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AN EVALUATION OF THE MENTAL HEALTH OF PRE- AND POST-OPERATIVE CORONARY ARTERY BYPASS PATIENTS

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**AN EVALUATION OF THE MENTAL HEALTH OF PRE- AND POST-OPERATIVE
CORONARY ARTERY BYPASS PATIENTS**

by

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A thesis submitted to the University of Plymouth in partial
fulfilment for the degree of

DOCTOR OF CLINICAL PSYCHOLOGY

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Faculty of Human Sciences

In collaboration with the United Bristol Healthcare Trust and the
Academic Department of Cardiac Surgery, Bristol Royal Infirmary.

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Abstract

Coronary artery disease and bypass surgery can have a major impact on many aspects of patients' lives. A substantial proportion of cardiac patients experience high levels of psychological morbidity and in many cases, this is not closely related to physical symptoms. From the current evidence it is not yet possible to reliably identify the factors that contribute to the development of patients' poor mental health. In this investigation, a detailed description of patients' social, psychological and medical history was gained both before and after surgery. Having had distressing experiences in the Intensive Care Unit was highly correlated with psychological morbidity six months after surgery. These findings were considered in relation to psychological theories of depression and anxiety in order to better understand the distress experienced by cardiac patients.

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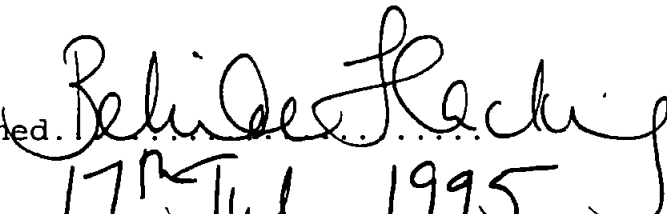
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AUTHOR' DECLARATION

At no time during the registration for the degree of Doctor of Clinical Psychology has the author been registered for any other University award.

The contents of this bound volume are identical to the volume submitted for examination in temporary binding except for the amendments requested at the examination.

This study was conducted while the author was a Trainee Clinical Psychologist in the South West Region based in United Bristol Healthcare Trust and the research was conducted in collaboration with the Academic Department of Cardiac Surgery.

Signed. 
Date... 17th July 1995

An Evaluation of the Mental Health of Pre- and Post-Operative Coronary Artery Bypass Patients

Introduction

Heart bypass surgery is now the most commonly practised cardiac surgical procedure; in 1992, 25,200 coronary artery bypass operations were conducted in the U.K. Yet despite good clinical outcomes for the surgery, a significant proportion of cardiac patients experience high levels of psychological morbidity (Gundle et al., 1980, Bass, 1984, Mayou and Bryant, 1987).

Interventions that have succeeded in reducing patients' psychological distress after surgery have been shown to facilitate physical recovery. This has been demonstrated by less analgesic use (Andrew, 1970), fewer post operative complications (DeLong, 1971, Anderson, 1987) and a shorter period of hospitalisation (Andrew, 1970). Promoting psychosocial recovery after surgery has positive implications for patients' quality of life, and would also prove to be cost effective.

To date, attempts have been made to identify a relationship between poor mental health and a range of clinical and non-clinical factors, although the results of these studies have provided contradictory evidence. From current evidence it is therefore not yet possible to identify reliably the factors that contribute to the development of poor mental health of a significant number of patients following cardiac surgery (Friedland et al 1992).

Much of the research has focused on individual variables yet clinical experience suggests that detailed information is required from patients to obtain a more thorough understanding of the development and maintenance of mental health symptoms that have been found in these patients. This research area is also characterised by a sparse application of psychological theories concerning the development and maintenance of mental health symptoms. There is therefore a need to use this theoretical base

whilst taking into account the specific factors that are relevant to this particular population of patients.

The first section of this review will give a brief account of coronary heart disease, the treatment and the risk factors associated with the development of the disease. The second section will assess critically the literature on the outcome of heart bypass surgery with regard to physical, social and psychological factors. The third section will consider the relationship between psychological distress and physical illness. In the final section, the findings on the outcome of surgery will then be considered in relation to well established psychological theories of depression and anxiety in order to better understand the distress experienced by cardiac surgery patients.

Coronary Heart Disease

Coronary artery disease occurs when the supply of oxygenated blood from the arteries to the myocardial tissue of the heart is restricted. There are several reasons for this. Most commonly, lipids such as cholesterol are deposited as plaques (or atheromata) on the inner walls of arteries, progressively reducing the inner cross-sectional area (lumen). These plaques also 'harden' the arteries, reducing their capacity to distend and allow for increased blood flow when required. This process is known as atherosclerosis.

Whenever the blood supply is insufficient for the level of demand, ischemia occurs, and if the condition is prolonged, the myocardial tissue infarcts, otherwise known as a heart attack. A clot may also form which occludes an artery, which is another cause of a myocardial infarction.

Transient, non-infarcting ischemia, caused by the hardening of the artery walls, is experienced as chest pain (angina) and is usually precipitated by physical exertion. Unstable angina can cause spasms which precipitate a myocardial infarction. Patients with coronary artery disease typically describe other symptoms of

breathlessness and fatigue which, combined with the angina, severely restrict their level of activity.

Treatment

Typically, patients with less severe forms of coronary artery disease undergo medical treatment but, where there is a risk of the heart being damaged irreversibly, cardiac surgery is advised.

Medical Management

Drugs are used to relieve symptoms and prevent heart attacks. Side effects may be experienced. If medical management is not successful and only one artery is occluded, an angioplasty (where a catheter with a balloon at the tip is passed into the narrowed artery and inflated to widen the vessel) may be appropriate.

Surgical Management

Heart bypass surgery was developed in the mid-1960s and it is now the most commonly performed cardiac procedure. In the U.K., the incidence of cardiac artery bypass graft surgery increased by 52% from 1987 to 1992 (Izzat, 1994).

The technique involves making an incision through the sternum to open the chest up and transferring the pumping action of the heart to a heart bypass machine. Several veins are taken from the leg or chest and grafted onto the heart. Patients are told by medical staff of the operative mortality before their coronary heart bypass surgery, which currently averages 1-3% (Izzat, 1994).

Patients usually come into hospital the day before surgery and stay for an average of 10 days. They are kept in the intensive care unit for the first 3 days after the operation and are monitored for complications such as blood clots, abnormal heart rhythms, wound infections or pneumonia. Rehabilitation starts in the low dependency unit which follows on from the intensive care. This involves being given physiotherapy exercises and information as to the expected course of recovery. Counselling to help the patient prepare psychologically for their discharge is not routinely given.

Risk Factors Associated with Heart Disease

Epidemiological studies have demonstrated that there is a strong link between heart disease and such variables as elevated serum cholesterol, hypertension, cigarette smoking and obesity (Shaper, Peacock and Walker 1981). When these factors combine with stress, which is said to mobilise the fatty deposits in the body, the risk of developing heart disease is increased(Eyer,1984, Shaper, Peacock and Walker, 1981). Having a family history of heart disease may be regarded as a risk factor as much as through the lifestyle and diet adopted as through any heritary vulnerability. Any of these factors incur a greater risk of coronary heart disease, a combination of more than one element confers a degree of risk that is more than just additive.

There has been some evidence linking the type A personality (defined as extremes of competitiveness, striving for achievement, aggressive and impatient) as a strong and independant risk factor for coronary heart disease (Rosenman et al. 1975, Friedman et al. 1986). Recent longitudinal studies in post-infarction populations have suggested, however, that Type A Behaviour is not predictive of heart disease (MRFIT Research Group, 1982; Shekelle, Gale and Norusis, 1985).

The contradictory findings may to some extent be explained by the following points. Studies tend to assume that the type A characteristics are stable traits, yet new models suggest that this pattern of behaviour may be transient and changes according to the circumstance (Smith, 1989). Type A behaviour also tends to be erroneously viewed as a unitary construct in many studies, yet it actually represents a constellation of behaviours, some of which may be more closely associated with heart disease than others (Dembroski et al. 1985). The structured interview (Rosenman, 1978), regarded as the most reliable measure of Type A Behaviour, is time consuming to administer and is not always used by approved trainers in an appropriate style, raising concerns about the equivalence of its use in the different studies.

Outcome of Surgery

One of the principal goals of heart bypass surgery is to increase the quality of patients lives, yet considerable difficulties lie in how to define this concept. It may be anticipated that there are large individual differences in how this is construed and measures need therefore to cover broad areas of functioning. In a review by Packa (1989), it was noted that no definition of 'Quality of Life' has been univerally accepted. Patients' quality of life should ideally be considered in light of their age and particular circumstances. Thus, elderly patients may be satisfied that they no longer have such severe angina and accept that they remain less physically able, whereas younger people may well expect that they return to work and fully participate in a family and social life.

In the coronary artery bypass population, quality of life has most frequently been measured by return to work and reduction in angina (King et al. 1992). In this review however, a broader view will be taken, as the outcome of surgery is related to social, sexual, physical and work functioning, marital and family relationships and mental health.

Physical Outcome

Angina is relieved in about 80 to 90% of patients and substantially improved for the remainder, (Treasure 1983,Kilip and Ryan 1985) requiring less anti-anginal medication to be taken. However, patients often find it difficult to distinguish between sternal discomfort due to the surgical procedures and cardiac pain, which may be distressing if the patient attributes such symptoms to the surgery not having been sucessful (Wilson-Barnett, 1981). There is a reported reduction in breathlessness, (Mayou and Bryant, 1987) and an improved exercise capacity (Kilip and Ryan 1985). Post-operatively, the leg or chest wounds from the bypass grafts often cause considerable discomfort and residual pains are common (Mayou and Bryant, 1987).

Neuropsychological Outcome

The research findings into neurological functioning as an outcome of surgery are diverse and contradictory. Many of the studies are confounded by a lack of relevant non-bypass control groups (Mattler et al. 1991) and the use of a variety of measuring instruments makes comparisons across studies difficult (Treasure, 1983). When interpreting test results, many studies are limited by not using age graded population norms (Bornstein, 1985, Lezak, 1987). With such poor designs and lack of long term, detailed follow-up data, the research in this field needs to be examined carefully.

Post Cardiotomy Psychosis

This acute mental disorder tends to occur 2 to 5 days after surgery following a lucid interval and is normally of a limited duration. This condition is characterised by a clouding of consciousness, hallucinations, paranoid ideation, incoherent speech, disturbances of sleep and psychomotor activity and disorientation (DSM IV).

In 1965, Kornfeld, Zimberg and Malm identified this disorder as occurring in as many as 70% of heart surgery patients although, now with technical improvements in surgery, the incidence is greatly reduced (Milano and Kornfeld 1984). A prospective study conducted by Eriksson in 1988 found that 35% of the male patients undergoing coronary artery bypass surgery showed postoperative psychotic symptoms but this was not predictive of difficulties later on in convalescence. Corresponding figures for delirious post-operative states in general hospital surgical patients tended to be lower at 0.02-0.5%, with the exception of cataract operations (Eriksson, 1988).

The following factors have been considered to be potentially distressing for patients in the intensive care unit (Clit and Popa, 1985). Patients are very dependant upon the medical staff at this time and may easily become confused with the number of staff involved in various activities. The technical equipment that patients find themselves attached to on waking up in the intensive care unit may be alarming and the high level of sensory stimulation

(auditory and visual) may disturb their sleep pattern (Harrell and Othmer, 1987). The high work load of staff members may make it difficult to give very much individual attention to the patients who are then unable to make their needs known. Guerra (1980) found that patients experienced post-operative nightmares about surgery or being attacked, yet they were less distressed about the actual recall, due to the blunting effects of the anesthesia than they were by not being able to communicate this distress to those around them.

The evidence tends to suggest that post-operative psychosis is multi-determined and is not only due to organic factors (e.g. microthrombosis, heart lung machine) but also to the effects of these environmental factors (Layne and Yudofsky, 1971). Seeing a patient in this state can be upsetting for relatives and it has been suggested that that families need to be prepared for this possibility and given support by medical staff (Raymond et al. 1984).

Neurological and Cognitive Deficits

One of the indicators used as an index of diffuse cerebral damage following cardiac surgery has been the regional cerebral blood flow (RCBF). Newman et al. (1987) sought to distinguish between the general effects of the surgical procedure and the extracorporeal circulation on patients' cerebral functioning by comparing coronary artery bypass with thoracic surgery patients. There was a drop in the RCBF in the coronary artery bypass group, although this was not sustained at 8 weeks postoperatively. Both the control and bypass groups suffered acute neurological deficits 8 weeks after surgery (46% and 37% respectively) as measured by verbal memory tests. Bypass patients with no neurological deficits at 8 weeks showed a net increase in RCBF levels while those with a deficit showed a drop; this may reflect cortical cell loss. Although a considerable amount of neurological disturbance was found in both groups of patients, the mechanisms underlying these deficits as shown by the RCBF changes and the patterns of neurological improvement over time appear to be different.

Cognitive impairment was studied by Sotaniemi, Mononen and Hokkanen (1986) using psychometric testing. Intellectual impairment was found postoperatively with improvement at one year, although some deficits were still present five years later. This suggests that although postoperative cognitive impairment generally diminishes after one year, it is still a signal of vulnerability.

Since depressed patients tend to emphasise cognitive deficits, the results of this study may well be confounded by not differentiating between affective and cognitive impairment (Newman et al. 1989). In neither of the studies reviewed, was there any working definition of neuropsychological impairment. Individual differences can also be obscured by the majority in the analysis of the test results.

With some patients, neurological and psychological impairments are transient and are not of long term significance, yet with others, such complications are very disabling. The extent to which such deficits affect an individual may depend upon psychosocial factors. The association between poor mental health and deteriorated cognitive functioning needs to be examined further.

Psychosocial Outcome

Social Functioning

Although many patients are less physically restricted after the bypass operation (Llangeluddecke et al. 1989, Jenkins et al. 1983), involvement in leisure and domestic activities does not necessarily increase. Llangeluddecke et al. (1989) found that one quarter of the sample reported a residual impairment in social functioning 12 months after surgery. It seems that many patients are content to be able to perform their usual, undemanding activities more comfortably, and few patients wish to change the pattern of their lives and become more energetic. It has been suggested that on returning home from hospital, patients did not know how to differentiate between normal and abnormal symptoms and therefore were very cautious about what activities they involved themselves

in (Flynn and Frank, 1987). This may account to some extent for the diminished participation in social activities.

Family Functioning

Patients often describe how their families become distressed and over-solicitous before and after heart surgery (Jenkins et al., 1983, Goldschmidt et al. 1984), although the experience of surgery can still bring them closer together (Stanton, 1984). Llangeluddecke et al. (1989) found that 67% of a sample of 99 subjects reported a greater involvement in family activities and only 5% described a decline compared to pre-operative levels.

Marital Relationship

High levels of psychological morbidity have been identified in the spouses of heart bypass patients; in a study by Llangeluddecke et al. (1989) one third of the partners had clinically significant levels of depression and/or anxiety before surgery. Changes in lifestyle brought about by the heart disease were cited as a major cause of the difficulties. A third of spouses were depressed 12 months post-operatively and if the patient was distressed, there was a high probability that the spouses would also be. The incidence of depression was not related to the severity of the patients' disease or the physical outcome of surgery.

In coming to terms with a diagnosis of heart disease, both the patients and their partner need to adjust. Successful coping strategies should not necessarily be viewed as an individual affair to do with the patients' own personality traits, but adaptive behaviour mediated through significant social relationships. A study by Radley and Green (1986) showed how some male patients became very withdrawn after the diagnosis of heart disease. Their wives responded by taking on more work and responsibility, which strained the relationship. Other patients expressed a need to keep as active as possible in order to put the illness out of their mind, yet were forced to withdraw from some of their outside engagements due to the symptoms of the disease. In these circumstances, the husband often became more controlling within the

domestic situation, resulting in the wife's withdrawal. These dynamics made it more difficult for her to intervene to help her husband make appropriate adjustments to his life style.

These studies demonstrate the importance of involving partners in the management of heart disease both before and after surgery. Some cardiac rehabilitation programmes include spouses in the education component to stress management, diet and exercise, although little attention tends to be paid to the emotional work of recovery for both patient and caregiver (Hagen, 1991, Smith, 1992).

Sexual Functioning

For a substantial proportion of patients, the frequency and satisfaction of sexual activity after bypass surgery does not improve (Horgan et al. 1984, Bass, 1984, Kornfeld et al. 1982, Mayou and Bryant, 1987). In a study by Llangeluddecke et al. (1989), 52% of patients found that their sexual activity was impaired pre-operatively, 31% reported continued impairment and dissatisfaction post surgery. Clinically depressed patients are more likely to complain of sexual maladjustment, loss of libido being in itself symptomatic of depression, although this impairment is also widely reported as damaging to self-esteem in the normal patient population (Folks et al, 1988).

Return to Work

Whether an individual is able to return to work has been shown to depend largely upon such factors as social class, age and the type of work. In a study by Gundle et al. (1980), 25 of the 30 patients were unemployed 1 year after surgery; 23 had been employed before surgery. A larger retrospective survey by Zyzanski, Stanton, Jenkins and Klein (1981) found that after a period of 3 years, 90% of 724 bypass patients had no physical disabilities and 71% of those under the age of 61 were in employment. The discrepancy in the findings was attributed to the lower socio-economic sample in the Gundle study and the low skilled work that the patients had previously been employed in.

Bryant and Mayou (1989) found that some patients were forced to do different, less satisfying jobs and were struggling to keep up, while others were glad to be able to pick up their previous role. Of the 61 patients interviewed in the study by Llangeluddecke et al. (1989), 43% reported that their work performance had improved compared to pre-operative levels, yet the majority reported a mild residual impairment 12 months after surgery.

Whether patients are able to return to work has been examined more closely as an outcome of surgery than other measures, although this does not necessarily give a very accurate indication of quality of life. Some patients, especially those near retirement age, may not expect or want to go back to work, while others are very concerned about their job prospects (Zyzanski, Stanton, Jenkins and Klein, 1981).

Mental Health

Retrospective studies from as early as 1972 have found adverse psychosocial outcomes in a significant proportion of heart surgery cases (Frank, Heller and Kornfeld, 1972). In a more recent study by Bryant and Mayou (1989), the incidence of depression and anxiety in patients before the heart bypass surgery was twice that of the the general population; a year after surgery, the number of cases had slightly decreased. High pre- and post-operative levels of depression were also found in a study by Llangeluddecke et al. (1989), psychological morbidity decreased after surgery from a third to a quarter of the sample population. A similar incidence of depression 1 year post operatively was also found by Magni (1987).

Good physical outcomes of surgery are not matched by patients' psychosocial recovery (Bass, 1984, Mayou and Bryant, 1987). Attempts have been made to identify a relationship between poor mental health and a range of non-clinical factors. Some studies have found a relationship between low socioeconomic status and poor social support and an increase in the incidence of depression and anxiety (Gundle et al. 1980, Coomes, Roberts and Crist, 1989, Kos-

Munson et al. 1988.) Psychological factors were also found to be important. Previous psychiatric history, poor coping skills and a diminished perception of personal control were positively correlated with poor mental health (Weiss, Eichhorn and Geissler, 1989, Mayou and Bryant, 1987, Redecker 1992, Friedland et al. 1992).

Many patients are apprehensive prior to surgery; the heart is associated with life and any surgical procedure on this vital organ is viewed with anxiety (Pieper, Lepczyk and Caldwell, 1985). Rakoczy (1977) identified four stages that patients pass through as they wait for heart surgery; confrontation, self-reflection, resolution and countdown. The final stage starts the day before surgery, patients reported feeling vulnerable and powerless as they waited to be seen by the various professionals. Some described reacting to this loss of control by feeling angry, frustrated or depressed (Roberts, 1978).

Not being given enough information about the surgical process may augment patients' fears and also lead them to develop unrealistic expectations of recovery (Keller, 1991). In a study by Ley (1982), 65% of coronary patients were dissatisfied with the level of communication that they had had with doctors. Other studies have cited how patients, by rarely being able to deal with the same doctor for any length of time and having infrequent contact with the consultant in charge of their care, are blocked from being able to form relationships which would facilitate communication (Hauser, 1981). In such circumstances, the behaviour of the medical profession may actually create additional stress for patients.

As the surgical technology improves, patients with poorer heart and medical conditions may now be operated upon. This may require that patients who are more medically stable have their surgery postponed in order to fit in emergency cases. Studies show that patients typically express much anger and disappointment in response to their operation being cancelled. The focus of worry is no longer so much on the surgery, but when it will be performed (Kennedy, 1968,

Johnson and Lauver, 1989, Bresser, Sexton and Foell, 1993). In some cases, this uncertainty manifested itself in an exacerbation of the physical symptoms of heart disease. Such observations highlight how the procedures adhered to in hospitals can be very stressful for patients.

Psychological and social problems are often not recognised by physicians and surgeons and even if they are identified, appropriate treatment is frequently either not available or not provided (Maguire, Tait and Brooke, 1980, Brody, 1980). Eriksson (1990) found that one week after heart bypass surgery, 44% of patients were moderately to severely anxious and 14% were moderately to severely depressed. These levels of psychological morbidity had not been detected by the medical or nursing staff. It seems that hospital doctors and nurses are not well trained in the detection and management of psychological distress in patients.

Comment

Although there is general agreement in the studies that patients are pleased with the outcome of surgery, there is a wide range of individual response (Ramshaw and Stanley 1981, Jenkins et al. 1983, Llangeluddecke et al. 1989). Particular areas of dissatisfaction appear to be to do with sexual functioning and work status.

The emphasis given in many of the studies to the broad improvements with the majority of patients masks the experience of those who perceive that their quality of life has deteriorated or remained poor since the heart surgery. In each aspect of functioning, there are about 5 to 20% who report changes for the worse (Gundle et al. 1980, Ramshaw and Stanley 1981, Llangeluddecke et al. 1989.) Bryant and Mayou (1989) examined the global outcome by collating the improvements or deterioration in each of the major areas of functioning; they found that 25% of patients had an excellent outcome and were very satisfied, 30% had a generally good outcome, 30% less than satisfactory and the remaining 15% reported to be considerably worse than before the operation.

There has been relatively little comment on those patients who consider that the quality of their lives has not been improved by surgery. Ratings of satisfaction have not been found to be related to reduction in physical symptoms like angina, but are more closely associated with patients depressed mental state, atypical chest pain and reports of feeling limited (Jenkins et al. 1983, Stanton et al. 1984, Bass 1984, Horgan et al. 1984, Mayou and Bryant, 1987.)

Current findings only partly account for the high incidence of psychological morbidity. Certain psychosocial factors, such as low socio-economic status, that have been associated with poor mental health in cardiac patients are also relevant to the development of depression in other populations (Brown and Harris, 1978). It has been noted that some patients' psychological morbidity is long standing and may not be related to the cardiac condition as such. Friedland et al. (1992) identified that there were important differences between the patients who had a prior history of depression and those who were experiencing their first depressive episode since the diagnosis of coronary heart disease. Patients with a prior history tended to be more severely depressed, were more likely to report feeling like a failure and tended to have a less serious heart condition than those patients who were experiencing their first episode of depression.

On closer examination of the studies, certain methodological and conceptual problems may be identified. Many of the measures used in the studies are of doubtful validity and much emphasis has often been placed on self-report questionnaires instead of assessment interviews. Reliance on questionnaires as the only means of data collection is likely to underestimate the actual levels of distress as patients often deny the impact of the illness as a way of coping (Nichols and Springford, 1984, Stanton et al. 1984). The design of many studies is furthermore limited by being retrospective and having no control groups.

In a study by Coomes, Roberts and Crist (1989), 75 patients were

assessed for social support using self-report questionnaires on four occasions following surgery. Social support was then correlated with the patients mental health status as measured by a self-report depression scale. Yet, the nature of depression means that patients are likely to undervalue the support that they receive and assessments only after surgery do not allow any comparisons to be made with the pre-operative state. There was also little comment as to the mechanisms by which social support may influence the process of recovery and whether such support could be partially responsible for an improvement of physical and/or mental health. No control group was included in the study by which the impact of social support could be compared with other medical patients, nor was there any account of how the dynamics of social support may change over time.

Although some of these shortcomings were addressed in a study by Fontana, Kerns, Rosenberg and Colonese (1989), the specific behavioural manifestations of intimacy in support giving and how these were communicated to the patient were not considered. This highlights the importance of clearly defining how variables are to be measured and for the patients' own attributions of events to be sought.

The scope of the enquiry is also often too narrow with a predefined variable being focused upon; this provides only sparse details of the patient characteristics. Inferences have been made about the quality of the patients' lives based solely on whether they have returned to work and without reference to their own views of the situation (Misra et al. 1985). Although some studies have interviewed patients and gathered more information (Mayou and Bryant 1987), they fail to refer to psychological theories that would provide a context within which the impact of the different factors could be assessed. In a study by Bass (1984), psychiatric outcome was related to certain prescribed variables; neuroticism, social maladjustment, Type A personality and previous psychiatric history. However, by not conducting a more exploratory approach with in depth assessment interviews, the extent to which such

studies can inform clinical practise is limited.

The Relationship Between Physical Illness and Psychological Distress

It has been shown in the literature that a significant proportion of physically ill patients are psychologically distressed (Gundle et al. 1984, Mayou and Bryant, 1987). Of the studies that have been reviewed so far, some have indicated that it is the direct experience of being ill that is responsible for this distress, others have cited the organisation and management of care as playing a role in this process. In this section, it will be argued that psychological distress has a negative effect on recovery from illness.

In a large scale prospective study by Querido (1959), 1630 patients were assessed in terms of their physical, social and psychological status on admission to hospital. Six months after discharge, each patient's medical condition was re-assessed as being either satisfactory or unsatisfactory. The majority (70.4%) of those whose medical condition had not improved were psychologically disturbed. Although it is difficult to establish the direction of causation in this association, Querido stated, 'It is plain that such a mental attitude on the part of the patient reduces the efficiency of the hospital staff by almost a half.'

Other studies suggest that a reduction in psychological distress prior to or after surgery enhances patients' physical recovery. Explaining carefully to patients about the surgery, what to expect during the post-operative period and how to practise relaxation techniques post surgery has been shown to result in reduced use of analgesia and shorter hospital stays (Egbert et al. 1964). Anderson (1987) found that careful preparation with information alone was enough to reduce patients' distress post-operatively, enhance their physical recovery and reduce the incidence of post-

operative hypertension. Although some patients when asked have described the level of preparation before surgery as being generally satisfactory, Stanton et al. (1984) note that even those who believed they had been given enough information experienced fears during rehabilitation. It seems that few standardised hospital programmes can provide all the information required before surgery and additional encouragement and support is often needed post-operatively.

Evidence suggests that people who are emotionally disturbed visit their GP's more frequently with somaticised complaints than others in the general population (Tessler, Mechanic and Diamond, 1976). Similarly, cardiologists conduct physical investigations for complaints that are psychogenic in origin. Conversely, people who are depressed and anxious experience a greater degree of pain and have less adaptive behaviour than the non-psychiatric population (Bond, 1980). Such findings indicate that in some cases, appropriate psychological care may reduce the demand for extensive medical investigations (Schlesinger, Mumford and Glass, 1983).

On the basis of the studies reviewed, the following points may be drawn. Recovery from illness and surgery is affected by the patients' psychological morbidity. Good preparation for surgery with coping techniques and detailed information can enhance physical recovery. There is a positive correlation between the extent to which medical services are used and patients' poor mental health. It may therefore be anticipated that if distressed patients were accurately identified before the heart bypass surgery and given appropriate treatment, their physical recovery would be enhanced and their subsequent use of medical services would be reduced.

Understanding the Impact of Coronary Heart Disease and Bypass Surgery on the Patient

Research findings in this area have not yet fully accounted for the development or maintenance of the depressive symptomology in heart bypass patients. Some of the factors that have been identified have included such variables as loss of employment or low social support. It is now increasingly clear from clinical reports that the extent of the problem cannot be fully accounted for merely in these simplistic terms. There is a need to apply a theoretical framework from psychological theories of depression and anxiety to findings from both clinical evidence and empirical research evidence.

After diagnosis of a chronic condition such as coronary heart disease, it is normal for patients to go through a period of disequilibrium (Moos,1977). The experience of anxiety and depression in such circumstances is not unusual and may even be adaptive. However, taken to the extreme, very poor mental health can impede adjustment. The following section examines the common emotional responses to coronary heart disease and bypass surgery and with reference to psychological theories, and suggests what the contributing factors to this distress may be.

It is to be anticipated that patients prior to bypass surgery should experience high levels of anxiety. Some patients waiting for heart bypass surgery may identify the experience of pain in the intensive care unit as being the situation that they most associate with fear, for others it may be the uncertainty of the surgical outcome. Although these may be unpleasant feelings for the patient, it may be part of the adaptive process to help the person deal with the perceived threat. For instance, the anxiety may stimulate the patient to find out more about coronary heart disease and prompt him to develop a more healthy lifestyle. In what has been called the, 'work of worrying,' the patient prepares himself for surgery by rehearsing the possible outcomes.

Some patients may react to their high states of anxiety by denying that they have an illness and merely avoiding any pursuits that are likely to exacerbate their physical symptomatology. Denial may serve a protective function. Havik and Maeland (1990) found that in the short term those patients who showed high levels of denial after myocardial infarction suffered from less emotional disturbance. However, in the long term, it is associated with a poorer prognosis as patients fail to develop appropriate coping skills (Janis and Levathal, 1965).

In order to feel less vulnerable, many patients seek 'blanket reassurance' from medical staff and selectively retain optimistic remarks that minimise the perceived danger (Janis, 1962). This may generate a child like dependency upon the medical authorities as the doctor is placed in an elevated position and patients abdicate their responsibility for the management of their own health (Wright, 1960). However, by adopting such a passive position, patients do not develop their own resources to cope if the operation is not successful or if their expectations of recovery are not met.

Cognitive appraisals influence the experience of anxiety. The person interprets situations in threatening manner according to a particular belief which exacerbates the anxiety, this produces symptoms to which the client reacts with more anxiety (Mathews and Macleod, 1986). In the case of a patient with coronary heart disease, he may believe that every angina attack could be the precursor for a myocardial infarction. Consequently, the experience of any chest pain creates high levels of anxiety due to the severe threat that this represents. Such an anxious individual may therefore become acutely sensitive to any chest pain and relate all such physical complaints inappropriately to the heart condition (Langosch, 1984).

For many patients, it is the sense of uncertainty over the outcome that causes much distress. According to the reformulated version of the learned helplessness theory, if a person is helpless, he

asks why and makes causal attributions as to the stability, globality and universality of his condition (Abramson, Seligman and Teasdale, 1978). If the patient believes that he has no personal control over the disease, that the changes in his life brought about by the disease are permanent and that surgery has a poor prognosis, he is at a high risk of becoming depressed. As was described in an earlier section, the way care is managed in hospitals may exacerbate such feelings of helplessness.

In a study by Anderson (1987), information about the surgery only reduced distress if it increased perceptions of personal control. Greater perceived personal control over recovery was also associated with a shorter hospital stay (Anderson, 1987). Some information, such as the cutting open of the sternum not being associated with very much post-operative pain, served to counter misconceptions, but this alone did not reduce the experience of generalised anxiety. As predicted by Lazarus' theory (1966), it appears that distress about a threatening event is determined primarily by perceived control over the event and not per se by how much information the person has received. These findings illustrate the importance of encouraging patients to take an active part in their rehabilitation and assume some responsibility for their health.

Some studies describe how the heart surgery may well alleviate physical symptoms and improve the health-related quality of life, yet the patient retains a sense of vulnerability (Eriksson, 1990). In terms of Maslow's hierarchy (1967), the lower level survival needs have been met, but the chronic, life threatening aspect of coronary heart disease may disrupt the higher order needs such as safety, self-esteem and self-actualisation. The threat to safety is compounded by the knowledge that it is not possible to directly monitor the disease process by visual or tactile inspection, indirect measurement of factors such as cholesterol levels only indicates whether the arteriosclerosis is progressing. Uncertainty therefore remains, this is described in the following extract by a patient who had two heart bypass operations within 11 months;

'The most profound change resulted not so much from the actual surgical procedures as from my realisation that serious underlying heart disease was still present- only temporarily bypassed. The fear of dying never really goes away. Even now (4 years later), any unusual pain or any day when I just don't feel well triggers that fear.' (Walker, 1986).

Such fears were echoed in another study by Mayou and Bryant (1987). One patient commented that,

' The quality of life has been spoilt by the constant fear of death.'

Heart disease and its treatment can have a major impact on many aspects of a patients life. Not only is there the threat of the illness itself to contend with, but the patient may not be able to continue employment, social activities may be curtailed and he may no longer be able to sustain the same level of sexual activity. Grief is a normal reaction that occurs in reponse to the experience of any major loss. The reaction is likely to be particularly intense if the patient has invested a lot of their self esteem in what has been lost (Janis and Levanthal, 1965). For instance, if the patient associates much of his worth in his role as a business man and that is taken away, he may go through a period of grieving for what is lost. Yet in so doing, the bond of this attachment is weakened, and he is able to move on to a new object of attachment.

Rachman (1980) refers to a similar mechanism, known as, 'emotional processing.' He observes that whenever a person undergoes a traumatic experience, the event frequently intrudes upon his thought processes and the associated emotions are relived. However, in the process of time, the event no longer evokes the same emotional reponse, and eventually the processing comes to a completion. Grief may therefore have an adaptive function, yet in some circumstances the process of adjustment becomes blocked and the patient experiences an abnormal reaction. As to why this should happen varies very much according to the individual. It may be that their previous experiences have sensitised them to certain experiences of loss, which amplifies their emotional response to

the loss associated with the heart disease. In such cases, the patient needs be guided through the process of mourning in order to come to a resolution.

Cardiac patients can become tired, breathless and have chest pains if they exert themselves too much. This often means that they may no longer do what they used to enjoy. Clinical experience indicates that the inactivity that results from the heart condition is a source of great frustration for patients. According to Ferster's operant model (1974), this gives the cardiac patient fewer opportunities for positive reinforcement as fewer activities are engaged in. However, if these activities have been intermittently reinforced, they may be more robust to extinction effects.

The second tenet of Ferster's model is the issue of passivity. When faced with an aversive event such as angina, the cardiac patient's most adaptive response is to be passive, so as to abate the chest pains, this reaction is therefore negatively reinforced. Passivity can encourage the patient to develop the, 'sick role,' as others take on responsibility for him. A patient is prone to develop depression if he already has a limited repertoire of behaviours and is reticent to get involved in alternative pursuits for fear of the aversive consequences (like angina) of doing so. Even if the operation has a successful outcome, the patient may have learnt to associate being active with the feeling of pain; he therefore remains passive. Family members may continue to treat the patient as 'sick' after the operation, being worried that cardiac symptoms will return (Brown and Rawlingson, 1979). The patient may therefore accrue some secondary gain by his passivity.

Ferster's model may be particularly applicable to the retired population who have coronary heart disease. Nickel, Brown and Smith (1990) found that patients over 65 were significantly less likely to be depressed and anxious, and have less heart associated disability. Retired patients may already have developed a broader repertoire of behaviour following their adjustment from working

life and place less emphasis on energetic pursuits that are constrained by the heart disease.

This model explains how passivity can be an adaptive response to heart disease, but how rigidity and withdrawal from positive reinforcement can result in depression. It also indicates how depression is maintained when patients become more active after the operation.

There is much individual variation in how people respond to the diagnosis of coronary artery disease and surgery, many make excellent progress and do not need any more services to be provided. However, a significant proportion of patients do not have a good psychosocial outcome after surgery. By gaining a fuller understanding of what is experienced as distressing for these patients, it is hoped that clinical services would be better able to identify how to meet patient's needs. The evidence suggests that the benefits of surgery would be enhanced if services were provided for the early identification of patients' distress. The effectiveness of preparation for surgery and rehabilitation would also be greatly increased if it was tailored to suit the patients' needs.

Conclusion

Heart disease and its treatment can have a major impact on many aspects of a patient's life. This has been described as an inability to fulfil economic, social and sexual roles which a patient may have considerable difficulty in adjusting to. It has been suggested that patients' impaired ability to maintain these activities due to the disease, combined with fears about the experience and effects of surgery, greatly contribute towards psychological distress. Expectations as to the level of functioning after surgery are not always realised, some patients report changes for the worse (Bryant and Mayou, 1989). Cardiac patients experience high levels of psychological morbidity which are often

independent of clinical outcome (Bass, 1984, Gundle et al. 1980).

The extent to which the research can be used to fully understand the poor mental health of these cardiac patients is limited. Current studies tend to focus on specific aspects of a patients experience and fail to take account of a more detailed history. Much of the research to date has also been confounded by the use of unreliable measures and diverse definitions of terms such as, 'neuropsychological impairment.'

Psychological theories of depression and anxiety were applied to the findings from both empirical research and clinical evidence in order to better account for the development and maintenance of depressive symptomatology in heart bypass patients. This provided a context in which the psychological effects of different symptoms, like physical disability, could be examined.

The pressing need is to investigate cardiac patients more thoroughly from a wider theoretical base which will incorporate research evidence from mental health combined with the most recent findings from the research. This study aims to assess patients with regard to social, medical, psychological and personal factors in both the pre- and post-operative periods.

Hypotheses

As described before, patients who reach threshold levels on the GHQ (30) will be categorised as being psychologically distressed. These patients will be expected to report in the semi-structured interviews pre- and post-operatively that they have suffered from a greater degree of disturbance in their lives subsequent to the diagnosis of heart disease and surgery than those participants who are not distressed. The variables identified in the hypotheses have been associated with psychosocial functioning as shown by the literature reviewed in the introduction.

1. Patients who are classed as being psychologically distressed in the pre-operative period will have significantly higher scores compared to the non-distressed group on the following variables as identified in the cardiac questionnaire:

Need of social support

Problems or anxieties about employment

Severe physical symptoms

Less engagement in pastimes

Worry associated with surgery and hospitalisation.

2. Distressed patients, as measured by above threshold scores on the GHQ, will score at significantly higher levels on the cardiac questionnaire both pre- and post-operatively than the non-depressed group.

3. There will be a significant positive correlation between the mental health state of patients pre- and post-operatively as demonstrated by their scores on the GHQ and HAD.

4. Patients who are classed as being psychologically distressed in the post-operative period will have significantly higher scores compared to the non-distressed group on the following variables as identified in the cardiac questionnaire:

Distressing memories of the intensive care unit

Need of social support

Problems and anxieties about employment
Severe physical symptoms
Less engagement in pastimes
Less well prepared for discharge
Poorer physical recovery than expected.

Post-Hoc Hypotheses

After having completed the data collection, it was evident that the addition of three further hypotheses would make a valuable contribution to the analysis. Path analysis will be used in hypothesis 7 to examine the relationships between the variables with the aim of providing quantitative estimates of the causal connections between them.

5. Factor analysis of the pre-operative cardiac questionnaire will reveal the following orthogonal dimensions;

Social support
Employment
Activity levels
Physical symptoms of heart disease
Mental health.

6. Factor analysis of the 6 week post-operative cardiac questionnaire will reveal the following orthogonal dimensions:

Experiences of hospitalisation
Experience of pain
Mental health
Subjective cognitive impairment.

7. The following variables, identified in the pre- and post-operative cardiac questionnaires, will be predictive of psychological distress;

Severe symptomatology
Problems or anxieties about employment
Need of social support
Less engagement in pastimes
Distress associated with surgery and hospitalisation.

Method

Introduction

This research was designed to study the psychological effects of heart bypass surgery and its surgical treatment on the mental health of patients. Patients were interviewed the day before surgery, at 6 weeks and 6 months post-operatively. There was no control group.

Participants

The participants were selected from the South West Regional Centre of heart surgery at the Bristol Royal Infirmary. Criteria for inclusion in the study were strict so that all patients had reasonably similar experiences of heart disease. Only patients who were undergoing coronary artery bypass grafting were asked to participate in the study. Redo grafting operations were excluded. Patients were taken from both emergency and waiting lists.

Approximately 10 cases of heart surgery are performed every week in the Bristol Royal Infirmary. Patients were recruited from any one of the 5 consultant surgeons who operate in the unit, with their full permission. It was not feasible to select only patients from one or two particular surgeons due to the requirement to recruit a certain number of participants in a limited period of time.

All patients were invited to participate in the study on the day before surgery when they were admitted to the ward as this was the first opportunity the researchers had of meeting the patients. It was recognised that all patients were likely to be distressed at this time and that the scores in the questionnaires may not therefore have been representative of their state in the preceding month. To offset this slightly, the researchers reminded patients that the questions referred to their mood over the last few weeks. Given that all patients were seen on the day before surgery, it may be expected that the responses made would be consistently elevated.

It was recognised that there would be a trade-off between the number of participants in the study and the detail of examination

with each. When developing a design for this thesis, it was recognised that a minimum of 40 participants would be required, 20 of whom would have scored pre-operatively at above threshold levels of the GHQ. It was anticipated that there would be a drop out rate with some patients electing not to continue with the study. Also, with a mortality rate of between 1 to 3%(Izzat, 1994), some patients would not survive. Any less than 40 subjects would not be a large enough sample size to identify significant relationships between the different variables.

It was estimated that each participant required approximately 1 hour for the semi-structured interview and to complete the 3 questionnaires, once before surgery and twice afterwards. With each participant therefore requiring approximately 3 hours, the maximum number of participants selected was set at 60, with the expectation that 180 hours of interviews would be the upper limit possible for the researcher.

Another factor limiting the number of participants in the study related to further practicalities involved in the longitudinal design of the research. Although the patients could be seen pre-operatively and at 6 weeks at the Bristol Royal Infirmary, the follow up sessions at 6 months required that domestic visits be arranged. Given that the South West Region stretches from Gloucestershire in the North to Cornwall in the South, this was inevitably difficult and time absorbing.

No control group was selected for this study. This was because the study was specifically designed to investigate the mental health status of coronary heart bypass patients, and was not meant to be a comparison with other surgical patients.

Pre-operatively, 54 patients were interviewed, 22 of whom scored at above threshold levels of the GHQ. At the first post-operative interview, 49 patients remained in the study, 2 patients having decided to drop out of the research and 3 patients having died. At 6 months, 34 patients were interviewed which represents a re-uptake

level of 69%.

Pre-operatively, the sample comprised 49 male and 5 female participants. At the 6 week post-operative stage, 45 male participants remained and 4 female, at 6 months 31 male and 3 female.

Procedure

Patients who fulfilled the criteria for inclusion in the study were identified using the surgical register. Patients who were approached to participate in the study were given an information sheet about the purpose and longitudinal nature of the research (see appendix 1). They were also assured that their treatment would not in any way be affected if they chose not to be involved. Participants were interviewed beside their bedside and then asked to complete the questionnaires.

Before the routine appointment at 6 weeks post surgery, patients were sent a letter reminding them of the research interview. The interview was carried out in the outpatient clinic. After having completed the questionnaires, patients were given a stamped addressed envelope and asked to complete a second cardiac questionnaire 4 days afterwards.

At the 6 month follow up, patients were sent another letter inviting them to participate in the study again. Interviews were carried out at the patients' homes where they were asked to complete the same set of questionnaires as at the 6 week meeting.

Patient Assessment

Patients were interviewed using the General Health Questionnaire (GHQ 30, Goldberg, 1972), the Hospital and Anxiety Depression Scale (HAD) (Snaith, Bridges and Hamilton, 1976) and the Cardiac Questionnaire developed by Belinda Hacking at the University Department of Cardiac Surgery.

General Health Questionnaire (GHQ 30)

The GHQ is used to identify psychiatric illness and distress (Goldberg, 1972). Factor analysis indicates that anxiety, depression and somatic symptoms underlie the measurement of distress (Goldberg and Hillier, 1979).

There are several versions of this questionnaire which are designed for different populations such as those with physical illness and those thought to be psychologically distressed. This study used the 30 item version of the questionnaire as this is the most appropriate form to measure psychological distress (Goldberg, 1972). Of the shortened versions of the questionnaire, the GHQ (30) has been extensively validated and is used widely in primary care and medical outpatient settings (Goldberg, Rickels, Downing and Hesbacher, 1976, Harding, 1976, Mann, 1977, Tarnopolosky et al., 1978). In the shortening of this version from the GHQ(60), items that had been found to be scored very highly with patients who had an 'entirely physical illness' were excluded (Goldberg and Blackwell, 1970).

As the GHQ refers to the patients' current mental health state, it is sensitive to changes over time, and as such is well placed for use in longitudinal research. Studies have shown that questionnaire scores accurately reflect changes in the clinical severity of patients symptoms over time (Goldberg and Blackwell, 1970). It has been noted that the GHQ questionnaire seems to be most accurate when it is administered in a medical setting (Goldberg and Hillier 1979).

The reliability of the General Health Questionnaire (30) has been extensively assessed using split-half and test-retest reliability methods. Split-half reliability was found to be .95 (using alpha reliability coefficients) (Goldberg, 1978). Test-retest reliability was found to range from .75 to .90 (ibid).

The GHQ has been evaluated using three forms of validity; content, construct and criterion. For these types of validity, the research

has demonstrated that the questionnaire reaches very high levels of significance (e.g. Goldberg, 1972, Tennant, 1977). Studies have assessed the concurrent validity by comparing the GHQ (30) with independent clinical assessment (clinical interview schedule) in medical and primary care populations (Maguire, Julier, Hawton, Bancroft, 1974, Sims and Salmon, 1975, Harding, 1976, Tarnopolosky et al. 1978,). Goldberg, Rickels, Downing and Hesbacher (1976) found that of the 224 interviews conducted in a primary care population, there was a 82.3%% level of sensitivity and 81.7% level of specificity using a threshold score of 3/4.

The GHQ (30) was used in this study to classify those patients who had psychiatric disturbance. Although the Leeds Hospital and Anxiety Scale (HAD) is commonly used in hospital settings, the GHQ was chosen in this study for the following reasons. It is a better instrument for detecting psychological distress and has high levels of validity and reliability, as shown by the above studies. It has also been validated for use with medical patients (Harding, 1976, Mann, 1977). The total cardiac scores, both pre- and post-operativley, also correlated more highly with GHQ scores than the HAD scores. A correlation matrix of the GHQ, HAD and cardiac questionnaire scores is shown in Table 2:1 below.

	Pre-Operative Cardiac Questionnaire	6 week Post- Operative Questionnaire	6 month Post- Operative Questionnaire
GHQ	.6945 (n=54)	.8497 (n=49)	.7969 (n=34)
HAD (A)	.6905 (n=54)	.6549 (n=49)	.6020 (n=34)
HAD (D)	.6425 (n=54)	.7949 (n=49)	.6963 (n=34)

Table 2:1.1 Correlations Between Cardiac Questionnaire, GHQ and HAD

Leeds Hospital Anxiety and Depression Scale (HAD)

This questionnaire was designed to provide a screening device for both anxiety and depression in a general hospital setting. The scale items have been selected to be relatively unaffected by concurrent physical illness.

There has been shown to be a high internal consistency in the two subscales of the HAD as demonstrated by factor analysis (Moorey, Greer and Watson, 1991). Part-total correlations have also demonstrated high internal consistency (Jack, Walker and Morley, 1991).

The scale has also been shown to have high levels of both content and construct validity (Zigmond and Snaith, 1983).

The Cardiac Questionnaire

This questionnaire was designed by Belinda Hacking at the University Department of Cardiac Surgery, University of Bristol. There are two versions, one pre-operative and the other post-operative. Both are presented in four sections (see appendix 3).

In the pre-operative questionnaire, the first section covers the physical symptoms and also the degree to which these symptoms affect the patients lives. The second section investigates the level to which the heart disease affects the patients social functioning and employment. The third section assesses the psychological impact of the heart disease on the patient's mental health. The fourth section assesses the psychological impact of the hospital procedures. The post-operative questionnaire differs in the first section, in that it investigates the patients' experiences in the intensive care unit, but otherwise it retains the same format.

Construction of Cardiac Questionnaire

Before constructing both the pre and post operative questionnaires, pilot studies were conducted. Twelve patients were interviewed about the effects of the heart disease and surgery to establish

what were the prominent features of their experiences. The questionnaire was constructed with reference to the information related in the pilot study and the relevant literature. For each question there were 4 responses which were based on increasing severity of symptoms; high scores therefore denoted a greater severity of symptomatology.

Due to constraints of time, reliability and validity testing was not conducted upon the responses of a different sample population, but on the responses of the participants involved in the study. This compromise was made only after it was established that the questionnaire was based upon well established psychological theories and was representative of the patient's reports in the pilot study.

Validity of the Cardiac Questionnaire

The face validity of the questionnaire was established after consultation with 3 senior clinical psychologists. Minor amendments to the phrasing of the questions were made as a result of the suggestions made.

Cross validation checks were conducted with the mental health section of the cardiac questionnaire and the GHQ and HAD using Pearson correlations. There was a association of 0.728 ($p < 0.05$) between the mental health section of the pre-operative cardiac questionnaire and the GHQ total score and correlations of 0.820 and 0.770 ($p < 0.05$) comparing the same section to the HAD(A) and HAD(D) respectively. With the post-operative questionnaire, there was a correlation of 0.815 ($p < 0.05$) between the mental health section and the GHQ, and 0.337 and 0.766 ($p < 0.05$) on comparing this section to the HAD(A) and HAD(D). This suggests that the cardiac questionnaire has similar levels of sensitivity to mental health state compared with other standardised questionnaires.

After a sample of participants had been interviewed ($n=15$), the experimenter completed the pre-operative questionnaire for the participant without having seen the responses given by the patient

himself. A Pearsons test showed a high correlation of 0.83 ($p < 0.05$) between the participants responses and ratings given by the researcher. Given that the semi-structured interviews were used in the analysis of the results, it was important to establish that there was a high consistency between what was reported in the interviews and what was scored in the questionnaire.

Internal Consistency and Reliability of the Cardiac Questionnaire
The internal consistency of the cardiac questionnaire was assessed using split-half tests. For the pre-operative questionnaire, the alpha reliability coefficient was found to be 0.84 and 0.88 for the post-operative questionnaire.

Test retest reliability could not be established in the pre-operative questionnaire given that it was completed the day before surgery. This reliability test was calculated in the post operative cardiac questionnaire, patients completed a second questionnaire four days after the first post operative interview ($n=22$). A Pearsons correlation of 0.867 ($p < 0.05$) was obtained suggesting that, within the time frame considered here, scores on the cardiac questionnaire are stable.

Semi-structured Interview

The semi-structured interviews were designed to provide details of relevant information relating to the psychological, social and physical effects of coronary heart disease and its surgical treatment. The interview schedule was designed to impose a structure so that the researcher could prompt the participant as required and discreetly return the subject to the relevant issue if their responses moved onto different areas (see appendix 2). The first interview also gathered information about the patients demographic details, premorbid social, medical and family history. The post-operative interviews assessed the patients perceptions of their experiences in hospital and current social, physical and mental health status.

An assistant conducted some of the pre-operative and six week post-

operative interviews. In order to train the assistant to conduct thorough interviews in a manner consistent with the researcher, the assistant observed the researcher carry out a series of interviews. The researcher was present when the assistant conducted the first three interviews and rated the performance as being highly satisfactory. To ensure that the interview styles continued to be consistent, the researcher would observe the assistant's interviews on a random basis and carefully study all interview notes. The consistency with which the interviews were carried out remained high.

Method of Analysis

The General Health Questionnaire

The General Health Questionnaire was scored using the Likert Scale which allocates 0,1,2 or 3 to the response choices. This method was selected as it is thought to be the most sensitive in assessing the intensity of symptomatology and change in psychological functioning in non-chronic conditions (Goldberg, 1972). Using the simple Likert scoring method, the cutting score that gives the best discrimination between psychiatric cases and 'normal' cases is 39/40 (Goldberg, 1972).

The Hospital Anxiety and Depression Scale

The HAD provides separate measures of the two constructs, anxiety and depression. For each measure, a score below 8 is in the normal range, 8-10 is borderline and above indicates significant psychological disturbance.

The Cardiac Questionnaire

The cardiac questionnaire was scored using a Likert scale which allocates 0,1,2 or 3 to the response choices. Studies conducted on the GHQ scoring methods have shown that this technique gives a measure of both the number of symptoms and the intensity (Goldberg, 1972). It has been shown to be the most sensitive scale for measuring the severity of symptoms and change over time.

The Semi Structured Interview

The themes that consistently emerged in the interviews were identified. The researcher defined these themes and numbered the patients' transcripts so that the anonymity of the notes could be maintained. Two independent raters read 12 pre-operative interviews each, having had two trial runs with the researcher, and noted down, using the patient's code, whether there was any evidence of the defined themes. The percentage agreement between the independant raters and the researcher was then calculated. This process was repeated for both sets of post-operative interviews. The percentage of interviews that were analysed by the independant raters at each of the three stages and the overall results of these reliability tests are given in Table 2:2 below;

Pre/post operative	% of total analysed by raters	% agreement between raters and researcher
Pre-operative	44%	91%
6 weeks post-op	41%	88%
6 months post-op	48%	79%

Table 2:2 The reliability ratings of semi-structured interviews

3. RESULTS

The results will be presented in three sections;

(1) Descriptive Data

(2) Quantitative Data

(3) Qualitative Data

The hypotheses will be analysed using the SPSS.PC statistics package.

3:1 Descriptive Data

In the pre-operative sample, there were 54 participants. In the first post-operative interviews 6 weeks after surgery, 49 participants remained in the study. At the interview 6 months after surgery, 34 participants elected to continue in the project. Table 3:1.1 shows the numbers of participants in the study and categorises them according to whether they scored above or below threshold on the GHQ.

	>39 GHQ	<39 GHQ	Total
Pre-Operative	22	32	54
6 wks post-op	8	41	49
6mths post-op	6	28	34

Table 3:1.1 Numbers in Categories of Participants

Attrition rates were either due to death or not wanting to continue in the study. The total number of withdrawals is set out in Table 3:1.2 below.

	Deceased	Withdrawals	Total Attrition
Pre-Op	0	0	0
6 wks post-op	3	2	5
6mths post-op	2	13	15

Table 3:1.2 Level of Attrition

Neither of the participants who withdrew from the study at 6 weeks after surgery had been diagnosed as distressed before surgery. Of those who withdrew at 6 months, 3 had had high levels of psychological morbidity at the 6 week stage.

Table 3:1.3 shows the age distribution of the groups of participants before and after surgery. The groups are classified according to above or below threshold scores on the GHQ.

	GHQ score	Number	Mean Age	SD	Range
Pre-Op	>39	22	61	7.79	41-78
	<39	32	64.5	7.45	49-78
6 Wks	>39	8	65	3.81	60-70
Post-Op	<39	41	64	7.37	49-78
6 Mths	>39	6	62.5	4.37	58-70
Post-Op	<39	28	65	7.35	50-70

Table 3:1.3 To show the age distribution of the participants in the groups before and after surgery

Table 3:1.4 shows the gender composition of the groups before and after surgery.

	GHQ Score	Male	Female	Total
Pre-Op	>39	20	2	22
	<39	29	3	32
6 Wks	>39	7	1	8
Post-Op	<39	38	3	41
6 Mths	>39	5	1	6
Post-Op	<39	26	2	28

Table 3:1.4 To Show the Gender Composition of the Pre- and Post-Operative Groups

Tables 3:1.5 to 3:1.7 show the distribution of above and below threshold GHQ and HAD scores in the pre-operative sample.

GHQ score	Number	Mean	SD	Range
>39 GHQ	22	52	10.05	39-78
<39 GHQ	32	26	6.48	12-38

Table 3:1.5 To show the Means and Standard Deviations of above and below Threshold GHQ Scores in the Pre-Operative Sample

HAD (A)	Number	Mean	SD	Range
>11 HAD (A)	17	14	1.66	12-17
<11 HAD (A)	37	5	2.46	0-10

Table 3:1.6 To show the Means and Standard Deviations of above and below Threshold HAD Scores for Anxiety in the Pre-Operative Sample

HAD (D)	Number	Mean	SD	Range
>11 HAD (D)	6	13	1.03	12-15
<11 HAD (D)	48	5	2.58	0-10

Table 3:1.7 To show the Means and Standard Deviations of above and below HAD scores for Depression in the Pre-Operative Sample

Tables 3:1.8 to 3:1.10 show the distribution of above threshold GHQ and HAD scores in the 6 week post-operative sample.

GHQ score	Number	Mean	SD	Range
>39 GHQ	8	50	12.44	39-78
<39 GHQ	41	21	7.5	4-36

Table 3:1.8 To show the Means and Standard Deviations of above and below Threshold GHQ Scores in the 6 week Post-Operative Sample

HAD (A)	Number	Mean	SD	Range
>11 HAD (A)	3	12	1.53	11-14
<11 HAD (A)	46	4	2.66	0-10

Table 3:1.9 To show the Means and Standard Deviations of above and below Threshold HAD Scores for Anxiety in the 6 week Post-Operative Sample

HAD (D)	Number	Mean	SD	Range
>11 HAD (D)	1	12	0	0
<11 HAD (D)	48	3	2.43	0-10

Table 3:1.10 To show the Means and Standard Deviations of above and below HAD scores for Depression in the 6 Week Post-Operative Sample

Tables 3:1.11 to 3:1.13 show the distribution of above threshold GHQ and HAD scores in the 6 month post-operative sample.

GHQ score	Number	Mean	SD	Range
>39 GHQ	6	49	10.07	39-65
<39 GHQ	28	23	8.13	6-36

Table 3:1.11 To show the Means and Standard Deviations of above and below Threshold GHQ Scores in the 6 month Post-Operative Sample

HAD (A)	Number	Mean	SD	Range
>11 HAD (A)	1	12	0	0
<11 HAD (A)	33	5	3.12	0-10

Table 3:1.12 To show the Means and Standard Deviations of above and below Threshold HAD Scores for Anxiety in the 6 month Post-Operative Sample

HAD (D)	Number	Mean	SD	Range
>11 HAD (D)	0	0	0	0
<11 HAD (D)	34	3	2.61	0-10

Table 3:1.13 To show the Means and Standard Deviations of above and below HAD scores for Depression in the 6 Month Post-Operative Sample

All of the patients who had above threshold scores in the anxiety and depression scales of the HAD both pre- and post-operatively also scored above threshold on the GHQ.

3:2 QUANTITATIVE DATA ANALYSIS

Hypothesis 1: Patients who are classed as being psychologically distressed in the pre-operative period will have significantly higher scores compared to the non-distressed group on the following variables as identified in the cardiac questionnaire:

- Need of social support
- Problems or anxieties about employment
- Severe physical symptoms
- Less active engagement in pastimes
- Worry associated with surgery and hospitalisation.

One tailed t tests were conducted on each of the variables and alpha was set at 0.05. The scores of those with high levels of psychological morbidity are compared with patients whose scores indicated that they were not distressed. Table 3:2.1 gives the t values for each pre-operative variable in the hypothesis. Group 1 represents those patients with an above threshold GHQ score, group 2 patients with a below threshold score.

Variable	Group	Number	Mean	SD	t	df	p
Social Support	1	22	.50	.74	.95	52	.17
	2	32	.31	.69			
Employment Problems	1	22	1.73	1.28	3.43**	52	.0005
	2	32	.63	1.07			
Physical Symptoms	1	22	5.95	2.08	1.21	52	.12
	2	32	5.28	1.97			
Engagement in Pastimes	1	22	2.14	1.04	1.66	52	.054
	2	32	1.72	.81			
Worry with Surgery	1	22	2.14	1.04	1.66	52	.052
	2	32	1.72	.81			

** p<.001

Table 3:2.1 Means, Standard Deviations and t Values of Pre-Operative Variables (n=54)

Need of more social support

The means, standard deviations and t value of question 3, part 2 of the pre-operative questionnaire given in Table 3:2.1. The t value shows that the difference in the scores between the distressed and non-distressed groups is not significantly different at $p < .05$.

More problems or Anxieties About Employment

The means, standard deviations and t value of question 6, part 2 are given in Table 3:2.1. The t value shows that the difference in the scores between the distressed and non-distressed groups is significantly different at $p < .001$.

More Severe Physical Symptoms

The total of questions 1,2,4 and 5 of part 1 were calculated for each patient. These items referred to the frequency of the pain, the severity, fatigue and breathlessness. The means, standard deviations and t value of this group of items is given in Table 3:2.1. The difference in the scores between the distressed and non-distressed groups was not significantly different at $p < .05$.

Less Active Engagement in Pastimes

The means, standard deviations and t value of question 2, part 1 are given in Table 3:2.1. The difference in the scores between the distressed and non-distressed groups was not significantly different at $p < .05$.

Worry Associated with Surgery and Hospitalisation

The means, standard deviations and t value of question 3, part 4 of the pre-operative questionnaire are given in Table 3:2.1. The difference in the scores between the distressed and non-distressed groups was not significantly different at $p < .05$.

The data does not fully support the hypothesis. There was only a significant difference between the distressed and non-distressed groups in the variable relating to employment. There were no other significant differences between the groups in the other variables.

Hypothesis 2: Distressed patients, as measured by above threshold levels of the GHQ, will score significantly higher levels on the cardiac questionnaire both pre- and post- operatively than the non-distressed group.

The mean scores and standard deviations of the pre-operative cardiac questionnaire are given in Table 3:2.2.

Group	No.	Mean	S.D.	S.E. of mean
>39 GHQ	22	32.00	9.50	2.03
<39 GHQ	32	21.34	8.24	1.46

Mean Diff. = 10.66

Table 3:2.2 Means and standard deviations of pre-operative cardiac questionnaire given to distressed and non-distressed groups (n=54).

A one tailed t test gave a value of $t=4.39$, $p=.0001$ with 52 degrees of freedom. This shows that there is a significant difference ($p<.001$) between the cardiac scores of the distressed and non-distressed groups of patients.

The mean scores and standard deviations of the 6 week post-operative cardiac questionnaire are given in Table 3:2.3.

Group	No.	Mean	S.D.	S.E. of mean
>39 GHQ	8	44.375	13.233	4.679
<39 GHQ	41	23.3902	7.539	1.177

Mean Diff. = 20.9848

Table 3:2.3 Means and standard deviations of post-operative cardiac questionnaire given 6 weeks after surgery to distressed and non-distressed groups (n=49).

A one tailed t test gave a value of $t=6.29$, $p=.0001$ with 47 degrees of freedom. The difference in the cardiac scores between the distressed and non-distressed groups was significantly different ($p<.001$).

The mean scores and standard deviations of the 6 month post-operative cardiac questionnaire are given in Table 3:2.4.

Group	No.	Mean	S.D.	S.E. of mean
>39 GHQ	6	45.6667	13.003	5.308
<39 GHQ	28	20.0357	8.867	1.676

Mean Diff. = 25.6310

Table 3:2.4 Means and standard deviations of cardiac questionnaire given 6 months after surgery to distressed and non-distressed groups (n=34).

A one tailed t test gave a value of $t=5.92$, $p=.0001$ at 32 degrees of freedom. This demonstrated that there was a significant difference ($p<.001$) in the cardiac scores between the distressed and non-distressed groups.

The results of the t tests confirm the hypothesis. Those patients diagnosed by the GHQ as being distressed scored significantly higher levels on the cardiac questionnaire pre- and post-operatively than the non-distressed group.

Hypothesis 3: There will be a significant correlation between the mental health state of patients pre- and post-operatively as demonstrated by their scores on the GHQ and HAD.

Table 3:2.5 shows the Pearson Product Moment coefficients (r) for each set of GHQ scores in the pre or post operative conditions.

	Pre-op	6 wks post-op	6mths post-op
Pre-op	1.00	.3064* (n=49)	N/S
6 wks post-op	.3064* (n=49)	1.00	.6435***n=34
6 mth post-op	N/S	.6435***n=34	.1.00

* p<.05 , *** p<.001

Note. N/S implies not significant.

Table 3:2.5 Correlations between GHQ scores pre- and post-operatively

The correlation coefficients show that there is a weak correlation between the GHQ score pre-operatively and at 6 weeks post-operatively, although there is no significant correlation between pre-operative levels of the GHQ score and at 6 months post surgery. A strong correlation exists between the GHQ scores at 6 weeks and 6 months post-operatively.

Table 3:2.6 shows the Pearson Product Moment coefficients (r) for each set of HAD scores for anxiety in the pre- or post-operative conditions.

	Pre-op	6 wks post-op	6mths post-op
Pre-op	1.00	N/S	.4153** (n=34)
6 wks post-op	N/S	1.00	.6480***n=34
6 mth post-op	.4153** (n=34)	.6480***n=34	.1.00

** p<.01 *** p<.001

Note. N/S implies not significant.

Table 3:2.6 Correlations between HAD scores for anxiety pre- and post-operatively

There is no significant correlation between the pre-operative score for anxiety and at 6 weeks, although there is a significant association between the scores at 6 months after surgery. There is a strong association between the anxiety scores at 6 weeks and 6 months post-operatively.

Table 3:2.7 shows the Pearson Product Moment coefficients (r) for each set of HAD scores for depression in the pre- or post-operative conditions.

	Pre-op	6 wks post-op	6mths post-op
Pre-op	1.00	N/S	N/S
6 wks post-op	N/S	1.00	.5013** (n=34)
6 mth post-op	N/S	.5013** (n=34)	.1.00

** p<.01

Note. N/S implies not significant.

Table 3:2.7 Correlations between HAD scores for depression pre- and post-operatively

The matrix of correlation coefficients shows that there is no significant correlation between the pre-operative and 6 week post-operative scores for depression or 6 month scores. A strong correlation exists between the 6 week and 6 month scores for depression.

The results do not support the hypothesis. For the three measures taken pre-operatively and at 6 weeks, only the GHQ scores show a significant correlation. When the pre-operative scores are correlated with the 6 months scores post surgery, only the measures for anxiety show a significant association. However, there was shown to be a strong association between all the scores at 6 weeks and 6 months post-operatively.

Hypothesis 4: Patients who are classed as being psychologically distressed in the post-operative period will have significantly higher scores compared to the non-distressed group on the following variables as identified in the cardiac questionnaire:

Distressing memories of the intensive care unit

Need of social support

Problems and anxieties about employment

Severe physical symptoms

Less engagement in pastimes

Less well prepared for discharge

Poorer physical recovery than expected.

One tailed t tests were conducted on each of the variables with alpha set at 0.05. The scores of those with high levels of psychological morbidity are compared with patients whose scores indicated that they were not distressed. The means, standard deviations and t values of the variables in the hypothesis are given in Tables 3:2.8 and 3:2.9. Group 1 represents those patients with above threshold GHQ scores, group 2 those patients with below threshold scores.

Need of More Social Support

The mean scores, standard deviations and t value of question 3, part 2 are given in Table 3:2.8. This item relates to the need for more social support. The t value shows that there is a significant difference ($p<.05$) in the need for more social support between the groups.

Problems or Anxieties About Employment

The mean scores, standard deviations and t value of question 6, part 2 are given in Table 3:2.8. The t value shows that there is not a significant difference ($p<.05$) in the problems or anxieties related to employment between the groups.

More Severe Physical Symptoms

The total of questions 1,2 and 3 of part 4 of the post-operative cardiac questionnaire were calculated for each patient. These items referred to; the frequency of the pain currently experienced, its severity and breathlessness. The mean, standard deviations and t value of this group of items is given in Table 3:2.8.

Levene's test for equality of variances showed as $F=6.13$ with $p=.017$. As this is a significant result with $p<.05$, the separate variance estimate was used to calculate t. The t value shows that there is a significant difference ($p<.01$) in the reported severity of symptoms between those patients who have above threshold scores on the GHQ and those who are not distressed.

Engagement in pastimes

The mean scores, standard deviations and t value of question 7, part 2 are given in Table 3:2.8. This item relates to engagement in pastimes. The t value shows that there is a significant difference ($p<.01$) in the extent to which the distressed and non-distressed groups engage in pastimes.

Less Well Prepared for Discharge

Questions 8 and 9 of part 4 were added together for each patient. These items referred to how well the patient thought he had been prepared for discharge by the staff and how helpful the information

about rehabilitation had been. The means, standard deviations and t value of this group of items is given in Table 3:2.8. The t value shows that there is no significant difference between the distressed and non-distressed groups in how well they considered that they had been prepared for discharge.

Poorer Physical Recovery than Expected

The mean scores, standard deviations and t value of question 7, part 4 are given in Table 3:2.8. This item relates to whether patients feel as healthy as they expected. The t value shows that there is a significant difference ($p < .05$) between the distressed and non-distressed groups in whether their expectations of recovery have been fulfilled.

Not all the variables in the hypothesis are supported by the analysis. The distressed group reported to have significantly more upsetting memories of the Intensive Care Unit, to need more social support, to suffer more from severe physical symptomatology, to engage less in pastimes and to not have had their expectations of recovery fulfilled compared to the non-distressed group. There were no significant differences between the groups in problems associated with employment or how well they considered that they had been prepared for discharge.

Six Months After Surgery

The same questions or groups of items were used in the analysis of patients cardiac scores six months after surgery as were used in the first post-operative analysis. Again, the scores of those with high levels of psychological morbidity (group 1) were compared with patients whose scores indicated that they were not distressed (group 2). The means, standard deviations and t values of the scores 6 months after surgery are given in Table 3:2.9.

Variable	Group	Number	Mean	SD	t	df	p
Distressing Memories	1	6	8.00	1.90	3.57***	32	.0005
	2	28	3.68	2.82			
Social Support	1	6	1.67	.98	1.32	32	.10
	2	28	.71	.71			
Employment Problems	1	6	2.17	1.17	2.58**	32	.008
	2	28	.82	1.16			
Severe Symptoms	1	6	4.17	2.57	2.25*	5.56****	.035
	2	28	1.75	1.30			
Engage Pastimes	1	6	2.25	.71	3.9***	32	.0005
	2	28	1.32	.79			
Prepared Discharge	1	6	3.33	1.75	2.80*	5.47****	.017
	2	28	1.29	.81			
Poorer Recovery	1	6	1.67	1.37	2.09*	32	.022
	2	28	.79	.83			

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

Note. **** indicates that a separate variance used to calculate t.

Table 3:2.9 Means, Standard Deviations and t Values of Variables 6 months After Surgery (n=34)

Distressing Memories of the Intensive Care Unit

The t value shows that the group with above threshold scores of the GHQ reported to have experienced significantly more distress ($p < .001$) in the Intensive Care Unit than the group with below threshold scores.

Need of More Social Support

The t value for this item shows that there is no significant difference ($p < .05$) in the need for more social support between the groups.

Problems or Anxieties About Employment

The t value showed there is a significant difference ($p < .01$) in the problems or anxieties related to employment between the groups.

More Severe Physical Symptoms

Levene's test for equality of variances showed as $F=4.307$ with $p=.046$. As this is a significant result with $p<.05$, the separate variance estimate was used to calculate t . A one tailed t test showed that there is a significant difference ($p<.05$) in the reported severity of symptoms between those patients who have above threshold scores on the GHQ and those who are not distressed.

Engagement in Pastimes

The t value showed that distressed patients engage significantly less ($p<.001$) in pastimes compared to non-distressed patients.

Less Well Prepared for Discharge

Levene's test for equality of variances showed as $F=7.49$ with $p=.01$. As this is a significant result with $p<.05$, the separate variance estimate was used to calculate t . The t value shows that there is a significant difference ($p<.05$) between the distressed and non-distressed groups in how well they considered that they had been prepared for discharge.

Poorer Physical Recovery than Expected

The t value shows that there is a significant difference ($p<.05$) between the distressed and non-distressed groups in whether their expectations of recovery have been fulfilled.

The analysis shows that all but one of the variables in the hypothesis are supported by the data. Patients with high levels of psychological morbidity reported 6 months after surgery to have more distressing memories of the Intensive Care Unit, to have been more difficulties regarding employment, to have worse physical symptomatology, to engage less in pastimes, to have been less well prepared for discharge and to not have made as good a recovery as expected compared to the non-distressed group. There was no significant difference in the reported level of social support between the two groups.

Hypothesis 5: Factor analysis of the pre-operative cardiac questionnaire will reveal the following orthogonal dimensions;

Social support

Employment

Activity levels

Physical symptoms of heart disease

Mental health.

Factor Structure of the Pre-operative Cardiac Questionnaire

The data from the pre-operative cardiac questionnaire was entered into an exploratory principal components factor analysis to determine whether sets of related responses would load on common factors. An orthogonal Varimax rotation was used as this encourages a greater differentiation between the factors.

The number of factors to be retained was based on a judgement influenced by the following considerations: (1) the eigenvalue after rotation being greater than 1 (Kaiser's criterion) and above the clearly best fitting straight line of the scree plot (2) the number of variables having significant loadings (using the Burt Banks formula 1947, where the acceptable value for loading to be judged significant increases with higher factors) (3) minimisation of factorial complexity, i.e. as few as possible variables having primary loadings on more than one factor (4) content coherence, i.e. groupings of high loadings after rotation that make psychological sense. The level of significance was set at 1%.

On the basis of the above criteria, 4 factors were retained. The eigenvalues for the 4 factors and the percentage variance that may be accounted for by the factors are given in Table 3:2.10 below. The total relative variance accounted for by the 4 factors was 48.9%.

Factor	Eigenvalue	% of variance
1	6.39	22.8
2	2.86	10.2
3	2.54	9.1
4	1.89	6.8

Table 3:2.10 The eigenvalues (> 1.0) for each factor in the pre-operative cardiac questionnaire (n=54)

The final rotated factor solution is given in Table 3:2.11. The first dimension is labelled 'Effect of physical symptoms on activity and morale.' The strongest loadings contributed were the extent to which the physical symptoms affected the patient's sense of self and fatigue. Following these in strength were scales describing restricted activity due to the pain and engagement in pastimes. The other significant variables related to frequency of pain experienced, breathlessness and mental health.

The second factor reflected a diverse range of variables. The strongest loadings related to the presence of other medical symptoms and the effect of this on coping ability. The extent to which the cardiac symptoms could be relieved was the third strongest loading, followed by ratings as to the helpfulness of the information related by staff in the hospital. All other significant variables, except the need for social support, had already been associated with factor one. The second factor is labelled 'Effect of medical problems on coping'.

The third factor referred to the extent to which the heart disease affected employment and the effect of the heart disease on the patient's morale. The other significant variables relating to engagement in pastimes and mental health have already been noted with previous factors. This factor was labelled 'Employment.'

The strongest loadings in the fourth factor relate to the extent

and helpfulness of the social support received. This is a bipolar dimension and is inversely related to how much the patient relies on people. This factor is referred to as 'Social Support'.

Variables	1.Effect of physical symptoms on morale and activity	2. Effect of medical problems on coping	3. Employment	4. Social Support
Effect of physical symptoms on self	.76**	.18	.13	-.06
Fatigue	.75**	.26	.15	.07
Restricted due to pain	.68**	-.11	.01	-1.0
Engagement in pastimes	.67**	.02	.40**	.17
Frequency of pain	.47**	.19	-.02	.05
Unhappy/depressed	.46**	.30*	.33*	.09
Pleasure from activities	.45**	.37**	.25	.05
Breathless	.38**	.35*	.04	**-.41
Scared/anxious	.36**	.30*	.15	-.14
Changed activites	.35**	.13	.58**	-.15
Other medical problems	.12	.86**	-.06	-.07
Effect of medical problems on coping	.13	.80**	.06	-.07
Ability to relieve cardiac symptoms	.14	.46**	.12	.0
Information	.05	.39**	-.05	.25
Need for social support	.11	.35*	.21	.08
Effect on employment	.11	-.02	.85**	.23
Effect of disease on morale	.06	.00	.84**	.03
Helpfulness of social support	-.06	-.07	.05	**-.92
Extent of social support	.11	-.03	.07	**-.90
Reliance on others	.29	.20	.27	**-.48

* p<.05 ** p<.01

Table 3.2.11 Rotated Factor Analysis of Psychosocial Variables Related to Heart Disease Prior to Surgery (n=54)

The four factors identified by the analysis; physical symptoms on activity and morale, social support, employment and effect of

medical problems on coping, account for 48.9% of the variance of the responses. Much of the patients' psychosocial experience prior to surgery comprises of these identified factors. As such, it may be considered that the groups of related questions have factorial validity in that they measure the same concept.

Although given the relatively small sample, definitive conclusions cannot be made, the analysis does indicate which psychosocial variables are related to each other.

The hypothesis is partly supported by the data. Analysis revealed social support, employment and the effects of physical symptoms as factors in the pre-operative questionnaire. Activity levels and mental health did not emerge as factors within the analysis.

Hypothesis 6: Factor analysis of the 6 week post-operative cardiac questionnaire will reveal the following orthogonal dimensions:

Experiences of hospitalisation

Experience of pain

Mental health

Subjective cognitive impairment.

Factor Analysis of 6 week Post-Operative Cardiac Questionnaire

The data from the cardiac questionnaire given at 6 weeks after surgery was entered into an exploratory principal component factor analysis (using an orthogonal Varimax rotation) to determine whether sets of related items would load onto factors. The criteria by which it was decided which factors would be retained was based upon the same considerations that were outlined in hypothesis 5. The level of significance was set at 1%.

On the basis of these criteria, 4 factors were retained. The eigenvalues for the 4 factors and the percentage variance that may be accounted for by the factors are given in Table 3:2.12 below. The total percentage variance accounted for by the 4 factors is

51.1%.

Factor	Eigenvalue	% of variance
1	8.28	25.1
2	4.05	12.3
3	2.45	7.4
4	2.08	6.3

Table 3:2.12 The eigenvalues (> 1.0) for each factor in the cardiac questionnaire given 6 weeks after surgery (n=49)

The final rotated factor analysis is given in Table 3:2.13. The first factor covered a range of variables. The three strongest loadings relate to mental health. The extent to which the patient relies on other people and whether the patients expectations of health after the operation have been fulfilled are the next strongest loadings. Following these, the remaining variables relate in order of strength to; anxiety, family's and patient's needs for more support and return to pastimes. Given the weighting of the loadings, this dimension is labelled as 'Mental Health'.

The four strongest loadings in the second factor the patients emotional reactions to the Intensive Care Unit. The final variable related to breathlessness currently experienced. The second factor is named as 'Experience of Intensive Care Unit'.

The third factor depicted is labelled 'Pain'. The four strongest loadings refer to the experience of pain and discomfort in the Intensive Care Unit and the last variable to the degree of pain that the patient is currently exposed to.

The final factor is described as 'Subjective Cognitive Impairment'. In order of strength, the loadings refer to the ability to focus the mind, memory problems and concentration.

Variables	1. Mental Health	2. Experience of ITU	3. Pain	4. Cognitive Impairment
Pleasure from activities	.79**	.14	.15	.05
Less confidence	.76**	.23	.20	.18
Unhappy/depressed	.67**	.21	.09	.21
Reliance on others	.64**	-.40**	-.09	.21
Expectations of health fulfilled	.57**	.25	.04	-.04
Scared/anxious	.57**	.61**	.06	-.31*
Family need for support	.46**	.05	.23	.16
Personal support needed	.45**	-.04	-.20	.22
Return to pastimes	.44**	-.23	.18	.42**
Fear in ICU	.07	.80**	.26	.09
Anxiety in ICU	.05	.69**	.42**	.07
Disturbing Memories of ICU	.00	.67**	.28*	.13
Effect of ICU on self	.27*	.67**	.02	.20
Freq. of pain in ICU	.00	.04	.88**	.04
Severity of pain in ICU	.22	.30*	.76**	.12
Discomfort in ICU	.00	.34*	.76**	.04
Pain control in ICU	.12	.09	.71**	-.09
Current experience of pain	.12	.05	.42**	.23
Ability to focus mind	.14	.18	.03	.83**
Memory Problems	.22	.21	.13	.74**
Ability to concentrate	.31*	.21	-.06	.62**

* p<.05 ** p<.01

Table 3:2.13 Rotated Factor Analysis of Psychosocial Variables Six Weeks After Surgery (n=49)

The principal components factor analysis demonstrates that 51.1% of the variance of the scores can be accounted for by 4 factors; mental health, experience of the Intensive care Unit, experience of pain and cognitive impairment. Much of the patients' psychosocial experience at this stage after surgery comprises of these identified factors. As such, it may be considered that the groups of related questions have factorial validity in that they measure the same concept. Although given the relatively small sample, definitive conclusions cannot be made, the analysis does indicate which psychosocial variables are related to each other.

The hypothesis is supported by the data. Analysis revealed mental health, experience of the intensive care unit, pain and subjective cognitive impairment as factors in the 6 weeks post-operative questionnaire.

Although it is recommended that factor analysis has a minimum of five subjects per variable, it can be conducted with smaller samples (Child, 1970). As a minimum, it is suggested that there are at least more subjects than variables. Given that in the post-operative questionnaire there are 33 variables and at the 6 month interview stage, 34 subjects, it was considered that the reliability was not sufficiently high for factor analysis to be conducted with the 6 month post-operative data.

Hypothesis 7: The following variables, identified in the pre- and post-operative cardiac questionnaires, will be predictive of psychological distress;

Severe symptomatology

Problems or anxieties about employment

Less social support

Less Engagement in Pastimes

Distress associated with surgery and hospitalisation.

Prediction of Psychological State Based on the Pre-Operative Cardiac Questionnaire

Pearson Product Moment Correlations were used to assess which responses in the cardiac questionnaire were associated with high GHQ scores for all participants. The significant correlations are presented in Table 3:2.14.

Responses	GHQ Score
Freq. of pain	.3029*
Restricted due to pain	.4168**
Fatigue	.4715***
Effect of physical symptoms on self	.5689***
Relief of symptoms	.2641*
Need more support	.3344**
Reliance on others	.4611***
Effect of disease on morale	.4161**
Effect on employment	.5448***
Engagement in pastimes	.3721**
Changed activities	.3641**
Less confidence	.6551***
Scard and anxious	.3860**
Less pleasure	.5733***
Unhappy and depressed	.6548***
Ready for surgery	.2816*
Worried about surgery	.3729**
* p<.05 ** P<.01 *** P<.001	

Table 3:2.14 Significant correlations (Pearson r) between GHQ scores and reponses to the pre-operative cardiac questionnaire (n=54)

All the other items had non-significant correlations with the GHQ.

The variables that showed a significant correlation with GHQ were entered into a stepwise multiple regression analysis. This was conducted to identify to what extent psychological distress (the dependent variable) could be predicted by these psychosocial characteristics (independent variables). The positive correlations in section 3 of the questionnaire relating to mental health were omitted. Tables 3:2.15 and 3:2.16 show the results of this analysis.

Variable	Beta Coefficient (on last step)	R Square Change
Effect of Physical Symptoms on Self	.44199	.32359
Effect of Disease on Morale	.38176	.17298
Worried about Surgery	.21343	.04242

Table 3:2.15 Summary of the Stepwise Regression Analysis to Show Psychosocial Predictors of Psychiatric Illness (n=54)

R Square	Adj.R Square	Standard Error	F Ratio
.53899	.51133	.10.4383	19.4858

Table 3:2.16 Summary of Final Step of Stepwise Regression Analysis (n=54)

The R square value of the equation is .54%. This infers that 46% of the variance of the dependant variable is not accounted for by the above variables. According to this analysis, the strongest predictor for poor mental health in the equation was the impact of the physical symptomatology upon the patient. This accounted for 32% of the variance. The second strongest predictor related to the

effect of the heart disease on the patient's morale, this accounted for a further 17% of the variance. The third response which predicted poor mental health was the patient feeling worried about the surgery. This contributed a further 4% to the variance of the dependant variable.

The F ratio test is based on the multiple correlation yielded by the analysis. The F ratio for the independant variables is 19.48580 at a significance level of <0.001 , indicating that the multiple correlation in the sample is significantly greater than zero.

The relationship between the variables identified by the regression analysis was further explored using path analysis. This technique allows the relative impact of the variables within a causal structure to be evaluated and gives an indication of which features will be predictive of high GHQ scores. Figure 3:2.1 shows the path diagram with path coefficients.

The causal structure and the direction of the variables in the diagram were based upon the research outlined in the introduction and the semi-structured interviews. The effect of the physical symptomatology made some patients feel distressed and have low morale. Patients' emotional reactions to the disease affected how they perceived treatment; those who felt very vulnerable as a result of the physical symptomatology also tended to be more worried by the surgery.

The effect of heart disease on morale and the extent to which the patient is worried by the surgery are deemed to be correlated variables; clinical experience suggests that patients with low morale are likely to be more susceptible to worry associated with treatment. This is indicated by the Pearson's product moment coefficient ($r=.25$). It is not therefore possible to determine the direction of the causality in this interaction, as shown by the two headed arrow.

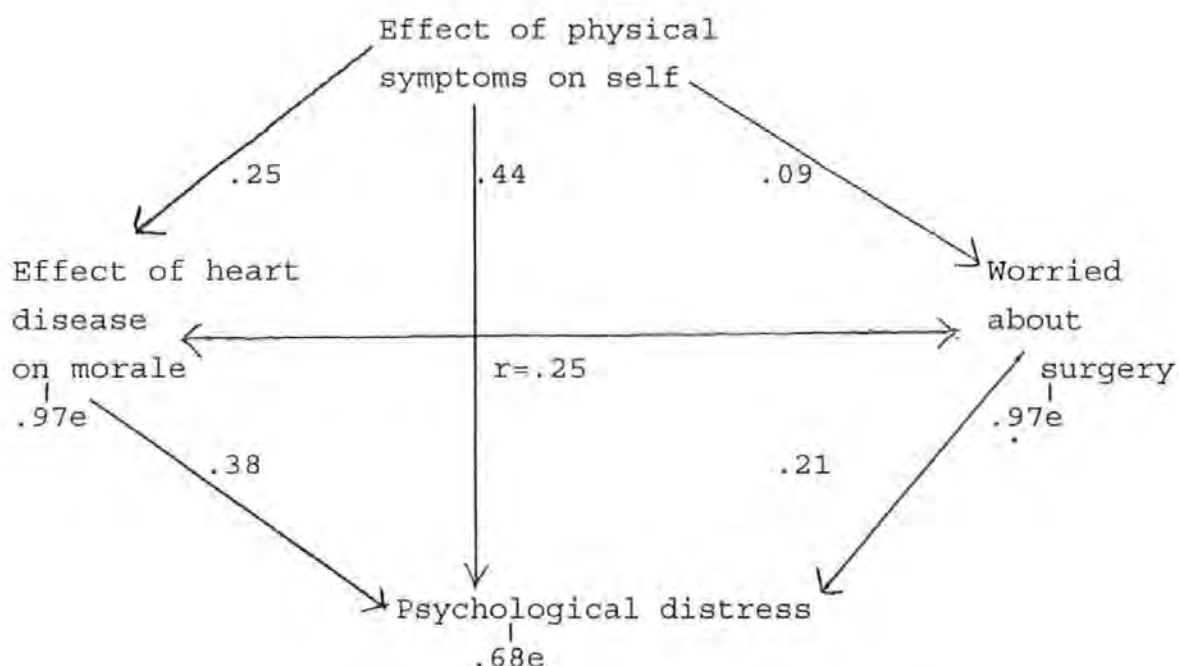


Figure 3:2.1 Path Diagram for Psychological Distress with Path Coefficients for Pre-Operative Group

The path analysis is derived from the following equations;

1. Morale = physical symptoms + worried + error
2. Worried = morale + physical symptoms + error
3. Psychological distress = morale + physical symptoms + worried + error

Standardised regression coefficients (beta) provide the path coefficients and the error terms are calculated by taking the R square away from 1 and taking the square root of this subtraction.

To establish the relative impact of each of the variables on psychological distress, the direct and indirect effects of each of the paths need to be added together.

Impact of physical symptoms on psychological distress;

Direct effect: .44

Indirect effect: $(.25)(.38) = .09$

$(.09)(.21) = .02$

Total indirect effect: $.09 + .02 = .11$

Total effect: $.11 + .44 = .55$

Impact of low morale on psychological distress;

Direct effect: .38

Indirect effect: none

Total effect: .38

Impact of worry on psychological distress;

Direct effect: .21

Indirect effect: none

Total effect: .21

This model suggests that the effect of physical symptoms upon the patient contributes most powerfully to the risk of psychological distress. The direct effect coefficient between the impact of the physical symptomology and psychological distress is strong ($\beta = .44$), yet this variable also works through an indirect route. It suggests that the patient, by feeling very affected by the physical symptoms, is more likely to have a diminished sense of morale and worry about the surgery more. This also increases the risk of psychological morbidity. On the basis of the effect coefficients, the impact of the heart disease on the patient's morale ($\beta = .38$) has a more powerful effect on psychological morbidity than worry about the surgery ($\beta = .21$).

The Pearson correlation coefficient matrix showed that the variables stated in the hypothesis were positively correlated with GHQ scores; need for more support, effect of heart disease on employment, frequent pain, less engagement in pastimes and worry about surgery.

The regression analysis indicated that feeling affected by the physical symptoms of heart disease, lower morale and worried by the surgery was predictive of high GHQ scores. The only variable in the hypothesis predictive of psychological distress in the stepwise regression analysis was worry associated with surgery. The hypothesis is not therefore fully supported.

The path analysis indicated that the impact of the physical symptoms on the patient had more of an effect on psychological morbidity than the other variables identified.

Prediction of Psychological State Based on the Cardiac Questionnaire 6 Weeks After Surgery

In order to evaluate which reponses in the cardiac questionnaire corresponded with high GHQ scores, the data were examined using Pearson Product Moment Correlations. The significant correlations are presented in Table 3:2.17.

Responses	GHQ Score
Severity of pain in ICU	.4565***
Discomfort in ICU	.2859
Anxiety in ICU	.4381**
Fear in ICU	.4428**
Effect of ICU on self	.5106***
Disturbing Memories of ICU	.5101***
Need for social support	.4193**
Family need for support	.4275**
Reliance on others	.2942*
Return to pastimes	.4875***
Less confidence	.5846***
Scared/anxious	.6517***
Pleasure from activities	.5846***
Unhappy/depressed	.7620***
Concentration problems	.6009***
Memory problems	.5231***
Difficulty focusing mind	.5849***
Difficulty in sleeping	.4688***
Current experience of pain	.5066***
Severity of pain	.5537***
Breathlessness	.4124***
Other symptoms	.3633**
Able to relieve symptoms	.3236*

Table 3:2.17 '(continued)'

Preparation for discharge .4030**

Expectations of health fulfilled .4062**

Helpfulness of information .3132*

* p< .05 ** p< .01 *** p< .001

Table 3:2.17 Significant Correlations (Pearson r) between GHQ scores and responses to post-operative cardiac questionnaire given at 6 weeks after surgery (n= 49)

All other items had non-significant correlations with the GHQ.

The variables that showed a positive correlation with the GHQ were entered into a stepwise regression analysis. This was conducted to determine which of the correlations were most predictive of psychological morbidity as shown by high GHQ scores. The results of the regression analysis are shown in Table 3:2. 18 and 3:2.19.

Variable	Beta Coefficient	R Square Change
Severity of pain	.30316	.30660
Return to pastimes	.38044	.16543
Disturbing memories of ICU	.25151	.16518
Affected by ICU	.31498	.0547
Breathlessness	.19090	.029

Table 3:2.18 Summary of the Stepwise Regression Analysis to Show Psychosocial Predictors of Psychological Distress Six Weeks After Surgery (n=49)

R Square	Adj.R Square	Standard Error	F Ratio
.72118	.68876	7.65219	22.24462

Table 3:2.19 Summary of Final Step of Stepwise Regression Analysis (n=49)

The R Square value of the equation as a whole is .72. This implies that only 28% of the variance in the dependant variable, psychological distress, is not accounted for by the 5 variables in the equation. The level of pain currently experienced by the patient contributes most highly to the score of psychological morbidity, accounting for 30% of the variance. The change in R square shows that the patient not returning to his pastimes since the operation and having disturbing memories of the Intensive Care Unit contributes to a further 33% of the variance.

The extent to which the experience in the Intensive Care Unit affected the person and the current level of breathlessness only contribute a further 8% to the dependant variable. The effect of the intensive care unit on the person is positively correlated with disturbing memories of the unit ($r=.5058$). Similarly, the current experience of pain is positively correlated with breathlessness ($r=.3167$). These correlations (Pearsons r) do not exceed 0.8 and are therefore not regarded as exhibiting multicollinearity (Duncan and Cramer, 1990). However, this may explain why these variables do not make a very strong independant contribution to the dependant variable.

The F ratio test is based on the multiple correlation of the analysis. This means that the ratio is able to give a collective expression of all the independant variables upon the dependant variable. The F ratio for the independant variables is 22.24462 at a significance level of <0.001 , indicating that the multiple correlation in the sample is significantly greater than zero.

The relationship between the variables identified by the regression analysis was further explored using path analysis. Figure 3:2.2 shows the path diagram with path coefficients.

The paths and directions of influence in the diagram are based on the research findings outlined in the introduction and reports taken from the semi-structured interviews. Breathlessness and atypical chest pain have been positively correlated with psychological distress (Bass, 1984) and patients suffering from these symptoms are less likely to be able to engage in their pastimes (Llangeddecke et al. 1989). Patients reported that distressing experiences in the Intensive Care Unit and inactivity had contributed towards their low mood.

Clinical experiences suggests that having disturbing memories of the Intensive Care Unit is correlated with the extent to which these experiences had affected the patient. Similarly, research suggests that breathlessness suffered by the patient is positively correlated with the pain experienced (Bass, 1984). It is therefore not possible to specify the direction of these causal relationships. This is shown in the diagram by the two headed arrows that indicates there is an interaction between the variables.

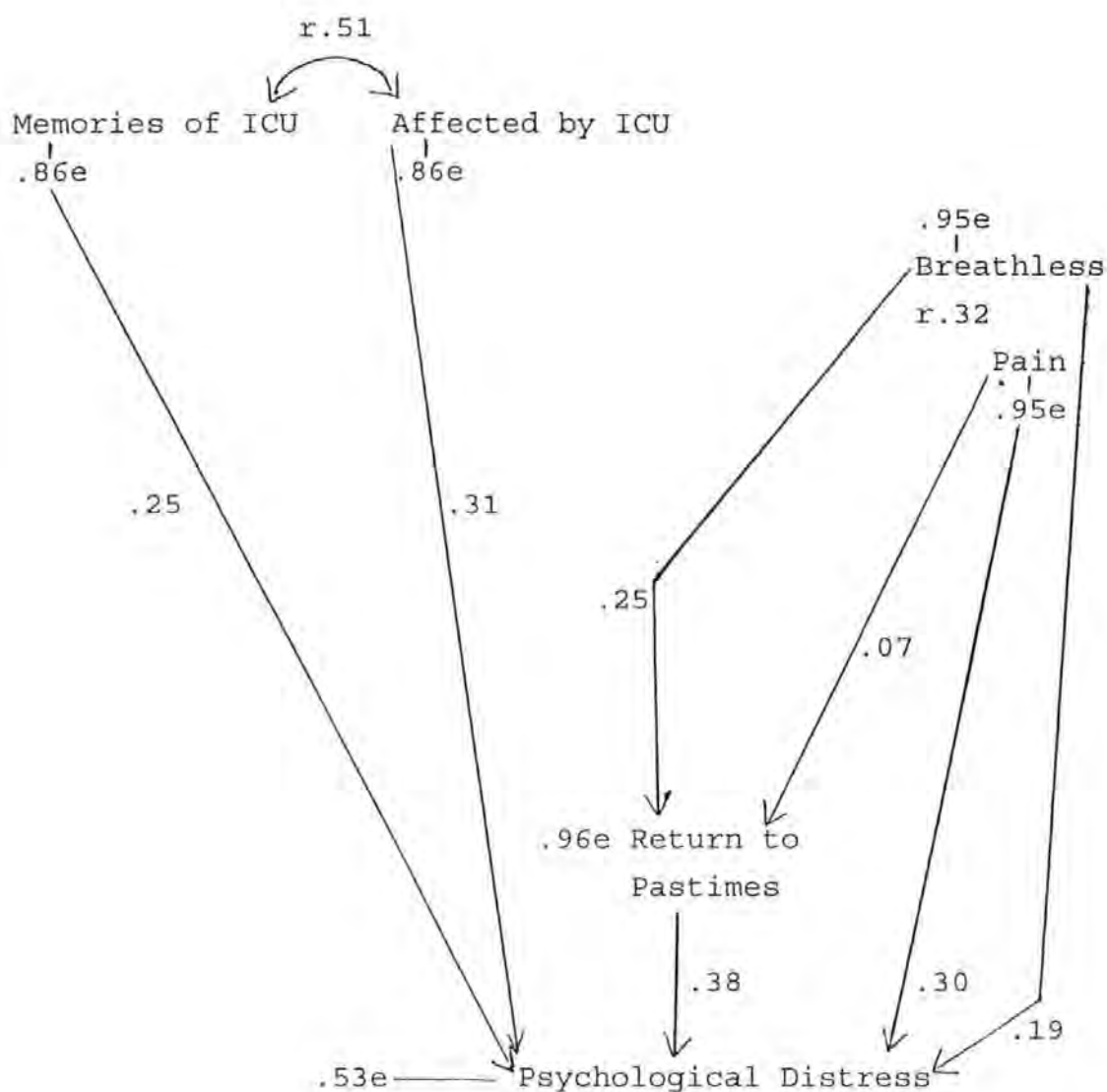


Figure 3:2.2 Path Diagram for Psychological Distress with Path Coefficients for 6 Week Post-Operative Group

The path analysis is derived from the following equations;

1. Affected by ICU= memories + error
2. Distressing memories of ICU= affected by ICU + error
3. Return to pastimes= pain + breathlessness + error
4. Pain= breathlessness + error
5. Breathlessness= pain + error
6. Psychological Distress= distressing memories of ICU + affected by ICU + return to pastimes + pain + breathlessness

To establish the relative impact of each of the variables on psychological morbidity, the direct and indirect effects of each of the paths need to be added together.

Impact of distressing memories of ICU on psychological distress;

Direct effect: .25

Indirect effect: none

Total effect: 0.25

Effect of ICU experience on psychological distress;

Direct effect: .31

Indirect effect: none

Total effect: .31

Effect of breathlessness on psychological distress;

Direct effect: .19

Indirect effect: $(.25)(.38) = 0.10$

Total effect: .29

Effect of pain on psychological distress;

Direct effect: .30

Indirect effect: $(.07)(.38) = 0.03$

Total effect: .33

Impact of not returning to pastimes on psychological distress;

Direct effect: .38

Indirect effect: none

Total effect: .38

In the case of the physical symptoms, the breathlessness combined with the reduced participation in pastimes, appeared to have a greater impact upon mental health than this combination with pain. However, this is contrary to the regression analysis which predicted that the severity of the pain experienced had a greater effect upon the patient's mental health than breathlessness. It has been noted that in complex models, the decomposition effects of the different variables using path analysis may not be as

reliable and that alternative types of calculation should be included in the analysis.

The results of the stepwise regression analysis do not fully confirm the hypothesis. The Pearson correlation coefficient matrix showed that most of the variables stated in the hypothesis were significantly correlated with GHQ scores; distressing memories of the Intensive Care Unit, need of more support, severe physical symptomology and lack of engagement in pastimes. Of these variables, distressing memories of the intensive care unit, being affected by the Intensive Care Unit, pain and breathlessness currently experienced and engagement in pastimes were predictive of psychological morbidity in the stepwise regression analysis. The other variables in the hypothesis were not predictive of psychological distress.

The path analysis indicated that distressing memories and feeling affected by the experiences in the Intensive Care Unit had a slightly more powerful effect on psychological state than the physical problems currently experienced. Being in pain and breathless restricted the patient's ability to return to pastimes, this lack of engagement in activities also contributed to the patient's poor mental health. The continued experience of physical symptoms furthermore had a direct effect upon psychological morbidity.

Prediction of Psychological State based on the Cardiac Questionnaire at 6 Months Post-Operatively

In order to evaluate which responses in the cardiac questionnaire were associated with GHQ scores, the data was examined using Pearson Product Moment Correlations. The significant correlations are shown in Table 3:2.20.

Responses	GHQ Score
Severity of pain in ICU	.4739**
Pain control in ICU	.4510**
Anxiety in ICU	.4418**
Fear in ICU	.4520**
Affected by ICU	.4090**
Disturbing memories of ICU	.4996**
Need more support	.3340*
Family need more support	.2986*
Reliance on others	.6123***
Effect on employment	.4053*
Return to pastimes	.5558***
Less confidence	.8406***
Scared/anxious	.5892***
Pleasure from activities	.7888***
Unhappy/depressed	.7594***
Concentration problems	.6098***
Difficulty focusing mind	.4212**
Difficulty in sleeping	.4950**
Experience of pain	.5405**
Breathlessness	.3288**
Other symptoms	.5583***
As healthy as expected	.6050***
* p< .05 ** p< .01 *** p< .001	

Table 3:2.20 Significant Correlations (Pearson r) between GHQ scores and responses to post-operative cardiac questionnaire at 6 months (n=34)

All other items had non-significant correlations with the GHQ.

The variables that showed a positive correlation with the GHQ were entered into a stepwise regression analysis. This was conducted to determine which of the correlations were most predictive of psychological morbidity. The results of this analysis are shown in Table 3:2.21 and 3:2.22.

Variable	Beta Coefficient (last step)	R Square Change
Reliance on others	.48403	.36215
Effect of disease on employment	.34309	.12671
Fear in ICU	.31628	.09328

Table 3:2.21 Summary of Stepwise Regression Analysis to Show Psychosocial Predictors of Poor Mental Health at 6 Months After Surgery (n=34)

R Square	Adj.R Square	Standard Error	F Ratio
.58215	.54037	8.90242	13.9323

Table 3:2.22 Summary of Final Step of Stepwise Regression Analysis (n=34)

The R square for the equation as a whole is .58. This implies that the above three factors account for 58% of the variance in the dependant variable. The way in which the patient considers that he has to rely upon others contributes most highly to psychological morbidity (as shown by high GHQ scores), accounting for 36% of the variance. The extent to which the heart disease and surgery has affected the patient's employment adds a further 13% to the variance as shown by the change in R square. The patient's memories of having been afraid while in the Intensive Care Unit still appear to make an impression upon the patient 6 months after the experience and accounts for a further 9% of the variance of the dependant variable.

The F ratio expresses the multiple correlation of all the independant variables upon the dependant. In this analysis, the multiple R on the last step is .76299 and the F ratio is calculated

to be 13.9323 at a significance level of $p < 0.001$. This strongly implies that the multiple correlation is unlikely to be due to chance and that the sample is significantly greater than zero.

The relationships between the variables identified in the regression analysis were further explored using path analysis. The causal relationships in the diagram are underlaid by research findings and reports in the interviews. Patients attributed the difficulties associated with employment and the subsequent need to rely upon others as being strong contributing factors to their poor mental health. Even six months after surgery, some patients found the memories of the Intensive Care Unit distressing. Figure 3:2.3 shows a path diagram with path coefficients.

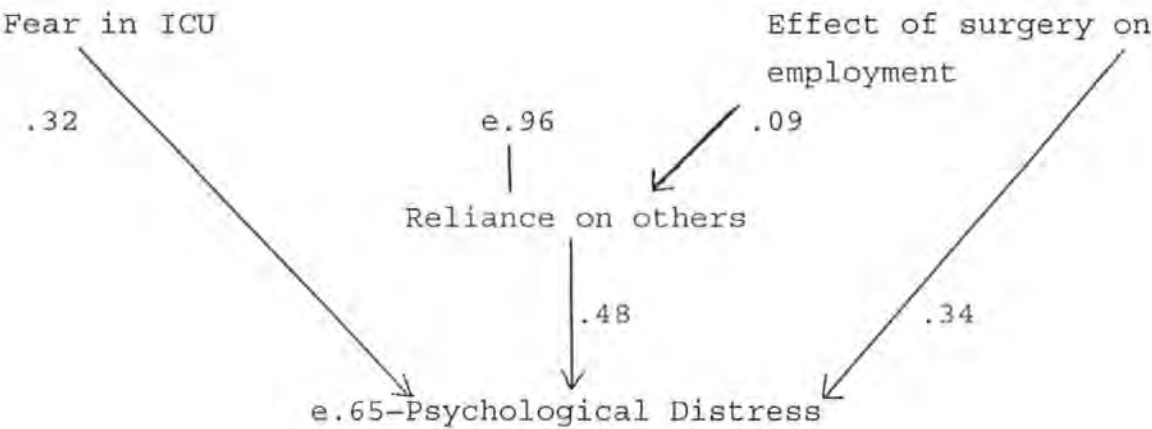


Figure 3:2.3 Path Diagram for Psychological Distress with Path Coefficients

The path analysis is derived from the following equations;

1. Psychological Distress= fear in ICU + reliance on others + effect of surgery on employment + error
2. Reliance= effect of surgery on employment + fear in ICU + error

To establish the relative impact of the variables on psychological morbidity, the direct and indirect paths need to be added together.

Impact of Fear in ICU on psychological distress;
Direct effect: .32

Indirect effect: none

Total effect: .32

Impact of reliance on others upon psychological distress;

Direct effect: .48

Indirect effect: none

Total effect: .48

Effect of disease on employment in relation to psychological distress;

Direct: .34

Indirect: $(.09)(.48) = .04$

Total effect: .38

On the basis of the effect coefficients, the way in which the patient considers himself to be more reliant on others has the strongest impact upon his mental health. Employment problems affect psychological morbidity both directly and indirectly through reliance on others. The effect of the patient's experiences in the ICU appear, even 6 months after surgery, to have an effect on psychological state.

The results of the stepwise regression analysis do not fully confirm the hypothesis. The Pearson correlation coefficient matrix showed that all the variables stated in the hypothesis were positively correlated with GHQ scores; distressing memories of the Intensive Care Unit, need of more support, problems relating to employment, severe physical symptomatology and less engagement in pastimes.

Of these positively correlated variables, fear experienced in the intensive care unit, reliance on others and problems relating to employment were predictive of psychological distress in the stepwise regression analysis. Other variables in the hypothesis were not predictive of psychological morbidity. The hypothesis is not therefore fully supported.

The path analysis indicated that feeling reliant upon others had the most powerful effect on psychological morbidity. The effect of the disease and surgery upon employment had a slightly stronger impact upon psychological state than the experience of fear in the Intensive Care Unit.

3.3 Qualitative Data Analysis

This section describes patients' experiences of heart disease and surgery. Pre-operatively, the patients alone were interviewed, although spouses were often included in the post-operative interviews. The information from the semi-structured interviews is drawn together into the themes that emerged in the qualitative analysis.

Pre-Operative Interviews

Physical Symptoms

Twenty-six of the pre-operative patients (48%) described their symptoms as being very severe. Of the distressed group, 59% reported suffering from severe symptomatology compared to 41% of the non-distressed group.

Patients commonly described feeling constantly tired. Some patients became quickly breathless on exertion, others found that a degree of breathlessness was always present. The majority of patients found that the medication was effective in reducing the pain associated with the angina.

Experience of Medical and Surgical Management

Preparation for Surgery

The majority of patients described feeling very shocked when they were told that they needed surgery. Many responded at first by denial, although they later accepted their condition. The way in which patients were informed of the disease and surgery had long term psychological consequences. The individuals who were told that they were likely to die of a heart attack if they did not have the operation and that they had a 'damaged heart', were highly anxious in the period before surgery.

Patients varied widely as to how much information about the operation was helpful. Some patients wanted to know as much as possible and found that explanations given by the medical staff

were very informative. Others said that the interaction with medical staff actually exacerbated their worries; it was commented that to be told of the the failure rate of the operation, not the success rate, made the patient more worried about the risk of mortality.

Some patients felt better prepared by seeing the Intensive Care Unit before the operation, others felt more frightened. One man remarked, 'Those bodies in the Intensive Care Unit looked awful sliced up like that. I was terrified after seeing the unit.' Another patient said, 'Those bodies looked like corpses. I was reminded of seeing my parents in the Intensive Care Unit before they had died.'

In all, 28% of patients considered that they had been inadequately prepared for the operation. Similar proportions of the distressed and non-distressed groups felt unprepared.

Social Dimension

Social Support

Of the total pre-operative sample, 9 patients (17%) thought that they needed more social support. A slightly higher proportion of distressed individuals complained of lack of support compared to those who were not distressed.

Two thirds of patients felt that the type of support they had received was not always what they had needed. They commented that people were very keen to give practical support, but were less able to give emotional support. This had made them feel isolated as they had no one to confide in. Several patients went on to say that they had tried not to accept too much practical help as they did not want to feel that they were unable to look after themselves, but this caused tension as family members restrained them from being active.

A proportion of the patients, 35%, were very aware of the strain the heart disease had placed upon their families. Both distressed

and non-distressed patients reported this family strain equally. About a half of the patients thought that their spouses were more distressed than they were and needed very much more support. They recognised that their spouses had not only taken on more responsibilities and work that they could no longer do, but they were also anxious about the outcome of the surgery. Several spouses commented that they had tended to avoid confrontation and conflict since their partner had got heart disease, for fear of precipitating a heart attack. This had often caused more strain as there was no longer any mechanism to relieve the tension that accumulated.

Problems or Anxieties About Employment

Of all those undergoing heart surgery, 37% said that they were worried about their employment prospects after surgery. Some patients had been made redundant as a result of the heart disease, others were unsure whether their job would be open to them after recovering from the surgery. Of these 20 patients, 14 (70%) were categorised as being psychiatrically ill according to above threshold scores on the GHQ.

Patients quoted employment problems as being one of the major sources of their distress. Financial difficulties were often associated with job insecurity. Nine patients were worried that they would not be able to maintain the standard of living that they had worked hard to achieve.

Twelve of the patients had been given little notice of their redundancy and had therefore not been able to prepare for this possibility, as one would with retirement. Being in age close to retirement, they did not believe that they would be able to pick up other employment after surgery, which disappointed them. Two of these patients were furthermore very bitter that their employers had not been more supportive and the way in which they had been treated made them question their loyalty to the company over many years.

Engagement in Pastimes

The majority of patients (74%) engaged less in pastimes due to the physical effects of the heart disease. Of these patients, 45% were categorised as having a psychiatric illness, 55% were not distressed.

Of the non-distressed group, 32% had been able to adapt their activities to suit their physical condition so that they did not feel so frustrated. Most of these patients had retired previously which they considered had helped them to adapt to a slower lifestyle. The distressed patients tended to report feeling depressed by their lack of engagement in pastimes and had not found other activities to be equally satisfying.

Psychological Dimension

In all, 46% of the sample said that the inactivity incurred with the heart disease had made them more irritable. They no longer were able to engage in activities that had been positively reinforcing in the past, which made them feel very frustrated. Many patients in the distressed group described how they had delayed having surgery for many years, worried of the risk associated with the operation. However, they now considered that their quality of life had become so poor by being inactive, that they now wanted to have the operation.

The majority of patients (78%) who considered that they had no personal control over the disease were distressed. Believing that there was nothing they could do to alter the course of the disease or the experience of symptoms created a great deal of uncertainty, which increased their anxiety. These external, global attributions also implied that they had a more negative perspective of their future as it was assumed that changes in lifestyle would make little difference as to the re-occurrence of the disease.

Of the total sample, 39% said that their self-esteem had been damaged by the effects of the heart disease. The loss of role associated with employment difficulties, not being able to do

normal activities in the household or lack of participation in leisure pursuits, was quoted by many patients as being a major source of distress. Of these patients with a low self-esteem, 52% said that they felt guilty and frustrated for relying upon other people.

Employment difficulties were attributed as being particularly damaging to self-esteem. Patients described how their lives to date had revolved largely around their work, but they now felt worthless. This feeling was accentuated when the patient had to rely upon his spouses' earnings, as one male patient said, 'Without a job and now relying upon my wife to keep the business going, I feel useless.'

Exactly 50% of the pre-operative patients said that the heart disease made them feel vulnerable and that having to wait so long for surgery had been very difficult. More of the patients who had a psychiatric illness (67%) described feeling vulnerable than those who did not have high levels of psychological morbidity (22%). Many of the patients who denied feeling vulnerable minimised the seriousness of the impending surgery. One patient said, 'I like to think that I am just having a little replumbing.' Many of these patients also said that they had complete faith in the doctors, so that they saw no need to worry.

Underlying the feeling of vulnerability for many patients was a fear of death; 15 of the 18 patients who said that they were afraid of dying, also felt vulnerable. The physical symptoms of the heart disease made many of this group think of their heart as being a 'time bomb.' Four patients believed that they would actually die during surgery, although they did not confide this to their spouses. A high proportion of patients (41%) had had close relatives who died of heart related problems, so that they were reminded of previous bereavements. Some patients (13%) felt that they were going through the pain of previous bereavements as they confronted their own mortality.

Six Weeks After Surgery

Physical Symptoms

Severity of Physical Symptoms

Of the total sample, 31% reported to still be in severe pain or breathless. All of the distressed group reported such symptomatology.

Many of these patients were very concerned that the surgery had not been unsuccessful and that further investigation was necessary. They had become increasingly anxious when medical staff were unable to explain why they were experiencing pain and did not give clear guidance as to the future management of their condition.

Patients who experienced medical problems (like an infection or burst stitches) post discharge were no more likely to be diagnosed as distressed than those who did not have such difficulties. In all, 33% of patients suffered such medical problems, and about half of these considered that they did not get enough support and information from their local medical services.

Experience of Medical and Surgical Management

Experiences in the Intensive Care Unit

Of all the post-operative patients, 47% reported having upsetting memories of the Intensive Care Unit. All of the patients diagnosed as having high levels of psychological morbidity said that they had had distressing experiences in the Intensive Care Unit, whereas a smaller proportion (37%) of the non-distressed group reported having such upsetting memories.

Some patients were distressed by the intense pain and discomfort experienced in the Intensive Care Unit. They described feeling very anxious when they saw the machinery that they were attached to and powerless when they were unable to communicate with the ventilator in their throat. A proportion of patients said that they felt so ill, they thought they were going to die. They became more anxious when the staff did not notice their distress. Sleep was often

disrupted, which made many patients feel worn down and irritable. At the time of the research, young children who had undergone cardiac surgery were looked after in the same unit as the adults and 15% of the patients said that they found it very upsetting to see children in that condition. Some spouses described how worrying it had been to see their partner in the Intensive Care Unit, particularly when the patient became very confused and deluded.

29% of the sample reported having upsetting nightmares or hallucinations during the period in the Intensive Care Unit, and for the majority of patients, these images still reoccurred 6 weeks after surgery. Of the patients who reported having nightmares, 75% were classed as having a psychiatric illness. Patients described feeling embarrassed by these dreams and tried to avoid thinking about them. One particular patient described his nightmares as horrific and constant throughout the period in the Intensive Care Unit. Sounds which actually occurred in the external environment (like traffic) were incorporated into his dreams. The themes of the dreams centred around loss, bereavement and failure. This patient and several others believed that it was the trauma of these recurring dreams that accounted for their current feelings of vulnerability.

Experience of Medical and Surgical Management

Feeling Prepared for Discharge

About a third of the patients said that they did not feel prepared for discharge from the hospital. They described feeling very vulnerable and worried about being able to manage without the security of the hospital setting. Many had derived a lot of support from the other patients in the hospital and missed this when at home. Of the distressed group, 75% described feeling unprepared for discharge as opposed to only 23% of the non-distressed group.

Information about Rehabilitation

More than half of the sample (53%) felt that they did not get enough information about the process of recovery. At the time of discharge, they said that they were so anxious about leaving, that they were not able to digest the information. Family members who were unsure of how to look after the patient on discharge from hospital accounted for 22% of this proportion. Three of the 8 distressed patients believed that the literature was inadequate in that it did not address any of the potential problems in rehabilitation. This made them feel that they had failed to achieve the expected standards of recovery.

Social Dimension

Employment Difficulties

At 6 weeks after surgery, 18% of the sample were worried about their employment prospects. This represented 9 patients in total, 4 of whom were diagnosed as clinically distressed. Some of the patients who had been distressed before surgery were now more positive about returning to work as they were no longer in severe discomfort.

Social Support

22% of patients needed more support. A greater proportion of patients diagnosed as distressed (75%) reported the need for more support than the non-distressed group (12%).

Many patients were very aware of the strain their heart disease had placed upon the family. Of the entire sample, 35% of patients thought that their family required more support. All but one of the distressed group believed that their families did not get enough support.

Resumption of Pastimes

A total of 49% of patients had not resumed their leisure activities 6 weeks after surgery and half of this group were disappointed by not being able to do so. Some patients did not yet feel well enough to engage in their pastimes and others were stopped by a

diminished capacity to concentrate after the operation.

Psychological Dimension

Of the total sample, 41% said that they were frustrated by the inactivity engendered by their physical state and 51% felt reliant on others. These two factors were commonly quoted by the distressed group as contributing to their low self-esteem. The distressed group further reported that the severe physical symptomatology made them feel very vulnerable and reminded them of the ongoing risk of mortality. As one patient said, 'Everytime I get a pain in my chest, I think that my heart may stop going.'

Overall, a proportion of 37% of the sample reported being unable to concentrate very well and to have problems with their memory. They had noticed a deterioration since surgery. More than twice the proportion of the distressed patients (75%) reported these deficits compared to the non-distressed group (29%).

A little more than half of the post-operative sample (53%) considered that they had benefitted from the operation by merit of being in less pain and more active. All of the patients with high levels of psychological morbidity were disappointed by their recovery from surgery. Five non-distressed patients also said that their expectations of recovery had not been met. The continued experience of symptoms such as breathlessness, fatigue or pain were the most common reasons given for feeling disappointed by the recovery.

Six Months After Surgery

Physical Symptoms

Severity of Physical Symptoms

In all, 38% of the sample said that they were still in severe pain or breathless 6 months after surgery. Almost three times as many of the distressed patients (83%) reported having severe symptoms as the non-distressed group (29%).

Twice as many of the distressed group(67%) had had post-operative medical problems compared to the non-distressed group (37%). Of both groups of patients, 21% had been disappointed by the follow-up by their local medical services. Two patients had been given little information about their condition but had been referred to a series of specialists. They had been very distressed by this process and found it difficult to communicate with the different doctors.

Experience of Medical and Surgical Management

Experiences in the Intensive Care Unit

Six months after hospitalisation, 38% of patients still recalled having had distressing experiences in the Intensive Care Unit. Of the distressed group, 67% said that these experiences were still upsetting, compared to 32% of the other group. The reasons quoted for this distress were similar to those at the 6 week interview after surgery.

Four patients (12%) were still troubled by the nightmares or hallucinations that they experienced in the Intensive Care Unit, two of whom were classed as distressed according to the GHQ. The intrusive and recurrent nature of these images was described as being very upsetting. One of the distressed patients also said that he was convinced he had felt the first incision of the operation before the anaesthetic took effect.

Feeling Prepared for Discharge

The majority of patients who thought they were not ready for discharge at the 6 week interview, maintained this opinion when asked 4 1/2 months later. In all, 26% of patients said that they were not prepared to leave and felt vulnerable without the support from hospital. More than 3 times the proportion of distressed patients believed that they had not been ready to leave compared to the non-distressed group of patients.

Information about Rehabilitation

More than half the sample (56%) believed that they had not received

enough information about recovery or the operation. Some patients remained unsure of how many grafts they had had done and whether this had been sufficient to ensure their future good health. Many were aware of the progressive nature of heart disease and questioned whether they would need to have a second operation.

A small proportion of patients (15%) had been able to go to rehabilitation classes at their local medical centre. This had generally been a helpful experience, although many considered that the programmes were more orientated towards post-myocardial infarction patients than heart bypass patients. However, many patients did not have the benefit of this source of information and were uncertain of what they should expect in the normal course of recovery. This had led some patients to become hypersensitive about any chest pain.

Social Dimension

Problems or Anxieties about Employment

32% of patients were worried by their employment prospects six months after surgery. All those patients who were concerned 6 weeks after the operation about their employment continued to be worried at the second post-operative interview. Individuals whose jobs had involved heavy manual work were pessimistic about their future employment prospects. Some patients found that their work performance was impaired by residual physical symptomatology, others by an impaired ability to concentrate.

Social Support

26% of patients considered that they were in need of more social support. All the patients diagnosed as distressed reported the need for more support, whereas only 3 of the non-distressed patients felt they needed more help. Many patients were very aware of the strain their heart disease had placed upon their family. One spouse said, 'Every one always asks after my husband, but my life has been affected by the heart disease as much as his has.' Of the entire sample, 50% felt that their family needed more support.

Psychological Dimension

More than half of the sample (56%) believed that they had benefitted from the operation by merit of being in less pain, tired and breathless; only one of the depressed group considered that he had benefitted from the operation. However, more than half of the individuals recognised that they were no more active subsequent to the operation; they were just satisfied to be in less physical discomfort.

Of the 35% of patients who felt that they had not achieved as good a recovery as they had expected, 67% were classed as having a psychiatric illness. Of the total group, 67% quoted the continued experience of severe physical symptoms of pain and breathlessness 6 months after surgery as being the main cause of their disappointment with recovery.

Half of the distressed group were worried about their future employment prospects, compared to 29% of the non-distressed group. They felt more dependant upon others without having a job, which had affected their self-esteem. All but one of the distressed patients felt guilty about their reliance upon others, where as only 14% of the non-distressed group considered this to be a problem.

Although some patients were able to adapt to not having the same pastimes, others were very disappointed. Six months after surgery, 50% of patients had not resumed their pastimes, the most common reasons given being fear of pain and a diminished ability to concentrate. Although many of the patients recognised that they did not suffer from pain very much any more, they were apprehensive of its recurrence and were therefore very cautious. All the distressed patients said that they were frustrated by the resulting lack of activity, yet of the non-distressed group, only 18% found this to be a cause for concern.

A third of the entire sample complained of having difficulty concentrating and memory problems since having had surgery. The

majority of this group comprised those individuals who were classed as distressed.

Six months after surgery, 44% of patients said that they felt vulnerable, some more so than at 6 weeks after the operation. Several distressed patients found the scar of the operation to be very disfiguring. One patient said he felt he had been 'brutalised' when he first saw it in the Intensive Care Unit. Although patients recognised that other organs are equally essential to life, they felt that having surgery performed on the heart generated a particularly strong emotional response.

For some patients, these feelings of vulnerability related to their aspirations of life after surgery not being met. They had hoped to feel stronger, but instead, they were not able to relinquish the fear of mortality. As one man said, ' You recognise that you are not infallible. That makes you feel very vulnerable.' Another man commented, ' Before the surgery, I felt that my heart was like a time bomb. I had thought I would feel differently now, but I don't.' All of the distressed group reported feeling vulnerable and having low self-esteem, 29% of the non-distressed group reported feeling similarly.

Discussion

Patients with coronary artery disease were shown to have high levels of psychological morbidity. Pre-operatively, 41% of this study sample scored at above threshold levels of the GHQ; 6 weeks after the operation, this had reduced to 19.5%. Six months after surgery, 18% of the sample had mental health problems. This is consistent with other research findings (Llangeluddecke et al. 1989, Bryant and Mayou, 1989). The incidence of psychological morbidity in this sample before surgery is four times that of the proportion described in the general population and six months after the operation, the prevalence of psychiatric cases remained above the population average according to above threshold scores of the GHQ (Goldberg and Huxley, 1980).

For some patients, emotional distress was associated with physical discomfort and post-operative complications. Yet in many cases, psychological morbidity was not closely related to physical symptomatology. In this detailed investigation, a range of psychosocial factors were also correlated with poor mental health. This section will discuss the significance of these findings in relation to psychological theories of mental health and other research studies.

The themes that emerged in the analysis of the qualitative data were highly consistent with the variables identified in the hypotheses. Patients' reports of their experiences generally agreed with the results of the quantitative analysis. The semi-structured interviews will be used to elaborate upon the findings of the quantitative data analysis.

Physical Dimension

There was no significant difference in the reported severity of the physical symptomatology between the distressed and non-distressed groups before surgery. However, the extent to which the physical symptoms affected patients was found to be predictive of psychological morbidity; some patients reported feeling very vulnerable as a result of the pain and discomfort.

The way in which patients thought about their physical symptoms affected how anxious they were likely to become. Patients who interpreted the physical symptoms of heart disease in a threatening manner became very anxious, which may have exacerbated the symptomatology. This supports the cycle of anxiety as described by Mathews and Macloed (1986). Those patients who thought of their heart as a 'time bomb' became very anxious when they had angina as they were afraid of having a myocardial infarction. Other patients may have suffered as much pain but minimised the seriousness of their condition by not considering the risks of mortality. These patients also tended to diminish the severity of the forthcoming operation by referring to it as 'replumbing'. Such cognitive appraisals would be expected to provoke less anxiety.

Distressed patients reported to have made a poorer recovery than expected and to have more pain than non-distressed patients. This was cited as being one of the main causes of their disappointment with surgery. Other research findings have also shown that atypical chest pain and breathlessness were correlated with psychological morbidity (Bass, 1984, Mayou and Bryant, 1987, Klimes et al. 1990).

In some cases, patients may have misinterpreted the normal sternal discomfort (due to the surgical procedures) for cardiac pain, as has been noted in other studies (Wilson-Barnett, 1981). It could be argued that it is symptomatic of highly anxious or depressed patients to complain more of pain and a poor recovery than others who are not distressed. Alternatively, these patients may have become distressed because they did not have as good a clinical outcome as other patients. Further investigation needs to be conducted to clarify this complex relationship.

The degree of physical symptomatology was not closely related to patients' levels of activity and engagement in pastimes. In the semi-structured interviews, many patients who experienced pain reported that they planned their lives carefully so as to minimise the limitations imposed by the heart disease. Other patients were very cautious and no longer tried to engage in activities for fear

of the recurrence of the pain, having been conditioned to associate particular experiences with discomfort.

It is predicted by Ferster's operant model (1974) that inactivity, as an adaptive response to discomfort, can be negatively reinforced. Even if the operation was successful, some patients had learnt to associate being active with feeling pain; they therefore remained passive. Distressed patients were more likely to report feeling frustrated by their inactivity and tended not to pick up alternative pursuits that better suited their physical condition. It was those patients who had a limited repertoire of behaviours and had therefore fewer opportunities for positive reinforcement who were more at risk of developing depression (Ferster, 1974).

Experience of Medical and Surgical Management

Although it may be anticipated that cardiac patients would feel anxious before surgery, in some cases, the way in which patients were managed by the medical system exacerbated their worries. Patients who were told that they would die if they did not have surgery or that they had a 'damaged heart', became worried they may not survive long enough to have the operation. To be told of the failure rate of the operation, not the success rate, also heightened some patients' fears of mortality. Given that pre-operative health checks can be potentially disturbing, any information about patients' personal risk should be explained carefully and in a manner which is sensitive to the patients' emotional response (Nichols, 1993). As the findings show, these recommendations were not always adhered to.

Patients who were intensely worried about the forthcoming surgery were highly likely to have poor mental health, yet there was no mechanism in the standard hospital procedures whereby these patients could be identified. Medical staff often do not notice which patients have high levels of psychological morbidity (Brody, 1980), and even if they were correctly identified, there was no service to which they could be referred. Clinical evidence

suggests that careful preparation for surgery can reduce patients' distress and thereby facilitate physical recovery (Anderson, 1987). Services that met patients' needs may not only improve patients' experiences of hospitalisation by reducing the distress experienced, but also prove to be cost effective.

Having had distressing experiences in the Intensive Care Unit was predictive of psychological morbidity up to six months after surgery. Other research evidence has also highlighted how the experiences in the Intensive Care Unit can be intensely distressing to patients (Clit and Popa, 1985). Apart from being shown the Intensive Care Unit before surgery, patients did not receive any further preparation for this period of hospitalisation. Patients varied as to what aspects of the experiences in the Unit were most distressing.

In the semi-structured interviews, a proportion of patients described the nightmares that they experienced in the Intensive Care Unit as still being upsetting six months after surgery. Patients often felt embarrassed by these images and tried to avoid talking about them. With reference to Rachman's theory on emotional processing (1980), when individuals undergo a traumatic event, the disturbing image frequently intrudes upon their cognitive processes and they re-experience the associated emotions. However, by avoiding the recollection of these images due to the anxiety provoked, satisfactory processing can be inhibited. Incomplete emotional processing implies that the images would continue to disturb the patients.

More patients with high levels of psychological morbidity reported six months after surgery that they had been insufficiently prepared for discharge, compared those who were not distressed. There was no significant difference between the distressed and non-distressed groups as regards preparation for discharge at the first post-operative interview. Six weeks after surgery is still relatively early in the process of rehabilitation, it may be some patients became distressed by the difficulties that they later encountered.

Distressed patients had more post-operative complications than the non-distressed patients and many felt that they had not been prepared for such potential difficulties by the hospital staff. Some distressed patients were worried that their condition warranted further surgery, and were frustrated that they had been given little information about their condition or prognosis. Anxious patients recognised that they had become hypersensitive to any chest pain as they did not know how to differentiate between normal and abnormal symptoms. This tendency has been identified in other research studies (Flyn and Frank, 1987). High anxiety levels on discharge limited how much information had been retained.

It appears that the standardised hospital programme did not provide all the information that was required and that additional encouragement and support were needed, particularly for those patients with high levels of psychological morbidity. This is consistent with other research findings (Mayou, 1992). Even if information is well presented and comprehensible, anxious patients will find it difficult to retain what has been said to them or to question the doctor about points that are unclear (Nichols, 1993).

By presenting information carefully and sensitively, patients are not only more likely to have realistic expectations of surgery and to be less strained by the confusion generated through lack of knowledge, but also to participate more in their own self-care. According to Rutter (1989), patients will only adopt preventative health behaviour if they consider that they are susceptible, that the harm caused by not changing their behaviour is severe and that the proposed benefits of change are tangible. New information about healthy lifestyles will be measured according to patients' previously held health beliefs (Becker, 1974). Medical staff need therefore to investigate with patients what the information represents to them and how it fits in with their preconceived beliefs about health.

Social Dimension

There were no significant differences in the need for more social

support between the distressed and non-distressed groups before surgery and at six months post-operatively. Only at the six week stage after surgery did the distressed group report not having enough support compared to the non-distressed patients. This finding is not consistent with other studies where a strong correlation was found between psychological morbidity and lack of social support (Coomes, Roberts and Crist, 1989, Fontana, Kerns, Rosenberg and Colonese, 1989).

These findings may be partly accounted for by a confusion between the extent of support received and the type needed. Patients reported in the semi-structured interviews that they had enough support, but it was not necessarily the sort that they needed. Some patients needed to talk about the emotional impact of the heart disease and surgery, but felt that they had no one to whom they could confide their fears. If the surgery had been successful, many patients felt that they should not be distressed, and therefore found it difficult to discuss with others why they still felt vulnerable and depressed. Others felt that their families, by doing too much for them, actually inhibited them from being as active as they would have liked to be.

Patients with high levels of psychological morbidity were significantly more likely to have difficulties relating to employment compared to those patients who were not distressed. Only at the six week stage after surgery was there no significant difference in the problems relating to employment between the distressed and non-distressed groups. During the early stages of recovery, patients remained optimistic about their employment opportunities. However, six months after surgery, they found that they were either not able to find further employment or to perform to the expected standards when back at work. Employment difficulties have been correlated with poor mental health in other studies (Mayou and Bryant, 1987).

Employment difficulties affected many aspects of patients' lives. Patients reported that by no longer being able to contribute

financially towards the household due to their loss of employment, they felt more reliant upon others. Many felt guilty about this and missed not being able to fulfil their habitual roles. The change in their employment status also had financial implications.

There was no significant difference before surgery in the extent to which distressed and non-distressed patients engaged in pastimes, although distressed patients were more likely to report feeling frustrated by their inactivity. After surgery, fewer distressed patients had returned to their pastimes compared to the non-distressed group. Patients with high levels of psychological morbidity reported to be restricted by persistent pain and breathlessness, or were over-cautious in their mobilisation should these symptoms re-occur.

Many individuals' self-worth is largely derived from their job or participation in certain pastimes. Patients reported that their self-esteem had been badly affected by no longer being able to fulfil the roles that they had previously been able to do. Grief is a normal response that occurs in response to the experience of any major loss (Janis and Levanthal, 1965); patients with high levels of psychological morbidity could be described as grieving over what they had lost as a result of the heart disease. This can be an adaptive process as patients detach themselves from what they no longer have, although many patients may need support to adapt to a new self-image.

Psychological Dimension

Heart disease and bypass surgery can have a major impact on patients' lives. Although the quality of many patients' lives is greatly enhanced by heart bypass surgery, for a substantial proportion of cases, the outcome is less than satisfactory. Distressed patients scored significantly higher on both the pre- and post-operative cardiac questionnaires than the non-distressed group. This indicates that patients with high levels of psychological morbidity suffered more disturbance in their lives subsequent to the diagnosis of heart disease and surgery than non-

distressed patients.

Given the dispersion of loadings in factor analysis, it is inevitable that the various scales will not be pure measures of the factors. In spite of this, factor analysis of the cardiac questionnaires in this investigation clearly revealed different psychosocial features as being pertinent to patients' experience before and after surgery. In so doing, it was demonstrated that the cardiac questionnaires have factorial validity and measure psychosocial functioning.

This study indicates that psychiatric outcome after surgery cannot be reliably predicted on the basis of pre-operative mood. The low correlation between pre- and post-operative mood is consistent with other research (Bryant and Mayou, 1989). Other psychosocial characteristics, such as feeling vulnerable as a result of the physical symptoms heart disease, may give a stronger indication of whether patients will have high levels of psychological morbidity after the operation.

Patients with poor mental health six weeks after surgery were likely to continue to have psychological difficulties later on. Certain psychosocial factors were also be predictive of psychological morbidity in the post-operative period. Pain was most predictive of poor mental health six weeks after surgery, followed by restricted engagement in pastimes and distress experienced in the Intensive Care Unit. Six months after surgery, the presentation had changed, feeling reliant on others was the strongest predictor of poor mental health, followed by employment difficulties and fear experienced in the Intensive Care. It could be argued that a cautious mobilisation and being restricted by pain and breathlessness in the early stages of recovery made patients more reliant upon others as they took on a 'sick role'. Physical symptomatology became less predictive of psychological morbidity than other factors as time progressed.

Pre-operatively, half of the patients reported that the physical

symptoms of the disease made them feel vulnerable as they were constantly aware of the threat of having a myocardial infarction. Many patients had expected that their fears would subside after surgery, yet for 44% of the sample, the feeling of vulnerability remained six months after the operation. With reference to Maslow's hierarchy (1967), it may be inferred that the lower level needs of survival had been met, but the experience of heart disease prevented patients from feeling that their higher order needs of safety and self-actualization were fulfilled.

Many patients found it very difficult to cope with the uncertainty incurred by the heart disease. The majority of patients who considered that they had no control over the disease before the operation were distressed. These patients believed that there was little they could do to affect their physical symptoms or the course of the disease. After surgery, some patients doubted that their condition would ever improve. The way in which the care of many patients was managed, with little information being given about their prognosis, exacerbated these feelings of helplessness. According to the reformulated version of the learned helplessness theory (Abramson, Seligman and Teasdale, 1978), patients' mental health is affected by the nature of their cognitive attributions. Those patients who believed that their heart condition was a permanent threat over which they had no control and that the negative changes brought about by the heart disease were permanent, were likely to become depressed.

Some research has demonstrated that patients' cognitive functioning may be impaired after heart bypass surgery (Sotaniemi, Mononen and Hokkanen, 1986, Newman et al. 1987). However, the extent to which such deficits impede patients' functioning has been shown to be largely dependant on their mental health status (Mayou, 1992). In this study, about a third of both post-operative groups complained in the interviews of not being able to concentrate well since having had surgery. The majority of those who complained of such problems were also depressed. Given that no formal neuropsychological testing was conducted in this study, it is not

possible to differentiate definitively between neurological or affective impairment. However, given that the majority of patients who had problems with concentration were depressed, affective impairment may well have been the predominant problem in many cases.

Summary

Coronary artery disease and bypass surgery can have major psychiatric and social sequelae. Poor psychosocial outcome is as much related to psychological factors as continued physical symptomatology. Psychiatric outcome after surgery is not highly correlated with pre-operative mood, other psychosocial characteristics may be better predictors psychological morbidity. Patients who experience psychological problems early in convalescence are likely to continue to have difficulties. Having had distressing experiences in the Intensive Care Unit was consistently predictive of psychological morbidity in the post-operative period. Other psychosocial features were also highly correlated with post-operative mood.

Recommendations for Clinical Practise

These findings suggest that the benefits of surgery could be enhanced if services were provided that better met patients' needs. The following implications for clinical practice will be considered in turn; management of pre-operative care and rehabilitation, identification of those with high levels of psychological morbidity and the provision of psychological treatment.

Many patients considered in retrospect that waiting for surgery had been the most difficult period. Yet with better use of the time before surgery, it is possible that psychiatric morbidity could be reduced. This period could be used as an opportunity for patients to prepare for surgery by, for instance, being taught relaxation exercises that would reduce their anxiety levels in the Intensive Care Unit. Interventions that have reduced patients' psychological distress post-operatively have also been shown to facilitate physical recovery (Anderson, 1987, Andrew, 1970, Delong, 1971).

This period could also be used to dispel unrealistic expectations of surgery and to discuss with patients how they could maximise the benefits of the operation by adopting a healthy lifestyle.

Many patients were not satisfied with the information about recovery. It was also commented that the style and context in which they were given the information was not commensurate with its retention. The local rehabilitation programmes tended to follow a standard procedure and were not tailored to meet individual needs. This is consistent with evidence that patients after myocardial infarction who have high levels of psychological morbidity find standard rehabilitation programmes inappropriate for their problems, resulting in poor rates of attendance (Mayou, Macmahon, Sleight, Florencio, 1981). Our findings suggest that some heart bypass patients require more than standard information and advice that concentrates upon common problems.

Communication between medical staff and patients can be improved by following certain guidelines (Ley, 1982a, Ley, 1982b). Information should be presented in an organised manner using simple terms and be tailored to the needs of each individual. Accurate recall is facilitated by the repetition of important points and reviews to check that patients have understood what has been said. It is often helpful if written information can substantiate what has been related verbally. Patients furthermore need to know who they can go to for information and advice; often no one person has responsibility for coordinating and relaying information (Ministry of Health Report, 1963, Nichols, 1993).

The mechanisms were not in place in the hospital to identify those patients with high levels of psychological morbidity. Research shows that medical staff often do not notice which patients have psychological problems in their routine interactions and appropriate treatment is therefore not provided on many occasions (Eriksson, 1990, Maguire, Taite and Brooke, 1980). Follow-up after surgery should not only include a medical investigation, but also an assessment of patients' mental health and psychosocial

functioning.

This study indicates that it is difficult to accurately predict which patients will have psychological difficulties after surgery on the basis of their pre-operative mood. However, those patients with high levels of psychological morbidity a few weeks after surgery are likely to continue to experience difficulties later on in rehabilitation. Certain psychosocial factors may be predictive of patients' subsequent mental health.

Patients with a poor psychiatric outcome should be referred on to appropriate treatment. Each patient needs to be assessed individually and the type of treatment offered should reflect their particular problems. A patient who is being excessively cautious after surgery may be helped by a behavioural programme of graded exercise, where as another patient who still has distressing memories of the Intensive Care Unit may benefit from counselling.

The objective of coronary artery bypass surgery is to not only extend patients' lives, but also to improve the quality. The evidence suggests that although patients' medical needs may be well attended to in hospitals, the impact of the disease and surgery upon patients' mental health tends to be neglected. By incorporating the above recommendations into hospital practise, the overall care of patients would be improved.

Critique

Patients were interviewed in the pre-operative ward on the day of admission to hospital. It was difficult to maintain patients' privacy in these circumstances and some patients declined to be part of the study on account of this. Given that there was no other provision where patients could be interviewed, it was not possible to set up any alternative system.

It was anticipated that there would be a trade-off between the detail with which patients were investigated and the number of patients involved in the study. The sample size was further limited by the large geographical distance that had to be covered for the post-operative interviews. With the help of an assistant, more patients could also have been included in the research. A larger sample size would have strengthened the study by increasing the reliability and validity of the findings.

The attrition rate of the final post-operative interview was high. This may have resulted in a skewed sample in that the patients who withdrew may have done so as they were distressed. Follow-up of these patients may have elucidated the reasons of their decision to withdraw.

There were some inconsistencies in the data collection. Spouses were included in some of the post-operative interviews and contributed valuable insights into the impact of the heart disease on the patient and family. Some patients were also more guarded about describing the nature of their difficulties if a family member was present. This source of inconsistency was offset slightly by the cardiac questionnaires which were filled in by the patients without the involvement of family members.

Post hoc reliability and validity tests were conducted on the cardiac questionnaire with the sample population. Given that the questionnaire was based upon psychological theory, clinical experience and patients' reports in the pilot interviews, it was

judged that this was an acceptable risk to take. If there had been more time, it would have been more appropriate if the questionnaire had been tested upon a different population before starting the study.

To test the temporal reliability of the post-operative questionnaire, patients were asked to fill out a second cardiac questionnaire four days after the first one had been completed. Given that progress at this stage in the rehabilitation is often rapid, a longer period between the completion of the questionnaires may have represented real differences in the patients recovery. There remains a risk, however, that the stability of responses was a reflection of the patients remembering their previous responses. Further testing needs to be carried out if the questionnaire is to be used more widely in clinical settings.

Some of the distressed patients in the study may have had high levels of psychological morbidity regardless of the heart disease. Being depressed, it may be anticipated that their perspective would be more negative than patients who were not psychologically disturbed. As with all correlations, it is not possible to conclude the direction of causality. Although distressed patients tended to attribute their low mood to the heart disease and surgery, the presence of other confounding factors cannot be ruled out.

Further evidence may have clarified the direction of some of the correlations. For instance, some patients' complaints of post-operative complications and pain may have been symptomatic of their poor mental health. Others may have become depressed as a result of the surgery not having been successful. With more information about their medical condition and readmissions to hospital, it may have been possible to establish whether patients' poor mental health or poor physical health was the predominant problem.

The emphasis in this study was upon the factors that may account

for the development and maintenance of depressive symptomatology in patients with coronary artery disease. Yet by concentrating upon those patients who became distressed, not enough attention was given to those patients who maintained good mental health. Not all the patients at risk of psychological morbidity actually became distressed, it may be that these patients employed effective strategies to maintain their psychological well being. These techniques may be applicable to those patients with high levels of psychological morbidity.

With the benefit of hindsight, improvements in the design and method are clear. However, there are some aspects of the study, such as the presence of confounding factors, that cannot be eliminated from clinical research. In considering the problems encountered in this study, opportunities for future research present themselves.

Directions for Future Research

This study suggests that a substantial proportion of heart bypass patients have mental health needs that are not being met by the existing services. Detailed investigation needs to be continued into the development and maintenance of poor mental health with this group of patients. Intervention studies also need to be set up to establish what type of services would be most effective in reducing psychological morbidity. The benefits of this provision in relation to patients' quality of life and physical recovery need to be monitored.

A more thorough understanding of the psychological problems experienced by cardiac patients may be gained with large prospective studies. The incidence of psychological morbidity in a sample population before the diagnosis of heart disease should be measured. Subsequent levels of psychological morbidity after diagnosis and bypass surgery could be compared to this baseline. This would give an indication of the impact heart disease and surgery has upon patients' mental health. In order to identify the long term effects of these experiences, patients' mental health and psychosocial functioning need to be assessed several years after surgery. Larger sample sizes are needed to identify whether the correlations that emerged in this relatively small scale study are consistent with other populations.

Having gained a more thorough understanding of the psychosocial problems encountered by heart bypass patients, intervention studies need to be carried out. It is important to identify if psychological therapy can ameliorate cardiac patients' mental health problems as this would indicate what type of service provision is required for this client group. The effect of reduced psychological morbidity upon the use of hospital resources also needs to be evaluated in order to establish the cost effectiveness of any new service provision. More sophisticated services would not only provide better care for the patients, but may also prove to be cost effective.

Further research needs to establish whether heart bypass patients present with particular mental health problems, or if other cardiac patients also have similarly high levels of psychological morbidity. In order to do this, a longitudinal study needs to be set up whereby a group of heart bypass patients are matched for age, sex and severity of physical condition with a group of patients due to have another type of cardiac operation.

There remains a pressing need to gain a better understanding of the factors that contribute to the development of psychological morbidity in cardiac patients. Research findings need to be applied to clinical practise in order to provide efficient services that meet patients' needs.

Appendix 1

Patient Information Sheet

Thank-you for agreeing to take part in this study. This project is concerned with the psychological well being of the patients in this unit. Over the years it has been recognised that heart disease can have a large impact on a patients life. We are concerned about this and would like to develop ways to help patients who experience difficulty. In order to do this, we obviously need to ask patients about their own experiences.

We will be asking you to complete some questionnaires and then we will interview you about how things have been for you in your life. We would like to see you before surgery and then six weeks and six months later. All the information will be confidential and you are free to withdraw at any stage, before, during or after the study. Your decision to withdraw will not affect your treatment in any way.

If you would like any more information about this study we will be happy to provide it. Please feel free to contact Belinda Hacking or Freda Gardner at the BRI academic cardiac surgery unit, (tel no;0272-283143) at any time at or after the study.

Appendix 2

Semi-Structured Interviews

Patients will be interviewed to assess the social, psychological and physical effects of coronary heart disease and its surgical management. These interviews will be conducted when patients are admitted to hospital the day before surgery, then at six weeks and 6 months post-operatively.

The first interview will include patients demographic details, premorbid social, medical and family history. The areas that were covered are outlined below.

Pre-operative Semi-Structured Interview

Physical Symptoms

Restraints on activity

Tiredness

Pain

Other symptoms

Experience of pre-operative investigations

Experience of medical and surgical management

Preparation for surgery

Understanding of information about the disease

Social Dimension

Social Support

Leisure and employment status

Reliance upon others

Psychological Dimension

Feelings of vulnerability

Self-esteem

Insight or denial of disease

Feeling prepared for surgery

Sense of personal control over the disease
Premorbid history of depression
Family history of depression

Post-Operative Semi Structured Interview

Physical Symptoms

Experience of pain
Remaining physical discomfort
Other symptoms
Effect of this on patient
Expectations of recovery

Experience of Medical and Surgical Management

Experience of Intensive Care Unit
Experience of Low Dependency Unit
Preparation for discharge
Information relating to rehabilitation

Social Dimension

Employment status
Social support
Resumption of pastimes
Reliance on other people

Psychological Dimension

Feelings of vulnerability
Self-esteem
Problems with memory or concentration
Quality of life
Particular difficulties/pressures
Benefits of surgery

Appendix 3: Pre- and Post-Operative Cardiac Questionnaires
General Health Questionnaire (30)
Hospital Anxiety and Depression Scale (HAD)

Cardiac Questionnaire

Cardiac Questionnaire

How often have you been in pain as a result of heart disease?	Never	Sometimes	Frequently	Constantly
How would you describe the pain?	Mild	Moderate	Severe	Very Severe
How much has your pain restricted you?	Not at all	Sometimes	Frequently	Constantly
Have you felt tired?	Not at all	A little more than usual	Quite a lot more	Constantly
Have you felt breathless?	Not at all	Sometimes	Frequently	Constantly
Can you relieve your physical symptoms?	Always	Often	Sometimes	Never
Have the physical symptoms affected you in your self?	Not at all	A little	Quite a lot	All the time
Have your friends/family been supportive?	Very supportive	Moderately	Not very supportive	Not at all
Has this support been helpful?	Very helpful	Quite helpful	Not very helpful	Not at all
Do you feel that you need more support?	No more	A little more	Quite a lot more	Much more
Does you partner/family need more support?	No more	A little more	Quite a lot more	Much more
Do you rely on the support of others more as a result of your heart disease?	Not at all	A little more	Quite a lot more	Much more
How much has your heart disease affected you in your self?	Not at all	A little	Quite a lot	A lot
How badly has your heart disease affected your employment?	Not at all	A little	Quite a lot	A lot

Have you been able to continue your pastimes since having heart disease?	As much as before	A little less	Quite a lot less	Much less
Have you changed your activities as a result of the heart disease?	None	A few	Many	All
Have you found that you have had less confidence since you were diagnosed as having heart disease?	Same as before	A little less	Quite a lot less	Much less
Have you been feeling scared or anxious?	No more than usual	A bit more	Quite a lot more	Much more
Do you get as much pleasure out of things as you used to?	As much as before	A little less	Quite a lot less	Much less
Have you been feeling unhappy and depressed?	Not at all	Rather more than usual	Quite a lot more	Much more
Have you ever been treated for a mental health problem?	No	For less than 1 year	For between 1-5 years	For more than 5 years
Did you feel ready to come into hospital for surgery?	Completely	Moderately	Fairly	Not at all
Are you feeling worried about the heart surgery?	Not at all	Mildly	Moderately	Extremely
How helpful is the information that you have had from the staff about heart disease and the surgery?	Very helpful	Quite helpful	Not that helpful	Very unhelpful
Would you have liked to have been told more from the staff?	No more	A little more	Quite a lot more	Much more
Has your surgery been postponed?	No	Once	Twice	Three times
Do you currently have other medical problems?	None	A few	Some	Many
Do you think that any of these conditions may be affecting the way you are coping?	Not at all	A little	Quite a lot	Very much

Cardiac Questionnaire

Operative Questionnaire

Did you experience pain when you were in the intensive care unit?	Never	Sometimes	Frequently	Constantly
(If applicable) How would you describe the pain?	Mild	Moderate	Severe	Very severe
Was your pain well controlled?	Very well controlled	Adequately	Not very well	Not at all well
Did you experience discomfort when you were in the intensive care unit?	Never	Sometimes	Frequently	Constantly
How anxious were you?	Not at all	A little	Quite Anxious	Very Anxious
Did you feel frightened?	Not at all	A little	Quite Frightened	Very Frightened
Have these experiences affected you in your self?	Not at all	A little	Quite a lot	Very much
Do you have disturbing memories of of your experience in the intensive care unit?	Never	Sometimes	Frequently	Constantly
Looking back, do you think that you were prepared well for the experience of the intensive care unit?	Very well	Quite well	Not very well	Not at all well
Have your friends/family been supportive?	Very supportive	Moderately	Not very supportive	Not at all
Has this support been helpful?	Very helpful	Quite helpful	Not very helpful	Not at all
Do you feel that you need more support?	Less than before	The same	A little more	Much more
Does you partner/family need support?	Less than before	The same	A little more	Much more
How much do your rely on people since your operation?	Less than before	The same	More than before	A lot more
How badly has your operation affected your employment?	Not at all	A little	Quite a lot	A lot
Have you returned to your pastimes since having surgery?	As much as before	A little less	Quite a lot less	Much less

Have you found that you have had less confidence since you had the operation?	Same as before	A little less than before	Quite a lot less	Much less
Have you been feeling scared or anxious?	No more than usual	A little more than usual	Quite a lot more	Much more
Do you get as much pleasure out of things as you used to?	As much as before	A little less	Quite a lot less	Much less
Have you been feeling unhappy and depressed?	Not at all	A little more than usual	Quite a lot more	Much more
Have you been finding it hard to concentrate?	Not at all	Sometimes	Frequently	Constantly
Have you had problems with your memory?	Not at all	Sometimes	Frequently	Constantly
Have you been finding it hard to focus your mind?	Not at all	Sometimes	Frequently	Constantly
Have you had difficulty sleeping since returning home?	Not at all	Sometimes	Frequently	Constantly
Do you experience pain now?	Never	Sometimes	Frequently	Constantly
(If applicable) How would you describe the pain?	Mild	Moderate	Severe	Very severe
Are you breathless?	Not at all	Sometimes	Frequently	Constantly
Do you experience any other symptoms?	Not at all	Sometimes	Frequently	Constantly
Can you relieve this physical discomfort?	Always	Often	Sometimes	Never
Are you taking any medication?	None	Less than before	The same as before	More than before
Are you as healthy as you expected to be after the operation?	More healthy	As healthy as expected	Not as healthy	Much less healthy
How well did the staff prepare you for discharge?	Very well	Adequately well	Not that well	Not at all
Has the information you were given about rehabilitation been helpful?	Very helpful	Quite helpful	Not that helpful	Very unhelpful

GENERAL HEALTH QUESTIONNAIRE



Please read this carefully:

We should like to know if you have had any medical complaints, and how your health has been in general, *over the past few weeks*. Please answer ALL the questions on the following pages simply by underlining the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those you had in the past. It is important that you try to answer ALL the questions.

Thank you very much for your co-operation.

HAVE YOU RECENTLY:

1 — been able to concentrate on whatever you're doing?	Better than usual	Same as usual	Less than usual	Much less than usual
2 — lost much sleep over worry?	Not at all	No more than usual	Rather more than usual	Much more than usual
3 — been having restless, disturbed nights?	Not at all	No more than usual	Rather more than usual	Much more than usual
4 — been managing to keep yourself busy and occupied?	More so than usual	Same as usual	Rather less than usual	Much less than usual
5 — been getting out of the house as much as usual?	More so than usual	Same as usual	Less than usual	Much less than usual
6 — been managing as well as most people would in your shoes?	Better than most	About the same	Rather less well	Much less well
7 — felt on the whole you were doing things well?	Better than usual	About the same	Less well than usual	Much less well
8 — been satisfied with the way you've carried out your task?	More satisfied	About same as usual	Less satisfied than usual	Much less satisfied
9 — been able to feel warmth and affection for those near to you?	Better than usual	About same as usual	Less well than usual	Much less well
10 — been finding it easy to get on with other people?	Better than usual	About same as usual	Less well than usual	Much less well
11 — spent much time chatting with people?	More time than usual	About same as usual	Less time than usual	Much less than usual
12 — felt that you are playing a useful part in things?	More so than usual	Same as usual	Less useful than usual	Much less useful
13 — felt capable of making decisions about things?	More so than usual	Same as usual	Less so than usual	Much less capable

PLEASE TURN OVER

Hospital Anxiety and Depression Scale (HADS)



Name: _____ Date: _____

Clinicians are aware that emotions play an important part in most illnesses. If your clinician knows about these feelings he or she will be able to help you more.

This questionnaire is designed to help your clinician to know how you feel. Read each item below and **underline the reply** which comes closest to how you have been feeling in the past week. Ignore the numbers printed at the edge of the questionnaire.

Don't take too long over your replies, your immediate reaction to each item will probably be more accurate than a long, thought-out response.

	A	D		A	D
I feel tense or 'wound up'			I feel as if I am slowed down		
Most of the time			Nearly all the time	3	
A lot of the time			Very often	2	
From time to time, occasionally			Sometimes	1	
Not at all			Not at all	0	
I still enjoy the things I used to enjoy			I get a sort of frightened feeling like 'butterflies' in the stomach		
Definitely as much			Not at all	0	
Not quite so much			Occasionally	1	
Only a little			Quite often	2	
Hardly at all			Very often	3	
I get a sort of frightened feeling as if something awful is about to happen			I have lost interest in my appearance		
Very definitely and quite badly			Definitely		3
Yes, but not too badly			I don't take as much care as I should		2
A little, but it doesn't worry me			I may not take quite as much care		1
Not at all			I take just as much care as ever		0
I can laugh and see the funny side of things			I feel restless as if I have to be on the move		
As much as I always could			Very much indeed	3	
Not quite so much now			Quite a lot	2	
Definitely not so much now			Not very much	1	
Not at all			Not at all	0	
Worrying thoughts go through my mind			I look forward with enjoyment to things		
A great deal of the time			As much as I ever did		0
A lot of the time			Rather less than I used to		1
Not too often			Definitely less than I used to		2
Very little			Hardly at all		3
I feel cheerful			I get sudden feelings of panic		
Never			Very often indeed	3	
Not often			Quite often	2	
Sometimes			Not very often	1	
Most of the time			Not at all	0	
I can sit at ease and feel relaxed			I can enjoy a good book or radio or television programme		
Definitely			Often		0
Usually			Sometimes		1
Not often			Not often		2
Not at all			Very seldom		3

Now check that you have answered all the questions

	A	D
TOTAL		

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