did not show any significant increments in variance attributable to the marital factors.

The regression analyses provided some evidence that marital, medical, and age factors interact in predicting physical recovery. Specifically, there was a trend for marital x medical and marital x age interactions to account for a significant increment in variance when predicting

patients' ratings of sexual frequency. In particular, the interactions of surgical status x marital adjustment, age x marital adjustment, and age x communication significantly predicted patient report of sexual frequency seven months after surgery. These results suggest that medical and age factors have different effects on the dependent measure of sexual frequency depending on the level of the marital adjustment.

The nature of some of the individual interactions are somewhat anomalous and difficult to explain. For example, for the better surgical status group, the relationship between marital adjustment and sexual frequency was positive. However, for the worse surgical status group, the variables were inversely related such that the better the marital adjustment the less frequent the sexual relations. It may be for patients who had a more difficult surgical recovery, that spouses and patients are more protective and concerned about the effects of sexual relations on the patient's health, and thus reduce the frequency of sex. One must also keep in mind that although the correlation coefficients were significantly different from each other, they were not significant within each group, and thus, conclusions drawn from these analyses must be tentative. The same should be said for the other significant finding for the age x total dyadic adjustment interaction. Again, the relationship between marital adjustment and sexual frequency was positive for the younger

patients, but inversely related for the older patients. Perhaps the frequency of sexual relations is not considered as important in the older cohort of patients as for the younger patients, or perhaps older patients also tend to be the ones who have more physical problems which might prevent them from having frequent sexual relations.

Overall, the results of the interactions suggest that the relationship between the medical and marital factors is not a linear one; that is, it is not a simple function of adding the values of each factor to predict the dependent measure of sexual frequency. Results for spouses showed that neither marital factors nor medical x marital interactions accounted for any significant increment in variance in predicting sexual frequency or satisfaction.

Given these results from the multiple regression procedures, the data provide only partial support for the notion that marital factors can contribute to the patient's perceived physical recovery.

If there is a relationship between the marriage and the patient's perceived physical recovery, what are the mechanisms or processes by which the marital relationship facilitates recovery? We can suggest several possibilities. One is that another variable which facilitates recovery also covaries with marital adjustment and physical recovery- risk factor reduction. That is, couples in more positive marriages may lead healthier lifestyles, for example, by eating a low cholesterol diet, exercising regularly, and

abstaining from smoking, and reinforce each other for maintaining the healthier habits. Consistent with this line of thought, there is some research comparing the married to the unmarried which suggests that married people are in better physical health (Andrews & Withey, 1976; Pearlin & Johnson, 1977) which may, in part, be due to healthier habits. Unfortunately, we cannot test this idea since we did not assess health habits at the study follow-up.

Another possible mechanism by which marriage may facilitate recovery is offered by Waltz and colleagues (1988). They suggest that positive marriages with high intimacy provide opportunities to confide and help the patient maintain the self-esteem needed to cope with the stress of an event such as a heart attack, thus preventing the onset of depression. This mechanism suggested by Waltz and colleagues could certainly be true of bypass patients as well. Depressed patients not only have a more pessimistic view of their recovery but may also be more likely to have less energy and thus actually participate less in physically rehabilitating activities. Again, other studies comparing married people to unmarried people show that the married are happier, less likely to commit suicide, and less likely to have psychological problems such as depression (Gove & Hughes, 1980; Gove, Hughes, & Style 1983). In particular, there is some evidence that happily married couples in general have better psychological health than unhappily married couples (Gove, Hughes, & Style, 1983), although this

relationship may hold true for men but not for women. So, to the extent that a positive marriage can buffer the effects of depression which can then allow the patient the energy and desire to engage in physical activity, recovery may be facilitated. In this study, depression was assessed just before surgery using the Profile of Mood States (POMS) as was marital adjustment, so we tested the relationship between depression (as a mood state) and marital adjustment, and found that the two were not significantly related. We were unable to test this relationship at the follow-up as we did not assess depression at that time, but it would certainly be worth examining in future studies.

Hypothesis 2: The Psychosocial Impact of Surgery

Hypothesis 2 concerns the impact of bypass surgery on the couple's marital and sexual functioning. Based on the review of the literature, it was expected that marital functioning would improve but sexual functioning would worsen for both patients and spouses. This hypothesis was tested by conducting a series of repeated measures analysis of covariance on the marital and sexual activity scores. From the patient's perspective, two of the five Dyadic Adjustment Scale scores (affectional expression and dyadic cohesion) improved from the pre-surgical to the post-surgical time points. The other marital scores did not change significantly over time. Sexual frequency did diminish by the seven month time point, but sexual satisfaction did not change. So, at least from the patient

analyses, there was some support overall for the second hypothesis.

With one exception, results from the spouse data did not confirm hypothesis 2. With regard to marital functioning, spouses reported less marital satisfaction and less overall marital adjustment at the seven month follow-up. They also reported increased dyadic cohesion at the follow-up. Thus, overall, spouses appeared to be more dissatisfied with their marriage at the seven month follow-up. Hypothesis 2 also predicted that sexual functioning would diminish, and this was supported by the sexual frequency data for spouses. However, sexual satisfaction did not change significantly over time. In summary, the marital functioning results for spouses did not support hypothesis 2, and the sexual functioning results only partially supported hypothesis two.

In general, it appears that marital functioning appeared to improve from the patient's perspective but worsen from the spouse's viewpoint. Both patients and spouses noted that sexual frequency diminished, but sexual satisfaction remained unchanged. Patients continued to want sexual relations more often at follow-up as they had pre-surgically, but their wives continued to feel satisfied with the frequency of sexual relations.

Given these results, what processes may be accounting for the changes in marital and sexual functioning? First, there are the possible processes that

may underlie the changes in marital functioning. After surgery, the patient is in a position of increased dependence on his wife for physical and emotional support (Michela, 1981). Particularly for this cohort of participants, the wife is the primary care-taker of the patient. She may feel she has the main responsibility of planning the proper meals, making sure her husband gets adequate rest and exercise and takes his medications, and finally, may feel that she is responsible for his emotional health as well. During the recovery period, patients are probably receiving more attention and care than usual, so it is understandable how they might feel better about their marital relationship. But it may be that the cost of the care-taking for spouses, at least, is that they feel less satisfied with the relationship overall, that their care and concern is not reciprocated. Anecdotally, in the present study, one patient's wife noted that she felt resentful because she did so much for him, and he did not act as though he appreciated it. In fact, he spent more time with friends and his relatives than he did with her, and she consequently felt left out.

In addition to the overall cost of care-taking for the spouse, issues such as maintaining the proper diet and exercise often create tension within the marriage. For example, one exasperated wife mentioned that she had done all she could to provide the "right" food, and she was tired of nagging her husband to stick with the proper diet. She

felt he was being selfish by not thinking about how his behavior worried her, and how he was continuing to place himself at risk for early death. As the wife fulfills her husband's needs during the recovery, who is there to fulfill the wife's needs? For many spouses, they relied on their adult children as well as their female friends. Yet, the intimacy needs cannot be met in the same way as in a marital relationship, and thus it may be that spouses still feel less support overall as compared to their husbands. These particular women may also have felt less comfortable about asking for help and reaching out to others because they may have believed that they should be able to cope with their husband's recovery on their own.

Another possible interpretation of the results for hypothesis 2 is that the marital relationship is not significantly different for patients and their wives at follow-up, but that spouses may be more likely to report difficulties in the marriage than their husbands. This seems somewhat unlikely since, if such a difference did exist, we would expect to see it at the pre-surgical time point, and we did not see such differences between patients and spouses at that time.

The decreased marital satisfaction of spouses at follow-up may reflect the fact that some wives who were dissatisfied with their marriages before surgery were reluctant to report marital unhappiness at that time and may have felt that it was still important to "rally around the

patient" at this difficult time. However, by the seven month follow-up they may have felt that the patient was recovered by then and that it was OK to admit to marital dissatisfaction. Although this is a plausible explanation, it seems somewhat unlikely in light of the fact that spouses evaluated their marital relationship privately and independently of their husbands.

It is interesting that spouses reported decreased marital satisfaction and overall marital adjustment, but increased cohesion by the seven month follow-up. The items that comprise the cohesion scale are items that refer to sharing activities together, e.g., "How often do you together on a project together?". It is possible that spouses could be spending more time with their husbands during the recovery period and do more activities together, but actually enjoy it somewhat less. So, although the spouses may have felt more cohesive, they still reported that their overall relationship was less satisfying.

From prior research, it is clear that wives can be significantly affected by their husbands' illness and surgery (Goble, Adey, & Bullen, 1963; Wynn, 1967; Skelton & Dominian, 1973; Mayou, Foster, & Williamson, 1978; Gilliss, 1984; Langeluddecke, Tennant, et al, 1989). A few studies have asked patients about their marital relationship before and after bypass surgery. For example, Zyzanski, Stanton, Jenkins, & Klein (1981) found a small group of patients who suffered negative changes in their marital relationships,

Jenkins, Stanton, Savageau, Denlinger, & Klein (1983) found no changes in patients' marriages, while others have found that patients felt their marriage had improved (Langeluddecke, Fulcher, et al, 1989; Mayou & Bryant, 1987). From this study, it appears that one cannot assume that the marital relationship changes in the same way or even in the same direction for patients and spouses.

Regarding the impact of surgery and recovery on sexual frequency and satisfaction, we found that sexual frequency diminished but satisfaction did not change from patients' and spouses' perspectives. The decreased frequency of sexual relations at seven months post-surgery is particularly interesting when one considers that patients significantly increased their abilities to perform other vigorous activities. The diminished frequency of sexual activity for bypass patients has been noted in other studies (Gundle, et al., 1980; Kornfeld, Heller, Frank, Wilson, & Malm, 1982). What might be responsible for the decrease in sexual activity? One possible explanation is that patients and spouses are concerned about the impact of sexual activity on the patient's health, they do not understand that many of the activities they perform on a daily basis are more physiologically demanding than sex, and are thus reluctant to engage in sexual relations. There is some research to support this notion. A number of studies have shown that spouses and patients (both MI and bypass) are afraid to have sexual relations because they think sex will

bring on a heart attack or sudden death (Bloch, Maeder, & Haissly, 1975; Skelton & Dominian, 1975; Kavanagh & Shepherd, 1977). Although this concern appears to be a potential reason for the decrease in sexual activity, it probably is not responsible for the diminished activity found in this study. We asked patients and spouses how concerned they were about the effects of sexual activity on health, and the majority of them reported a low level of concern. Spouses did report significantly more concern than did patients.

Another possible explanation for the diminished sexual activity is that patients are on medications which may impair sexual drive or performance. Again, although there are some medications thought to have this effect (Burnett & Chanine, 1978; Warren & Warren, 1977; Neri, Zukerman, & Bahary, 1980), it is an unlikely explanation in this study since the tendency is for physicians to reduce the number of medications that patients take after surgery as compared to the time period just before surgery. The continuing process of atherosclerosis may itself be at least partially responsible for the decreased sexual frequency. Unfortunately, it is difficult to separate the effects of disease from medications in this population since the majority of patients with atherosclerosis are on medications. However, it is certainly plausible that the blood vessels in the genito-urinary tract system of the male would be vulnerable to the atherosclerotic process, which

might impair the circulation necessary for sexual performance. Another reasonable explanation for the decrease in the frequency of sexual relations is that the patient may be continuing to experience skeletal muscle discomfort in the chest area where the incision was made. The muscular discomfort which has been noted by some patients may make certain positions requiring isometric strength for sexual intercourse more difficult (J. M. Zoltick, personal communication, September 12, 1989).

Finally, a likely explanation for the diminished sexual activity is probably the spouse's decline in marital satisfaction. If she is feeling less satisfied and less supported by her partner, she may be less likely to desire intimate relations. This may also explain why she is satisfied with the frequency of sexual relations when her husband is not.

Of the research done thus far with bypass patients, few studies have investigated the role of the marital relationship in the recovery process. Even fewer have done so from both the patient's and spouse's perspectives. Of those which have examined marital factors, there appears to be consensus that the marital relationship can have a significant impact on the patient (e.g. Waltz et al, 1988; LaMendola & Pellegrini, 1979; Miller & Brewer, 1969; Kulik & Mahler, 1989). This study supports the hypothesis that marital factors play a significant role in the patient's recovery, and delineates this relationship more specifically

(teasing apart the marital from the medical factors) through the use of regression procedures. It also provides new information about patients' and spouses' marital and sexual relationships, and how they may be affected differentially by stressors such as bypass surgery and recovery. The spouses' decreased marital satisfaction suggests that there may be a cost to the role of care-taker for someone who has a chronic illness and is recovering from surgery. Along this same line of thought, Kessler, McLeod, & Wethington (1985) review the health-damaging effects of providing social support, and find evidence that there are serious personal costs associated with being a care-provider. In particular, they review research which suggests that women are more likely to report stressful events involving more people, and are more responsive to those events. It appears that the emotional costs of caring for other people accounts for a significant part of the mental health disadvantage of women. Studies in other areas have shown that care-takers of ill patients report increased distress. For example, Fadden, Bebbington, & Kuipers (1987) found that spouses of patients with affective disorders felt their marital relationships were strained. Kerns & Turk (1985) have reported that more than 20% of their samples of spouses of chronic pain patients show significantly depressed mood. Flor, Turk, & Scholz (1987) found that 51% of spouses of chronic pain patients reported marital dissatisfaction.

The present study has some weaknesses which are

helpful to examine when planning for future research. First, one important issue is whether or not the pre-surgical assessment of marital adjustment may have been influenced by the upcoming surgery. Coronary artery bypass graft surgery is a very serious surgery which may well cause considerable anxiety for patients and their spouses, particularly a few days before the procedure. Thus one concern is whether or not the pre-surgical assessment of marital adjustment reflects a stable level of adjustment or whether it is increased or lowered temporarily due to the anxiety about the procedure. One suggestion therefore has been to include a comparison group of patients and their spouses to see if their marital adjustment is comparable to the present group of participants. The problem is to determine which group is an adequate comparison group. For example, patients who have been diagnosed with coronary heart disease and who are medically treated would most likely be less severely ill as compared to patients who are about to undergo CABG surgery, since surgery represents a more serious form of treatment. Other medical patients who are about to undergo other forms of surgery or diagnostic procedures also are likely to differ from CABG patients in important ways, including the nature of the disease, the severity of disease, and ways of coping with the disease and surgery or diagnostic procedures. Given these likely differences between the comparison groups and the present sample, it would be difficult to interpret the similarities

or differences in ratings of marital adjustment. It would appear that the most appropriate way to assess whether the upcoming surgery does influence the rating of marital adjustment would be to evaluate the same group of patients and their spouses and assess perceptions of their marital relationship several weeks or months before the surgery and then again a few days before surgery, and compare the two ratings. Unfortunately, this is difficult to do logistically in the United States since the majority of patients are not scheduled several weeks ahead of time for surgery. In Canada and many European countries, this process is different, and patients often do know at least several weeks ahead of time about their scheduled surgery (S. A. Shumaker, personal communication, September 12, 1989).

Given that a comparison group was not included in the present study, patients and their spouses were asked independently in a questionnaire format several days before surgery whether they felt their marital relationship had recently improved, worsened, or stayed the same. Over 70% of patients and over 60% of spouses felt there had been no change. In addition, patients who had been interviewed three or fewer days before surgery were compared to patients who had been interviewed four or more days before surgery on their ratings of marital adjustment. Results indicated no significant differences between the groups, $F(26,32) = 1.54$, $p > .25$. Spouses' ratings of marital adjustment were also

compared in a similar manner, and there were no significant differences between groups, $F(36,22) = 1.39, p > .42$. It seems likely that the couples' relationships did not change dramatically just before surgery, and that any adjustment in their marriages had probably been going on gradually since at least the time of the patients' diagnosis of heart disease. Thus, although it is an important issue as to whether the surgery influenced the marital rating, it is a difficult one to address logistically.

The use of self report-questionnaires with better psychometric properties is another factor which would have improved this study and should be considered in future research. In particular, the scales of marital communication and display of affection should be investigated further to assess more fully their validity and reliability. In addition, the assessment of sexual frequency and satisfaction could be strengthened by including questionnaires on sexual activity (with items on various forms of sexual activity and not just intercourse). Daily record-keeping of sexual behavior is another way of obtaining more detailed and accurate information about a couple's sexual relationship, but given the response rate to the basic sex questions in the present study, it is likely that a significant percentage of participants would not answer. Finally, the use of objective measures of physical recovery from CABG surgery such as exercise tolerance testing would enhance the evaluation of patient outcome for

research in this area.

One practical issue in doing research of this nature is the retention of subjects for the follow-up assessments, which was a problem in this study. One idea is to contact participants more frequently to remind them of their commitment to the study. For example, Scheier and colleagues have sent their participants birthday cards to stay in touch. Brief telephone contacts may also be useful for staying in touch with bypass patients and their wives. Of course, this necessitates more time from the research team, but it could be time well spent.

Future Research Directions

Much work remains in the area of recovery from bypass surgery. Since CABG is the second most common elective surgery in the United States, it affects many people, including the patients' spouses and other family members. It appears that there may be a relationship between the quality of the marriage and recovery from bypass surgery, and that the surgery itself has an impact on marital and sexual functioning. The next step is to elucidate the mechanisms or processes by which these relationships develop. One idea is to place more emphasis in the future on the spouses' role as care-taker to understand how we may improve their quality of life as well as improve the patients' quality of life during recovery. For example, a simple idea might be to assess the attitudes and knowledge of spouses involved in pre- and post-operative meetings with

the physician as compared to spouses for whom the meetings are not offered to see if more realistic attitudes and increased knowledge not only benefit spouses but also benefit the patients' recovery as well. Another idea is to assess the nature of the natural support systems that do exist for spouses to see what (or whom) is most helpful. If research indicates that support for spouses is lacking, then perhaps there is a place for a support group specifically designed for the spouses of bypass patients, analagous to Mended Hearts, the volunteer group of patients who have experienced cardiac surgery.

One other important area for future research is to assess the generalizability of these findings for female patients and their spouses. The majority of studies examining quality of life issues have been conducted with male CABG surgery patients. Thus, it is not clear whether the difficulties noted previously for female spouses are due to gender or to the care taker role that women often assume. At least one study has suggested that recovery is more problematic for female patients (Jenkins, Stanton, Savageau, Denlinger, & Klein, 1983) and several reasons have been offered, including: a) women have more recurrent angina afterward (Bolooki, et al, 1975; Loop, Golding, MacMillan, Cosgrove, Lytle, Sheldon, 1983; b) the graft patency rates are considerably lower which may in part be due to their smaller vessels (Tyras, Barner, Kaiser, Codd, Laks, & Willman, 1978; and c) cardiac function is less improved

(Bolooki et al, 1975). It is also suggested that female patients may be less likely to be married than male patients and even if they are married, may not have as much support during the recovery period when support is especially helpful.

In summary the present findings suggest that the marital relationship may indeed play a role in the recovery of the male coronary bypass patient such that the more positive the marital relationship, the more beneficial are its effects on recovery. However, the surgery itself appears to have some negative effects, including decreased marital satisfaction for spouses and decreased frequency of sexual activity as rated by both patients and spouses. Given that these results are generally independent of the patient's pre-operative and peri-operative medical status more attention should be devoted to psychosocial factors such as the quality of the marital relationship and other family dynamics in future research on recovery from coronary artery bypass graft surgery.

Table 1

Comparison of Patients and Spouses on Selected
Demographic Characteristics

Characteristics	Patients	Spouses
Mean age (years)	60.2 (6.4)	54.2 (10.6)
Mean # years educated	15.1 (3.9)	14.2 (2.8)
Employment status		
Employed fulltime	41.4%	28.3%
Employed parttime	10.3%	20.0%
Homemaker	1.7%	43.3%
On medical leave	15.5%	5.0%
Retired	27.6%	3.3%
Unemployed	3.4%	0%
Blue collar job	36.7%	-
White collar	63.3%	-
Ethnic background		
Asian	1.7%	1.7%
Black	8.3%	8.3%
Caucasian	90.0%	90.0%
Mean # years married	30.3 (10.6)	30.3 (10.6)

Table 2

Comparison of Patients and Spouses on pre- and post-surgical
Dyadic Adjustment subscale means and standard deviations

DAS subscale	Patients			Spouses		
	N	Mean	SD	N	Mean	SD
A few days prior to surgery:						
Consensus	48	50.88	7.24	48	49.69	7.21
Satisfaction	50	39.28	6.70	54	40.80	5.17
Affectional Expression	39	8.92	2.43	38	9.18	2.31
Dyadic Cohesion	49	13.24	3.07	52	14.92	3.67
Total DAS score	35	112.89	15.58	36	115.42	14.21
Seven months after surgery:						
Consensus	48	49.50	6.62	48	49.21	6.63
Satisfaction	50	38.26	7.88	54	36.81	5.01
Affectional Expression	39	9.54	1.64	38	9.26	2.04
Dyadic Cohesion	49	14.27	3.07	52	15.71	4.09
Total DAS score	35	113.29	15.16	36	112.42	12.63

Range of possible scores:

Consensus: 0 to 65 Satisfaction: 0 to 50

Affectional Expression: 0 to 12 Dyadic Cohesion: 0 to 24

Total Score: 0 to 151

Higher score indicates more positive attribute (e.g., higher total DAS score reflects better marital adjustment).

Table 3

Comparison of Patients and Spouses on Satisfaction with
Sexual Relations

Before illness:

	N	Mean	SD
Patients	36	1.58	0.65
Spouses	40	1.42	0.59

A few days prior to surgery:

Patients	36	1.81	0.92
Spouses	40	1.60	0.90

Seven months after surgery:

Patients:	36	1.64	0.72
Spouses:	40	1.63	0.70

Patients were asked to complete the following self report item:

"Before illness were your sexual relations":

- _____ Very Satisfactory
- _____ Somewhat Satisfactory
- _____ Somewhat Unsatisfactory
- _____ Very Unsatisfactory

The item was scored from one to four, with one representing very satisfactory and four representing very unsatisfactory.

Table 4

Comparison of Patients and Spouses on Satisfaction with
Frequency of Sexual Relations

A few days prior to surgery:

	Want sexual relations more often	Satisfied with frequency of sexual relations
Patients	55.3% (21/38)	44.7% (17/38)
Spouses	20.0% (8/40)	80.0% (32/40)

Seven months after surgery:

Patients	52.6% (20/38)	47.4% (18/38)
Spouses	20.0% (8/40)	80.0% (32/40)

Table 5

Comparison of Frequency of Sexual Relations Before Illness,
Just Prior to Surgery, and Seven Months after Surgery

	Patients			Spouses		
	N	Mean	SD	N	Mean	SD
Mean Frequency of Sexual Relations in an Average Month Before Illness	37	5.57	3.70	37	6.59	3.83
Mean Frequency of Sexual Relations in an Average Month Prior to Surgery	37	4.19	3.60	37	5.16	3.80
Mean Frequency of Sexual Relations in an Average Month Seven Months After Surgery	37	3.43	2.15	37	3.62	2.31

Table 6
 Sample Means, Standard Deviations, and Percentages for
 Pre- and Peri-operative Medical Status Variables

	N	Mean	SD
Mean Admission SBP	55	130.56	18.05
Mean Admission DBP	55	79.71	12.00
Mean # Hours in Surgery	55	3.26	0.94
Mean # Hours in SICU	55	29.35	18.91
Mean # Grafts	55	3.15	0.95
Percentage of Patients with the Following:			
Angina Present	89.1%	(49/55)	
Below normal ejection fraction ($<50\%$)	25.6%	(11/43)	
Hypertension Present	45.5%	(25/55)	
History of MI	43.6%	(24/55)	
History of arrhythmias	29.1%	(16/55)	
History of diabetes	14.5%	(8/55)	

Table 7

Percentage of Patients Reporting
Cardiac-related Symptoms

Symptom:	Pre-surgical		Post-surgical		χ^2	probability
	N	%	N	%		
Angina	37	69.8	12	22.6	23.0	p<.001
Dyspnea	25	48.1	17	32.7	2.7	p>.10
Fatigue	29	54.7	40	75.5	5.3	p<.025
Concentration	14	26.9	24	46.2	3.4	p<.06

(The table reflects only those patients who have symptom data for both presurgical and postsurgical time points.)

Table 8
 Comparison of Patients' Pre- and Post-surgical
 Means and Standard Deviations for the
 Functional Status Questionnaire

	Pre-surgical			Post-surgical			
	N	Mean	SD	N	Mean	SD	
* Basic Activities of Daily Living	47	96.45	10.39	47	98.18	4.77	F(1,47)=2.04 p >.15
* Intermediate Activities of Daily Living	45	68.02	1.42	45	89.26	1.98	F(1,45)=39.61 p <.0001

*
Subscale is scored from 0 to 100%, with 100 indicating maximum functional ability.

APPENDIX A

THE WASHINGTON HOSPITAL CENTER

Informed Consent to Participate in Research Project/Study

Title of Project/Study: Predicting Adaptation to
Coronary Artery Bypass Surgery

1. I, _____, agree to participate in a study being conducted by Drs. Paul Corso and Joseph Lindsay, and/or certain of his assistants. I understand that the study involves research and that the purpose(s) of the research is as follows:

To investigate how different men and women handle the experience of CABG surgery. What is learned in this study will help to better prepare future patients for surgery and their rehabilitation.

2. I understand that the duration of my participation will be for one year.

3. I understand that the procedures to be followed are:

We will conduct an initial interview the week before surgery. This will last about one hour. We would also like to talk with you once more during your hospitalization. We would also be interested in talking to you six months and one year after surgery for approximately a half hour each time. Of course, if at any point, you would like to withdraw from the study, you are free to do so. We will be asking you questions about your experience of surgery and asking you to fill out several forms during the first interview. Some of the forms will be given to you during our visit after surgery. We have tried to design each form so that it can be easily understood and quickly filled out.

4. Most of the questions that we will ask you are things that you have probably already thought about and may have discussed with your spouse or close friend. If, however, the questions should raise some uncomfortable issues for you, you can refuse to answer the questions.

5. I hereby give you permission to talk with my doctor about my surgery. I realize that by talking with my doctor you will understand my medical situation better. I also give you permission to collect information about my temperature, blood pressure, and other such measures.

6. I understand that my participation in this study and my medical records will be kept confidential and no information identifying me will be released without my permission. A statistical report of this research project/study, however, may be disclosed in a scientific paper. I further understand that there is the possibility that the Food and Drug Administration may inspect the records.

7. I understand that in the event of injury resulting from the research procedures, there will be no monetary compensation or gratuitous medical treatment for this injury provided to me by the Washington Hospital Center, _____ or any person involved in this research project.

8. I have had an opportunity to ask the researchers involved questions about the project. I understand that I am to contact Dr. Joseph Lindsay, Chief, Department of Cardiology (541-7597) or Angela Silverman, Research Nurse (541-6264), if I have any questions.

9. I understand that my participation in this research study is voluntary, that my refusal to participate will involve no penalty or loss of benefits to which I might otherwise be entitled and that I may discontinue my participation at any time without penalty or loss of benefits to which I am otherwise entitled.

10. I understand that there are no additional costs that I will incur as a result of participating in this project.

11. I understand that significant new findings developed during the course of the research, which may relate to my willingness to continue participation, will be provided to me.

12. I understand that there will be approximately 150 subjects involved in the study.

Witness

Signature of Patient

Date and Time: _____

5. How helpful has
spouse's illness?

APPENDIX B

Demographic Items

< > Male < > Female

1. What is the highest grade in school that you have completed?

(Circle the highest grade completed.)

Elementary:	1	2	3	4	5	6
High School:	7	8	9	10	11	12
Trade School:	13	14				
College:	13	14	15	16		
Graduate/Prof. School	17	18	19	20+		

2. What is the highest diploma or degree you have?

< > No degree or diploma

< > High School, GED

< > Associate (AA)

< > Bachelors (BA or BS)

< > Masters (MA, MS, or MBA)

< > Professional (PhD, MD, Law)

3. Do you belong to any organized religion or religious group?

< > Yes

< > No

Which one?

Skip to Question 6.

4. How often do you attend church/synagogue?

< > Never

< > Once or twice a year

< > 3-10 times a year

< > 1-3 times a month

< > Once a week or more

< > Daily

5. How helpful has your religion been in helping you deal with your spouse's illness?

< > Very helpful

< > Somewhat helpful

< > Not at all helpful

06

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APPENDIX C

Sexual Activity Questions Assessed Pre-surgically

1. During the last year, how often have you had sexual relations?

< > Frequently

< > Occasionally

< > Rarely

< > Not at all Skip to question 4.

2. On the average, how many times a month do you have sexual relations? _____ times a month

3. Currently are your sexual relations?

< > Very satisfactory

< > Somewhat satisfactory

< > A little unsatisfactory

< > Very unsatisfactory

4. Are you satisfied with the frequency with which you are having sexual intercourse or would you like to have sex more often?

< > More often

< > Satisfied

< > Less often

5. Before your (spouse's) illness, on the average how often were you having sexual relations a month? _____

6. Before your (spouse's) illness, were your sexual relations:

< > Very satisfactory

< > Somewhat satisfactory

< > A little unsatisfactory

< > Very unsatisfactory

APPENDIX D

Dyadic Adjustment Scale

Most persons have disagreements in their relationships. Please indicate below the approximate extent of agreement or disagreement between you and your partner for each item on the list on the left side.

How often do you and your partner agree/disagree on this matter?

	Always	Always	Occasionally	Frequently	Always	Always
	Agree	Agree	Disagree	Disagree	Disagree	Disagree

Handling family finances						
Matters of recreation						
Religious matters						
Demonstrations of affection						
Friends						
Sex relations						
Conventionality (correct or proper behavior)						
Philosophy of life						
Ways of dealing with parents or in-laws						
Aims, goals, and things believed important						
Amount of time spent together						
Making major decisions						
Household tasks						
Leisure time interests and activities						
Career decisions (unless retired)						

Every Day Almost Every Occa- sionally Rarely Never

How often do you kiss your partner?					
Do you and your partner engage in outside interests together?					

Never Less than Once a Month Once or Twice a Month Once or Twice a Week Once A day More Often

How often do you and your partner have an exciting exchange of ideas?					
How often do you laugh together?					
How often do you calmly discuss something?					
How often do you work together on a project?					

The following two questions are about areas in a relationship about which couples sometimes agree or sometimes disagree.

In the last few weeks did you disagree about being too tired for sex?

< > Yes < > No

Who was too tired?

< > Partner was

< > I was

In the last few weeks did you disagree about not showing love?

< > Yes < > No

Who was not showing love?

< > Partner was not

< > I was not

The numbers on the following line represent different degrees of happiness in your relationship. The midpoint, 3, represents the degree of happiness in most relationships.

Please circle the number which best describes the degree of happiness, all things considered, of your relationship.

0 1 2 3 4 5 6

Extremely Fairly A little Happy Very Extremely Perfect
 Unhappy Unhappy Unhappy Happy Happy

Which one of the following statements best describes how you feel about the future of your relationship?

< > I want desperately for my relationship to succeed, and would go to almost any length to see that it does.

< > I want very much for my relationship to succeed, and will do all I can to see that it does.

< > I want very much for my relationship to succeed, and will do my fair share to see that it does.

< > It would be nice if my relationship succeeded, but I cannot do much more than I am doing now to help it succeed.

< > It would be nice if it succeeded, but I refuse to do any more than I am doing now to keep the relationship going.

< > My relationship can never succeed, and there is no more that I can do to keep the relationship going.

Please answer the questions on the left hand side by putting a check in the column under the best answer on the right hand side.

	All the time	Most of the time	More often than not	Occas- sionally	Rarley	Never
How often do you discuss or have you considered divorce, separation, or termination of your relationship?						
How often do you or your partner leave the house after a fight?						
Do you confide in your partner?						
Do you ever regret that you married/lived with your partner?						
How often do you and your partner quarrel?						
How often do you and your partner "get on each other's nerves?"						

APPENDIX E

Cardiac Symptoms assessed pre-surgically

Many patients experience symptoms associated with their heart disease. I am going to read you a list of these symptoms and ask you if you have experienced them, in particular, over the last month, how often you have experienced them, and the intensity.

- 1= daily
 2= 3-5 days a week
 3= 1-2 days a week
 4= 6-10 days a month
 5= once a month
 6= other (less than once a month)

Symptom?

How often?

Intensity?



Do you experience?

1=not too severe
 10=extremely severe

Angina		
Shortness of breath		
Fatigue		
Sleeping problems		
Ability to concentrate		
Irritability		
Eating problems		
Other		

APPENDIX F

Functional Status Questionnaire

This group of questions refers to many types of physical and social activities. We would like to know how difficult it was for you to do each of these activities, on the average, during the past month. By difficult, we mean how hard it was or how much physical effort it took to do the activity because of your health. Circle the number:

- 4 if you usually had no difficulty doing it;
- 3 if you usually had some difficulty doing it;
- 2 if you usually had much difficulty doing it;
- 1 if you usually did not do the activity because of your health;
- 0 if you usually did not do the activity for other reasons;

During the past month,
how much physical
difficulty did you
have?

1. Taking care of yourself, that is, eating, dressing, or bathing?	4	3	2	1	0
2. Moving in and out of a bed or chair?	4	3	2	1	0
3. Walking several blocks?	4	3	2	1	0
4. Walking <u>one</u> block or climbing <u>one</u> flight of stairs?	4	3	2	1	0
5. Walking indoors, such as around your home?	4	3	2	1	0
6. Doing work around the house such as cleaning, light yard work, home maintenance?	4	3	2	1	0
7. Doing errands, such as grocery shopping?	4	3	2	1	0

8. Driving a car or using public transportation?	4	3	2	1	0
9. Visiting with relatives or friends?	4	3	2	1	0
10. Participating in community activities, such as religious services, social activities, or volunteer work?	4	3	2	1	0
11. Taking care of other people such as family members?	4	3	2	1	0
12. Doing vigorous activities such as running, lifting heavy objects or participating in strenuous sports?	4	3	2	1	0

APPENDIX G

Cardiac Symptoms Assessed Post-surgically

Persons with heart problems who have had bypass surgery sometimes have the following symptoms or experiences. Please read this list of items and check how often you have experienced them by using the following scales:

- 0= Never
 1= Daily
 2= 3-5 days/week
 3= 1-2 days/week
 4= 6-10 days/month
 5= Once a month
 6= Other

Please rate the intensity of the symptom or experience by circling a number from 1 to 10 where 1 is not very intense and 10 is very intense.

Example:	Item:	How often (0 to 6)	Intensity (1 to 10)
	Headache	4	3

HAVE YOU EXPERIENCED?	HOW OFTEN (0 to 6)	INTENSITY (1 to 10)
	0= Never	1= Not very intense
	1= Daily	10= Very intense
	2= 3-5 days/week	
	3= 1-2 days/week	
	4= 6-10 days/week	
	5= Once a month	
	6= Other	

Angina (Chest pain)	_____	1 2 3 4 5 6 7 8 9 10
Shortness of breath	_____	1 2 3 4 5 6 7 8 9 10
Feeling tired	_____	1 2 3 4 5 6 7 8 9 10
Difficulty concentrating	_____	1 2 3 4 5 6 7 8 9 10
Dizziness	_____	1 2 3 4 5 6 7 8 9 10
Trouble falling asleep	_____	1 2 3 4 5 6 7 8 9 10
Waking early and not being able to go back to sleep	_____	1 2 3 4 5 6 7 8 9 10
Sleeping restlessly	_____	1 2 3 4 5 6 7 8 9 10
Other	_____	1 2 3 4 5 6 7 8 9 10

APPENDIX H

Sexual Activity Questions Assessed Post-surgically

Please read the following questions and check the category that comes closest to describing your answer.

Have you resumed sexual intercourse since your surgery?

< > Yes

< > No

If yes, how long after your surgery did you resume sexual intercourse? (Please check one answer).

- _____ within one month after the surgery
- _____ within 1 to 1 and 1/2 months after the surgery
- _____ within 1 and 1/2 to 2 months after the surgery
- _____ within 2 to 2 and 1/2 months after the surgery
- _____ within 2 and 1/2 to 3 months after the surgery
- _____ within 3 to 3 and 1/2 months after the surgery
- _____ within 3 and 1/2 to 4 months after the surgery
- _____ within 4 to 4 and 1/2 months after the surgery
- _____ within 4 and 1/2 to 5 months after the surgery
- _____ within 5 to 5 and 1/2 months after the surgery
- _____ within 5 and 1/2 to 6 months after the surgery

How many times in the last month did you have sexual intercourse?
_____ times

Currently, are your sexual relations?

< > Very satisfactory

< > Somewhat satisfactory

< > A little unsatisfactory

< > Very unsatisfactory

Are you satisfied with the frequency with which you are having sexual intercourse or would you like to have sex more often?

< > More often

< > Satisfied

< > Less often

To what extent have you been worried that engaging in sex will negatively affect your health?

- < > Not at all concerned
- < > Somewhat concerned
- < > Moderately concerned
- < > Very concerned
- < > Extremely concerned

(Asked of patients):

When you and your partner have intercourse, how frequently have you had trouble attaining or maintaining an erection?

_____ % of the time

(Asked of spouses):

When you and your partner have intercourse, how frequently has your partner had difficulty attaining or maintaining an erection?

_____ % of the time

APPENDIX I

Affection Scale

We are interested in how often you express your affection to your partner. Couples exchange various types of affectionate behavior. You will be asked to check which of the behaviors listed below you have recently engaged in. Please read the following items and check whether you did that item yesterday by circling "Y" for yes and "N" for no.

Yesterday, did you:

- | | | |
|--|---|---|
| Say "I love you" to your partner? | Y | N |
| Kiss your partner? | Y | N |
| Hug your partner? | Y | N |
| Gently touch your partner? | Y | N |
| Sit close to your partner? | Y | N |
| Give a present to your partner? | Y | N |
| Think fondly about your partner? | Y | N |
| Compliment your partner on his
or her appearance? | Y | N |
| Make something for your partner? | Y | N |
| Do a favor for your partner? | Y | N |
| Write a nice note to your partner? | Y | N |
| Share a laugh with your partner? | Y | N |
| Cook a special meal for your partner? | Y | N |

Is there anything else you did yesterday to show your affection for your partner? Y N (Circle one)

If yes, please describe: _____

APPENDIX J

Communication Scale

When you and your partner talk about the surgery and recovery, how much of your communication focuses on the things listed below? For each statement listed below, please circle the number that corresponds to how often the focus of your conversation with your partner is as the statement describes.

Scale:	You focus on this a great deal	You focus on this a moderate amount	You focus on this very little	You focus on this not at all
	1	2	3	4

When you and your partner talk about surgery and recovery, how much of your communication focuses on:

Seeking support and reassurance from one another	1	2	3	4
Giving information to one another	1	2	3	4
Seeking advice about treatment from one another	1	2	3	4
Discussing medical related expenses	1	2	3	4
Organizing things that need to be done	1	2	3	4
Expressing feelings to one another	1	2	3	4
Praying together	1	2	3	4
Asking each other for help	1	2	3	4
Blaming each other	1	2	3	4

APPENDIX K

Coronary Bypass Patient Medical Status Form

Data
Patient's Name _____Current Date _____
Month Day Year

Nurse's Name _____

Date of Birth _____
Month Day Year

Height (inches) _____ Weight _____

SBP at admission _____ DBP at admission _____

Presence of angina (1) Yes (2) No

Ejection Fraction _____%

Diagnosed Hypertension (1) Yes (2) No

Angina Status (NY Classification) (1) Class I (3) Class III
(2) Class II (4) Class IVPre-operative myocardial infarction (1) (2)
Yes NoPre-operative cardiac arrest (1) (2)
Yes NoPre-operative arrhythmias (1) (2)
Yes NoPre-operative valve problems (1) (2)
Yes NoDiagnosed diabetes (1) (2)
Yes NoHistory of stroke (1) (2)
Yes NoHistory of arthritis (1) (2)
Yes NoHistory of cancer (1) (2)
Yes NoNeurological disease/problems (1) (2)
Yes No

Date of surgery	<u> </u> Month	<u> </u> Day	<u> </u> Year
Total surgery time	<u> </u> Hours	<u> </u> Minutes	
Number of grafts <u> </u>	Type of grafts: (1) Vein only (2) IMA (3) Both		
Peri-operative myocardial infarction	(1) Yes	(2) No	
Peri-operative edema	(1) Yes	(2) No	
Peri-operative cerebrovascular accident/stroke	(1) Yes	(2) No	
Hours in SICU	(1) Yes	(2) No	
COMA score at 12 hours <u> </u>			
COMA score at extubation <u> </u>			
Post-operative stroke	(1) Yes	(2) No	
Post-operative respiratory failure	(1) Yes	(2) No	
Post-operative renal failure (requiring dialysis)	(1) Yes	(2) No	
Reoperation	(1) Yes	(2) No	
Date of Discharge	<u> </u> Month	<u> </u> Day	<u> </u> Year
Post-operative edema	(1) Yes	(2) No	
Post-operative incisional infection	(1) Yes	(2) No	
Post-operative heart failure	(1) Yes	(2) No	

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