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SELF-RESPONSIBILITY PREDICTS THE SUCCESSFUL OUTCOME OF CORONARY ARTERY BYPASS SURGERY

Cecelia Johanna Eales

A thesis submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of
Doctor of Philosophy

Johannesburg, 1998

DECLARATION

., Cecelia Johanna Eales, declare that this thesis is my own work. It is being submitted for the degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

.....C.J. Eales.....

5th day of August, 1998

PUBLICATIONS AND PRESENTATIONS ARISING FROM THIS STUDY

PUBLICATIONS

Eales C, Stewart A, Noakes T, Goodman M 1998 Successful rehabilitation in patients with chronic disease. South African Journal of Physiotherapy 54: 6-9

Eales C, Stewart A 1994 Factors which may predict successful rehabilitation in patients who have undergone coronary artery bypass surgery: A pilot study. South African Journal of Physiotherapy 49: 45-49

Eales C J 1989 Instruction about rehabilitation after coronary artery bypass surgery. South African Journal of Physiotherapy 45: 49-51

PAPERS PRESENTED

Eales CJ, Noakes TD 1991 The acceptance of self-responsibility for rehabilitation following CABG surgery. The National Congress of the South African Society of Physiotherapy, Pretoria, South Africa.

Eales CJ, Goodman M, Meyer T 1993 A study to determine whether the designed questionnaire provides a reliable method of assessing improved quality of life and the acceptance of self-responsibility. The National Congress of the South African Society of Physiotherapy, Johannesburg, South Africa.

Eales CJ, Stewart A, Noakes TD, Goodman M 1995 Investigation into the acceptance of self-responsibility in patients who have undergone CABG. International Congress of the World Confederation of Physical Therapy, Washington DC, USA.

Eales CJ, Noakes TD, Goodman M. Stewart AV 1997 Self-responsibility: A component of improved quality of life in patients following coronary artery bypass surgery. International Congress of the South African Society of Physiotherapy, Cape Town.

Eales CJ, Noakes TD, Goodman M, Stewart AV 1997 Self-responsibility: a component of improved quality of life in patients following CABG surgery. Fifth National Cardio-Thoracic Special Group Conference, Fremantle, Western Australia.

Eales CJ, Noakes TD, Goodman M, Stewart AV 1998 Self-responsibility is an important aspect in the successful outcome of CABG surgery. World Confederation of Physical Therapists Africa, Pretoria, South Africa.

ABSTRACT

Coronary heart disease (CHD) is the most common cause of death in the western world (Roberts, 1992). A high incidence of CHD is also reported for the White and the Asian population of South Africa (Wyndham, 1979). Coronary artery bypass graft (CABG) surgery continues to be a proven, effective therapy to relieve symptoms of angina, to improve the patient's quality of life and to prolong life in selected patients (Connolly and Guyton, 1992). This intervention is costly and the operative success of coronary revascularization is limited unless the patient understands and will adhere to the prescribed medical regimen, diet and exercise after surgery (Marshall et al, 1986). The problem is compounded as post-operatively, the symptoms of coronary artery disease are ameliorated and the patient may be unaware of the persistence of the disease process. In addition, the World Health Organisation's definition of cardiac rehabilitation, puts forward the concept that the patient must accept responsibility for his or her own recovery (Oldridge, 1986). The role that the patient plays post-operatively must therefore become important in the final outcome. In 1977 Ginzberg wrote: "No improvement in the health care system will be efficacious unless the citizen assumes responsibility for his/her own well-being". This statement implies that people must take charge of their own health and not abrogate this responsibility to the experts.

This study was designed to determine whether the acceptance of self-responsibility is an important determinant of the successful outcome of coronary artery bypass graft (CABG) surgery. The final study was preceded by five pilot studies to assist in formulating and identifying the concept of self-responsibility. Questionnaires were designed to determine aspects of improved quality of life and self-responsibility. For the final study, 75 patients who had undergone CABG surgery, were selected from surgical patients in the private as well as the public sector. In order to assess the acceptance of

self-responsibility, the spouses/care-givers of the patients were included in this study. Patients were interviewed 4 to 6 days after the operation, and again six months and 12 months later. Successful outcome was measured in terms of improved quality of life using the criteria suggested by the Coronary Artery Surgery Study (Coronary Artery Surgical Study Principal Investigators, 1983). The acceptance of self-responsibility was then investigated as a possible factor influencing the improvement of the quality of life of these patients.

It was found that the acceptance of self-responsibility for the successful outcome of CABG surgery was a significant factor in the group of patients with an improved quality of life ($p<0.01$). From the results of this study, a profile of South African patients with improved quality of life was identified. They are: Men, married, annual income > R50 000 (US $8 000), who had a normal sex-life prior to the operation. They differ significantly from the group without an improved quality of life in the following aspects: they had spent more hours participating in sport at school ($p=0.04$), had stopped their sporting activities for a shorter period of time prior to the operation ($p<0.01$) and were taller ($p<0.01$). They were not depressed 12 months after the operation ($p<0.01$).

Patients who accept self-responsibility for their recovery after CABG surgery have the following characteristics: married ($p<0.01$), have a level of education > grade 12 ($p=0.01$), have an annual income > R50 000 ($p=0.05$). They differ from the group who are not responsible in that they and their spouses/care-givers have more knowledge about the disease and the risk factor modification ($p=0.01$; $p<0.01$), and twelve months after the operation the patients are satisfied with the outcome of the operation ($p<0.01$).

A stepwise logistic regression established that the acceptance of self-responsibility was the strongest predictive factor for an improved quality of life after CABG surgery. Patients who did not accept responsibility would not

have an improved quality of life irrespective of the impact of all other parameters.

Patients' satisfaction with the outcome of the operative procedure is an important predictor of the acceptance of self-responsibility. Realistic expectations of the outcome of CABG surgery will improve patients' satisfaction with the outcome. The knowledge of the spouse is a significant factor in the patients' acceptance of self-responsibility. The spouse of a patient is frequently neglected by health- care workers and yet this person is very important for the patient's successful lifestyle change. Knowledge of the chronic nature of their disease as well as risk factor modification and realistic expectations of the outcome of CABG surgery influences patients' acceptance of self-responsibility. Every effort should be made to assist patients in accepting the responsibility for their own recovery so that the outcome of CABG will be successful.

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LIST OF ABBREVIATIONS

ACE.....	Angiotension-converting enzyme
AHA.....	American Heart Association
BARI.....	Bypass, angioplasty revascularisation investigation
CABG.....	Coronary artery bypass graft
CAD.....	Coronary artery disease
CASS.....	Coronary artery surgery study
CHD.....	Coronary heart disease
HDL.....	High-density lipoprotein
HDL-C.....	High-density lipoprotein cholesterol
HOS.....	Health Opinion Survey
ICU.....	Intensive care unit
IDDM.....	Insulin dependent diabetes mellitus
IHD.....	Ischaemic heart disease
JNC V.....	Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure (Fifth report)
LDL.....	Low-density lipoprotein
LDL-C.....	Low-densit, lipoprotein cholesterol
LVEF.....	Left ventricular ejection fraction
MET.....	Metabolic equivalent
NIDDM.....	Non-insulin dependent diabetes mellitus
PTCA.....	Percutaneous transluminal coronary angioplasty
TOHP	The trials of Hypertension Prevention Collaborative Research Group
WHO.....	World health organisation

CHAPTER I

INTRODUCTION

STATEMENT OF THE PROBLEM

Coronary heart disease is the most common cause of death in the western world (Roberts, 1992). A high incidence of coronary heart disease (CHD) is also reported for the White and the Asian populations of South Africa (Wyndham, 1979).

Coronary artery bypass surgery is a common method of treatment for CHD. Since the introduction of surgical revascularisation for this disease, this operation has been and continues to be a proven, effective therapy to relieve symptoms of angina, to improve the patient's quality of life and to prolong life in selected patients (Connolly and Guyton, 1992). Surgical intervention remains the optimal therapy for severe symptomatic coronary artery disease when other medical therapies are unsuccessful or contra-indicated.

Coronary artery bypass surgery is an expensive intervention and the cost in South Africa (1995-1998) is in the range of R30 000 - R100 000 ($5 000 - $17 000). Krumholz (1997) stated that when comparing the mortality rates between a Canadian and a USA sample of elderly patients undergoing bypass surgery, the one-year mortality rate was virtually identical. However the USA sample had undergone bypass surgery 7.8 times as often as their Canadian counterparts. These results indicate that surgery is not the only treatment that saved the lives of patients.

However, should the patient be subjected to the surgical intervention, the objectives of the surgical intervention will be achieved only if patients understand that they have a chronic disease and that they should modify their lifestyle in order to stay well (Marshall et al, 1986). An empirical observation

of South African patients is that many of them are unaware that they have a chronic disease. They believe that the operation does indeed offer a complete cure. Similar observations have been reported by other researchers (Kinchla and Weiss, 1985). Patients who regard themselves as completely cured are not likely to be interested in or take responsibility for lifestyle modification after the operation.

There is growing evidence that aggressive risk factor modification can lower plasma lipids, reverse atherosclerosis and substantially diminish acute cardiac events in patients who already have the disease (DeBusk, 1996; Eagles et al, 1996; Maines et al, 1997). In the acute care setting the physician is responsible for the care of the patient and the role of the patient is passive. However in the chronic setting when a patient has to comply with lifestyle changes and risk factor modification, the patient is the only one who can decide to do this effectively and the role of the patient changes from passive to active.

Considering the cost of coronary artery bypass surgery and the fact that the outcome is unlikely to be successful unless the patient complies with a prescribed programme of risk factor modification and lifestyle change, patients' involvement to ensure a successful outcome has to be considered. If the patient does become involved should they not also accept the responsibility for the successful outcome?

The question to ask therefore is: is self-responsibility a factor in the successful outcome of coronary artery bypass surgery? If it is, which patients are most likely to become responsible, and so ensure the successful outcome of the surgical intervention.

SIGNIFICANCE OF THE PROBLEM

As the 20th century draws to a close there is an international demand that medical care should become more cost effective and instead of increasing facilities for sophisticated interventions such as CABG surgery, low cost interventions such as risk factor modifications become essential (Krumholz, 1997). This is specially the case in South Africa where there is pressure to ensure equitable distribution of available health resources to all sections of the community.

It seems that risk factor modification is an essential low cost intervention for the management of coronary heart disease, both as a preventative and maintenance measure after coronary artery bypass surgery.

Many patients regard the operation as a complete cure (Kinchla and Weiss, 1985). They do not realise that they have a chronic disease and hence they do not comply with the required post-operative regimen. They are convinced that they need take no further action in order to remain healthy. This perception is no longer acceptable as there is a strong argument that patients who have undergone such expensive surgery should at least become productive members of the society again.

Traditionally the role of the patient in the health care system has been characterised as essentially passive, demanding that patients place the responsibility for their health in the hands of health care professionals (Mahler, 1991). There is however a growing feeling that patients should be more actively involved with their own care (Knowles, 1977; Oldridge, 1986; Fries, 1980). In particular those patients with chronic diseases should become responsible for following the required health behaviours to maintain optimal health.

In summary there is therefore a growing demand for low cost, effective medical services for chronic diseases and patients should become actively involved with their own care to promote and maintain optimal health.

JUSTIFICATION FOR THE RESEARCH

Considering the exponential escalation of the costs of health care in South Africa, as well as the need for the judicious distribution of available funds, it becomes essential to determine the factors that contribute to the successful outcome of patients who have undergone an expensive operation such as CABG surgery.

This knowledge would assist in establishing the most cost-effective rehabilitation services, which according to Oldridge, should be the challenge of the 1990's (Oldridge, 1986). As we are approaching the end of the 1990's, this issue has not been resolved and remains of great concern (DeBusk, 1994; Krumholz, 1997).

There was virtually no reference in medical literature, other than in one article by Oldridge (1986), stressing the importance of the acceptance of self-responsibility for successful cardiac rehabilitation. He stated that an improved quality of life and an acceptance of self-responsibility for rehabilitation were the two most important components for successful rehabilitation of the patient with coronary artery disease (Oldridge, 1986). However there does not seem to be any evidence in support of this statement. Therefore it was decided in this research project to evaluate the successful outcome of CABG surgery in terms of an improved quality of life and to determine if self-responsibility was a significant factor determining an improved quality of life after CABG surgery.

Improved quality of life is an established concept and is measured in the following way as suggested by the Coronary Artery Surgery Study (CASS Principal Investigators and their Associates, 1983a):

- Return to gainful employment and/or recreational activities after the intervention.
- Amelioration of cardiac related symptoms.
- Improved functional status.

THE PURPOSE OF THE STUDY

To establish if the acceptance of self-responsibility is a significant factor in the successful outcome after coronary artery bypass surgery.

OBJECTIVES OF THE STUDY

The objectives of the study were to establish the factors that may predict the successful outcome of surgery in patients who have undergone coronary artery bypass surgery when assessed in terms of improved quality of life and to determine whether the acceptance of self-responsibility is an important factor determining this.

In addition information was sought on :

- The extent to which the socio-economic status of the patient influenced his or her ability to accept the responsibility for rehabilitation.
- The extent to which the medical status of the patient influenced the patient's ability to become self-responsible.
- The extent to which the patient's attitude towards his/her or her disease influenced acceptance of self- responsibility.
- Whether the patient's knowledge of the chronic nature of his/her disease and modification of risk factors had an effect on the acceptance of self-responsibility.
- Whether the spouse or care-giver's knowledge of the chronic nature of the disease and the modification of risk factors influenced the acceptance of self-responsibility.

The null hypothesis for this study was that the acceptance of self-responsibility is not a significant factor in the successful outcome of coronary artery bypass surgery.

THE TYPE OF STUDY THAT WAS DONE

A prospective study was performed to determine the outcome of coronary artery bypass surgery in a South African sample one year after surgery. The acceptance of self-responsibility as a factor in the successful outcome of coronary artery bypass surgery has not previously been established. In order to quantify self-responsibility and to evaluate its role in determining quality of life after coronary artery bypass surgery, a series of questionnaires were designed. Patients were interviewed on the 4th to 6th post-operative day, at six months and again one year after the surgery. The spouses or care-givers of the patients were also interviewed six months and one year after the operation.

The successful outcome of CABG surgery was measured in terms of the improved quality of life of the patient.

On completion of the study a statistical analysis was done to determine if self-responsibility was an important factor in determining quality of life after coronary artery bypass surgery. A regression analysis was then performed to determine the factors that predicted improved quality of life as a measure of the successful outcome of CABG surgery and acceptance of self-responsibility.

During the course of this study the thoughts expressed by Butler (1994) often came to mind: "Despite centuries of great scientific advances it would be wise to admit how little is really known. Human behaviour is only beginning to be understood and this may be the most dangerous terra incognito

We do not always get to our destination but many interesting discoveries are made along the way".

CHAPTER II

LITERATURE REVIEW

This literature review provides the background to support the argument that the successful outcome of patients who have undergone CABG surgery should be measured in terms of improved quality of life and that the acceptance of self-responsibility is an important factor determining the quality of life after CABG surgery.

The concept that life is a condition of human values, that it is lived according to a human plan, that it has to have quality to be of value, and that it is the individual's responsibility for maintaining a life of quality will be briefly introduced.

Reasons will be given for the selection of patients who have undergone CABG surgery as the ideal sample to study the relationship between quality of life and self-responsibility. An outline of the surgical intervention will be presented followed by a section on the essential components of coronary risk factor modification. The problems associated with chronic disease and the treatment implications for these patients will be analysed and then the essential argument for improved quality of life and the acceptance of self-responsibility will be proposed. The literature review will be concluded with a brief overview of health education and the modification of health behaviours.

LIFE AND HEALTH INTERVENTION

Human life is the condition of human values (Cohen, 1982). Whatever we strive for in life can only be achieved when living. The aim of medical intervention should therefore primarily be to maintain life. Through the ages, health care workers have always sought much more for their patients than

merely a prolongation of life. If the "good life" of the patient is the aim of the medical team, it is essential that not only should the prolongation of life be considered but in addition, the quality of that life. Philosophers as far back as Socrates have emphasised this point. It was Socrates who said in an Athenian court that he feared some things more than death and that it was not merely the possession of life itself, but the quality of that life, that counts most (Cohen, 1982).

A human person is a life lived according to a human plan (Royce, 1908). Diseases are not always fatal but the patient's comfort and happiness is affected by them and as a result the patient can no longer lead life according to his/her plan (Mosteller et al, 1980). If a patient lives a life according to a plan then it seems logical that the patient will take responsibility for that plan.

The concept of a patient's responsibility for leading a life of quality inspired this research. The philosophy being that the acceptance of self-responsibility is an essential aspect of an improved quality of life, that is, successful rehabilitation from any medical disease.

THE REASONS FOR SELECTING PATIENTS WHO HAD UNDERGONE CABG SURGERY

In a chronic and progressive disease such as coronary artery disease, for which there is no cure at the present time, it would perhaps be appropriate to consider an improvement in the quality of life and an acceptance of self-responsibility for compliance with long-term change in health style as the predictors of the successful outcome of rehabilitation (Oldridge, 1986).

According to Wenger et al (1984), CABG surgery is the prototype for elective cardiac surgery intervention in a clinical trail and "because of the favourable morbidity and mortality characteristics of both medically and surgically treated patients, quality of life measures are important". The course of the outcome of the intervention can also to a large extent be influenced by the lifestyle

change of the patient and the patient's active participation in the rehabilitation programme. For this reason, patients who had undergone CABG surgery were eminently suitable to study when investigating successful rehabilitation in terms of improved quality of life and acceptance of self-responsibility for rehabilitation.

Many studies have been undertaken to determine the impact of CABG surgery on the quality of life of coronary patients (LaMendola and Pelligrini, 1979; CASS Principal Investigators and their Associates, 1983a; Wenger et al, 1984; Caine et al, 1991; Speziale et al, 1996). These researchers agree that categories of life quality that are important to consider are material, physical, psychological, social and spiritual well-being.

The events that tend to mark the increased capacity of the patient to realise his/her plans for his/her life are recorded in quality of life trials. The patient's ability to take the responsibility for his/her own life plan after CABG surgery was specifically investigated in this study.

CORONARY HEART DISEASE

Atherosclerotic coronary heart disease is the most common cause of death in the western world (Smith, 1997). An important cause of atherosclerosis is an elevated serum cholesterol concentration. The higher the serum cholesterol concentration, specifically the low-density lipoprotein concentration, the greater the chance of developing symptomatic coronary heart disease and the greater the chance of having fatal coronary heart disease. Lowering the serum cholesterol concentration decrease the chances of having symptomatic or fatal coronary heart disease and it increases the probability that some atherosclerotic plaques may actually regress (Smith, 1997).

The most common method to describe the severity of coronary artery disease is by the number of major epicardial arteries narrowed by more than 50% in

the luminal diameter. A reduction of 50% in the luminal diameter is generally equivalent to a 75% cross-sectional area narrowing. Physiologically there is significant obstruction to flow in a lumen obstructed by more than 75% in cross sectional area (Roberts, 1992). Patients are divided into groups of one vessel, two vessel, three vessel and "left main" coronary artery disease.

Coronary bypass surgery (CABG) and percutaneous transluminal angioplasty (PTCA) are accepted methods for relieving angina and in this way improving the patient's quality of life. In certain sub-groups of patients with coronary disease, CABG surgery has been shown to improve survival (Pearson et al, 1994). The result has been a widespread use of revascularization procedures. The question is whether the resultant high incidence of procedures can be justified (Krumholz, 1997). While it is true that these procedures are superior to pharmacological treatment in patients with severe cardiac disease (Engblom et al, 1992), there are associated problems. As with any invasive procedure, there is the risk of complications. These procedures are also costly because of the need of hospitalisation and supporting high-tech facilities such as cardiac catheterization laboratories (Krumholz, 1997).

Short term and long term failure rates for these procedures have been described and 10-20% of the patients in the United States undergoing CABG surgery have previously undergone this procedure. The results of regrafting are less favourable than for the first operation (Engblom et al, 1992). It makes medical and economic sense to say that the probability of long term success should be optimised. Narrowing and occlusion of venous grafts, as well as of the native arteries, result in the recurrence of symptoms and increased mortality. These changes are positively correlated with serum cholesterol concentrations and smoking and therefore risk factor management after bypass surgery, is of the utmost importance (Hiratzka, 1995). If a patient has had such an expensive intervention as CABG surgery, then the goal should be that the optimal outcome must be achieved.

There is an international emphasis on cost reduction of medical services. In South Africa, where the focus is on equitable medical services for all population groups and where the incidence of CAD is very high among the White and Indian population groups, the prevention of heart and vascular disease as an alternative to expensive treatments for chronic disease, is imperative. There is currently much evidence that aggressive risk factor modification, especially the lowering of serum cholesterol concentrations, can reverse the atherosclerotic process and decrease the rate of acute cardiac incidents such as myocardial infarction and unstable angina pectoris (DeBusk, 1994).

In summary one can therefore say that, where possible, CAD should be prevented by aggressive risk factor modification. Where there is evidence of CAD, unless revascularization is essential, risk factor modification can reverse, in part, the atherosclerotic process and decrease the rate of acute cardiac incidents such as myocardial infarction and unstable angina pectoris. If a patient has had CABG or PTCA, then the outcome of these procedures in terms of mortality and economic cost, can be optimised by the addition of aggressive risk factor modification.

For completeness of this review a brief overview of surgical intervention and specifically CABG surgery will be presented, as well as an overview of risk factor modification.

CORONARY ARTERY BYPASS GRAFTING SURGERY

The treatment of atherosclerotic coronary artery disease is designed to relieve symptoms of myocardial ischaemia and prevent the catastrophic consequences of atherosclerotic coronary artery disease such as myocardial infarction or sudden death. Revascularization, using surgical bypass or percutaneous dilatation of the stenotic lesion is successful in achieving these

goals and in many instances is the only useful treatment (Principal Investigators, 1983a; Peduzzi, 1987; Wilson and Ferguson, 1995).

Improvements in surgical technique and perioperative care have reduced the mortality associated with surgical interventions. It is speculated that the population that will benefit in terms of survival from bypass surgery is probably greater than suggested by the Veterans Affairs (VA) Cooperative Study of Coronary Artery Bypass Surgery for Stable Angina (Takaro et al, 1976; Peduzzi et al, 1987), CASS researchers (Alderman et al, 1990; Rogers et al, 1990) and the European Coronary Surgery Study (Varnauskas, 1986; European Coronary Surgery Study Group, 1988). The reasons for this improved survival outcome are probably due to improved perioperative care, longer graft survival and the use of internal mammary artery grafts in preference to saphenous vein grafts (Wilson and Ferguson, 1995). Studies show that the one-year patency rate of the in situ internal mammary graft is 97% or greater and the 10-year patency rate approaches 90%. With saphenous vein grafts there is evidence of disease in 20% at one-year follow-up and 50% of vein grafts will be occluded at 10-year follow-up (Selke et al, 1991).

The major objectives of CABG surgery are improved quality of life, relief of angina and improved functional capacity (Booth et al, 1991) Because of the favourable outcome of surgery and the reduced mortality associated with the surgery, the effects of CABG surgery on functional status and quality of life have assumed increased importance in the decision to operate (Guadagnoli et al, 1992).

It has been reported that at three months post-operatively, 80% of patients who undergo surgery indicate that their symptoms are improved compared to 60% of patients who had undergone medical treatment (Passamani, 1991). These observations, in patients after CABG surgery, are certainly true in the

short term but there are problems in the long term such as the recurrence of the atherosclerotic process and symptoms at a later stage (Engblom, 1992).

INDICATIONS FOR CORONARY ARTERY BYPASS SURGERY

According to Hurst (1992) patients under the age of 65 years who have the appropriate anatomical lesions should be considered for surgical intervention even if they only have few symptoms. This opinion was echoed by Kravitz et al (1995) who reported that patients who received necessary revascularization (CABG or PTCA) within one year of angiography had lower mortality than those who did not. The same general results were obtained whether revascularization was received within 30 days or one year of the catheterization. The patients receiving necessary revascularization also had less chest pain at follow-up than those treated medically.

Metcalfe et al in 1994 however, were of the opinion that CABG surgery was of therapeutic value to only a minority of patients and that frequently the only value of the surgery was to alleviate symptoms. It was very likely that within the next ten years their symptoms would recur and angina would almost certainly be experienced again (Fitzgibbon et al, 1991; Weintraub et al, 1995). As many of the patients receiving CABG surgery for the first time are in their forties and fifties, it means that they will probably will have to have repeat CABG surgery. The operative risks and the probability of surgical success with subsequent CABG surgery are much less advantageous than for the first operation. There may thus be support for the argument that patients should only be referred for surgery if an adequate quality of life cannot be achieved by alternative therapy (Metcalfe et al, 1994).

What is also of importance is that the utilisation of revascularization treatment will be influenced by the following:

Firstly, need - The epidemiology of the disease varies considerably from place to place at national and local levels.
Secondly, supply - The availability of cardiologists and centres for carrying out surgical procedures are important predictors of the extent of utilisation.
Thirdly, demand - The patients' consultation threshold, general practitioners' referral threshold, cardiologists' referral and intervention thresholds all influence surgical rates (Payne and Saul, 1997).

Comparison of PTCA and CABG Surgery

It is of interest that patients undergoing CABG surgery or PTCA have similar overall risks of death and non-fatal myocardial infarcts at one to three years of follow-up but that CABG surgery patients have significantly less angina and less repeat revascularization than PTCA patients (Sim et al, 1995). CABG surgery, using the internal mammary artery where possible, remains the treatment of choice for patients with more severe disease and whose treatment is not amenable to treatment using percutaneous methods.

Complications of CABG Surgery

While rapid advances are being made in cardiac surgery, equally significant progress has been made in the field of interventional cardiology. Many patients now respond favourably to medical treatment and this has resulted in a distinctly different patient population being referred to cardiothoracic surgeons.

The patients being seen by the cardiothoracic surgeons now have diffuse multivessel disease and reduced left ventricular function (Eggerstedt and Mancini, 1995). Significant numbers of patients referred for surgery also have multiple associated disease processes. These include diabetes mellitus,

peripheral vascular disease, cerebrovascular disease, chronic obstructive lung disease and chronic renal insufficiency (Eggerstedt and Mancini, 1995).

A greater percentage of the patients referred for bypass surgery today are elderly. In 1992, Hurst stated that only in the case of disabling angina should it be considered necessary to operate on patients older than 75 years of age because the operative risk of mortality in older patients is approximately double the risk occurring in younger patients. Wenger (1994) also states that the highly symptomatic patient older than 75 years of age should be considered for PTCA. Age has been shown to be a strong predictor of CABG surgery operative mortality and with each 10 years of age the mortality increases by approximately 40% (Weintraub et al, 1991; Grover et al, 1993). Recent studies report mortality rates for octogenarians in the range of 8% to 12% (Ko et al, 1991; Williams et al, 1995). In spite of the high post-operative mortality, Ko and associates found that these patients had improved function and survival when compared with a medically treated group (Ko et al, 1991). The older patients who survive the operation have almost the same life expectancy for the first 4-5 years after the operation as the general population of the same age group (Williams et al, 1995), indicating that bypass surgery may well be worthwhile for the elderly patient if they are severely symptomatic and have a poor quality of life.

The incidence of stroke after bypass surgery is also much greater in the older population than in the younger population. Multidimensional investigations have shown that cardiopulmonary bypass often causes cerebral dysfunction (Sotaniemi, 1995) but in a study by Malheiros et al (1995) no difference was found in the neurological status of patients who had undergone coronary artery bypass grafting surgery with and without cardiopulmonary bypass (Malheiros et al, 1995). These authors concluded that cardiopulmonary bypass may not be the single cause of neurological morbidity in patients after CABG surgery but that a substantial proportion of the immediate

postoperative neur· ·ogical and neuropsychological deficits may be related to general and haemodynamic aspects of surgery (Malheiros et al, 1995).

The incidence for stroke after CABG surgery is slightly higher than the 2-11% that is experienced after valvular surgery, probably due to the fact that the CABG surgical patients are generally older (Pugsley et al, 1994; Ricotta et al, 1995). Shaw and associates (1987) found that 61% of 312 CABG surgery patients showed evidence of new neurological abnormalities and 4.8% of the patients had experienced definite stroke. The predictors for increased incidence of stroke following bypass surgery are triple vessel disease, age greater than 70 years, previous transient ischaemic attacks, peripheral vascular disease and diabetes mellitus (Rao et al, 1995).

Increasing numbers of women are currently undergoing coronary artery bypass surgery as a treatment for heart disease (Allen, 1996). It has been found that women have a higher operative mortality, a poorer graft patency, and experience more angina post-operatively (Farrer et al, 1997). The overall survival of women does not seem to be significantly different from men. Metcalfe (1994) speculates that the adverse outcome of CABG surgery in women may be due to the fact that they have a smaller physical size and thus smaller coronary arteries.

PREOPERATIVE RISK INDICATORS OF DEATH AT AN EARLY AND LATE STAGE AFTER CORONARY ARTERY BYPASS GRAFTING

In a prospective study on 2 000 patients, with a median age of 64 years, risk factors as indicators of death at an early (within 30 days) and late stage (30 days - 2 years), were established. Early mortality was 3.0% and late mortality 4.2% (Brandrup-Wognsen et al, 1995).

For patients undergoing bypass surgery the factors found to be independently predictive of early mortality were female sex, renal dysfunction, left main stenosis, number of diseased vessels, previous myocardial

infarction and functional class. The independent predictors for late mortality after bypass surgery were congestive cardiac failure, a history of cerebrovascular disease, diabetes mellitus, renal dysfunction and intermittent claudication (Brandrup-Wognsen et al, 1995). Renal dysfunction was the only risk factor predicative of mortality at both the early and late stages.

FACTORS INFLUENCING CORONARY ARTERY BYPASS GRAFT PATENCY

While major attention is being directed towards the prevention of CAD, one of the most important issues remains the palliation of symptoms. Since the inception of bypass surgery it has proved its superiority over pharmacological treatment in patients with severe coronary artery disease (Englom et al, 1992). It is likely that patients who are severely symptomatic, will experience an 80-90% improvement of symptoms immediately following bypass surgery.

As the operation does not influence the underlying disease these symptoms are likely to recur within the next 10 years. Many patients are in their fourth or fifth decade of life and this recurrence of symptoms has therefore serious implications. Rates of occlusion vary but rates of occlusion as high as 37-41% at 10 years after surgery have been reported (Bourassa et al, 1985; Fitzgibbon et al, 1991). There is currently a trend towards repeat CABG surgery, but the operative risks and probability of success are far less favourable than for the first operation (Petch, 1991; Fitzgibbon et al, 1991).

In order to favourably influence the long-term prognosis in patients who have undergone coronary artery CABG surgery, the graft life should be maximised. To achieve this, all patients should have their major risk factors attended to and this should preferably be the case before the surgical intervention. Particular attention should be paid to control of serum cholesterol concentrations, the presence of hypertension, smoking status, obesity, regular exercise programmes and the addition of hormone replacement therapy, where appropriate, for women.

In a prospective, double-blind, randomised, placebo-controlled trial of aspirin Gavaghan et al (1991), concluded that aspirin should be recommended in all patients after CABG surgery using vein grafts. In the early perioperative period the administration of aspirin (324 mg) resulted in significantly less occlusion of the vein graft in patients on aspirin (p= 0.004) and one year later the graft occlusion for patients on aspirin was still significantly reduced (p=0.01). From a surgical perspective, arterial grafts should be used in preference to vein grafts because of the substantial evidence of the improved long-term patency of these vessels. The internal mammary artery has an 85-95% patency ten years after bypass surgery (Grondin et al, 1984). It is often not possible to achieve complete arterial revascularization and saphenous vein grafts will continue to be used in a large proportion of patients with multivessel disease (Van Brussel et al, 1997).

The most important conclusion however is that CABG surgery improves life expectancy only in limited circumstances and patients should only be referred for surgical intervention if adequate quality of life cannot be achieved by alternative therapy (Metcalfe et al, 1994).

RISK FACTORS AND MODIFICATION OF RISK FACTORS

Coronary artery disease has a strong genetic component but is also greatly influenced by environmental factors such as diet, smoking and disorders such as diabetes mellitus and hypertension (Humphries et al, 1997). Patients with cardiovascular disease can benefit greatly from the implementation of risk reduction therapies. A consensus panel of the American Heart Association has recommended that health care providers use risk reduction therapies which can significantly increase survival, improve quality of life, decrease the need for interventional procedures such as bypass grafting and also reduce the incidence of subsequent myocardial infarctions (Smith, 1997).

HYPERCHOLESTEROLAEMIA

The presence of atherogenic lipoproteins in the plasma is a direct cause of coronary heart disease (Oliver et al, 199 It is only in recent years that sufficient evidence has been accumulated to indicate that cholesterol plays a major role in the development of atherosclerotic plaques (WC Roberts, 1996). Roberts (1996) states that he consi:ers the only absolute, independent risk factor for atherosclerosis is an elevated serum total cholesterol concentration or low-density lipoprotein (LDL) cholesterol concentration, either alone or in combination with a low high-density lipoprotein (HDL) cholesterol concentration.

There is no longer any dispute that there is a need to lower the average cholesterol level in the general public as a preventative measure for coronary heart disease. As a secondary measure, in the presence of established atherosclerotic lesions or established coronary artery disease, the lowering of plasma lipids can reverse the atherosclerotic process and substantially diminish the rate of acute cardiac events in these patients (DeBusk, 1996). In patients who have undergone CABG surgery, progression of the atherosclerotic process can be slowed down, both in the coronary arteries and the venous grafts by pharmacological lipid modification after bypass surgery. Because the long-term effects of the lipid lowering drugs are still unknown according to Engblom et al (1992) and the majority of bypass patients have only moderately elevated lipid values, a non-pharmacological approach is to be preferred. However in two important studies patients on lipid lowering drugs (simvastatin, pravastatin) were followed up over a period of approximately five years. The researchers concluded that the long-term treatment of patients with these lipid lowering drugs resulted in decreased myocardial infarctions and decreased deaths due to cardiovascular disease. Deaths due to non-cardiovascular causes were not increased and it was concluded that long-term treatment with these lipid lowering drugs were safe and improved patients' survival rates

(Scandinavian Simvastatin Survival Study Group, 1994; Shepherd et al, 1995).

Guidelines on the prevention of primary and secondary heart disease recommend that diet intervention should be the first line of action and those needing lipid lowering drugs should continue with the diet (Oliver et al, 1997).

In most patients who do not have familial hypercholesterolaemia, hyperlipidaemia results from poor eating habits and too little exercise. Non-pharmacological measures such as a prudent diet and regular physical activity (exercise) should reverse hyperlipidaemia and have an effect on the course of coronary heart disease (Schlierf et al, 1995).

Maines and co-researchers (1997) reported a modest reduction in total cholesterol and low-density lipoprotein cholesterol (LDL-C) concentrations in a group of patients who had attended cardiac rehabilitation programme for 12 weeks. They suggested that the dietary recommendations of the American Heart Association (AHA) were not sufficient to produce desirable changes in this lipid fraction. This opinion is echoed by De Lorgeril et al (1997), who feel that the diet prescription of the AHA is too restrictive and that patients will therefore not adhere to the diet. They also state that dietary counselling cannot be limited to three factors only i.e. $\leq$ 30% fat, < 7% saturated fat, < 200 $mg.day^{-1}$ cholesterol, and they go on to say "these scientifically quantitated principles should be adapted to the culture, ethnic origin and "image of the world" of each patient in order to create an environment favourable to the perception of positive associations between various foods and healthy habits".

Maximal dietary therapy should be started and continued even when cholesterol lowering drugs are used; dietary therapy enhances drug actions and helps reduce risk for recurrent events through other mechanisms (Grundy et al, 1997).

Patients with any form of atherosclerotic disease should be given intensive cholesterol-lowering therapy as these patients carry a fivefold to sevenfold elevated risk for developing new or recurrent CHD and need intensive risk reduction. Despite the fact that the benefit of cholesterol-lowering therapy has been proven in patients with CHD, up to two thirds of these patients receive no therapy to lower LDL serum cholesterol concentrations (Grundy et al, 1997).

Lipid lowering therapy results in highly significant reduction in total mortality (30%), coronary mortality, revascularization procedures (37%) and hospital days in therapy (34%). Benefits of lipid lowering occur within one to two years after the commencement of treatment (Smith, 1997).

The beneficial effects of lipid lowering therapy include regression of disease and lack of progression in 25% of patients. In most patients, stabilisation of high risk lesions appears to account for the dramatic improvement in patient outcomes because the actual change in the severity of coronary artery obstruction is only in the region of one to two percent (Smith, 1997). Marked reduction of low-density lipoprotein concentrations may also lead to relatively rapid improvement in endothelial function, less platelet adhesiveness as well as increased stability of vulnerable lesions (Oliver et al 1997).

Compliance to cholesterol altering drugs is a significant problem. Compliance to medication is defined as "the extent to which a person's behaviour in terms of medication(s) coincides with medical advice" (Insull, 1997). Approximately 50 percent of patients taking all types of drugs for long term regimens, discontinue at one year and 85 percent of patients at two years. Substantial non-compliance to cholesterol altering drugs has been reported (Insull, 1997). At present 50 percent of patients with atherosclerotic cardiovascular disease discontinue risk reduction therapies within one year (Smith, 1997).

Partial compliance or non-compliance results in a proportionate reduction of treatment benefit (Insull,1997).

Patients are more likely to comply if they understand the implications of elevated lipid levels but lipid profiles are not routinely measured and patients and doctors are often not aware of abnormal levels. A report on a survey of 20,000 managed by their physicians disclosed that 17% were found to be at very high risk and 6% at high risk for subsequent cardiac events, yet 21% and 33% received no drug therapy or dietary advice. Some of these patients with LDL cholesterol levels in the range 4.9-5.7 mmol/l received no treatment (29%) and 36% received dietary advice alone. Of the 1665 patients with CAD, only 42% had undergone a full lipid profile measurement and 32% had one the previous year (Teo, 1997). This gap between knowledge and clinical practice has been found to be an international phenomenon and the reasons for it are not clear.

A way of overcoming this problem would be to encourage patients to become involved in their own health care and in order to alert them to the fact that they may be at risk they should be exposed to written, easily understood, information packages. In addition the early establishment of positive health behaviours in adolescents might have long term benefits in reducing the prevalence of risk factors and mortality in high-risk adults. In the adolescent phase independent choices are often being made for the first time and cognitive skills are being developed (Fardy et al, 1996). There is every indication that, already at an early stage in life, beneficial dietary habits should be encouraged. Patients should also be aware of their cholesterol levels and the implications of abnormal levels as well as other risk factor data. They should know what steps to follow to normalise these levels (Roberts, 1997).

Other health professionals can help identify high risk subjects and help draw physicians attention to them. Pharmacists, as an example, can identify some

of these individuals and there should be a standing order that lipid levels should be checked regularly on discharge from hospital after cardiac events (Teo, 1997).

SMOKING

Cigarette smoking has been strongly associated with coronary heart disease. Cigarette smoking is the cause of 30% of coronary heart disease in the USA and the risk is strongly dose-related (Becker, 1992). The risk of myocardial infarction increases with the number of cigarettes smoked per day.

In patients with documented cardiac disease, smoking is associated with an increased risk for myocardial infarction and death. Smoking cessation lessens the risk of death or myocardial infarction in older as well as younger persons with coronary artery disease (Herm nson et al, 1988). Stopping smoking markedly improves survival among persons who have established coronary artery disease (Vlietstra et al, 1986). In that study quitters had a 32% lower five year morte' 'y than the continuers (five year mortality: quitters 15%; continuers: 22%).

In the study by Hermanson et al (1988), of a cohort of 1893 men and women from the CASS registry, 38% of patients who continued smoking after a diagnosis of coronary artery disease had died in a six year follow-up compared to 28% of the patients who had quit. The proportion of deaths in those who had continued smoking compared to quitters was significantly higher ($p<0.001$). Cavender et al (1992) reported in a 10 years of follow-up of the CASS registry, that there was a significantly ($p=0.025$) higher survival rate (80%) in the group of patients who had stopped smoking than in the group who had not (69%). These findings are not in agreement with the findings from the European Coronary Surgery Study where smoking at baseline was found not to have an adverse effect on the benefits of surgery in reducing mortality and that 10 years after surgery, smokers and non-smokers had similar outcomes (Julian, 1994). The population studied by Cavender et

al was different from the European Coronary Surgery Study in that they studied the effect of smoking cessation whereas the European Coronary Surgery Study compared the effects on smokers and non-smokers.

Cigarette smoking is also strongly related to sudden cardiac death (Kannel and Thomas, 1982; Ockene and Ockene, 1993). According to Hallstrom et al (1986), in patients who have experienced an arrest, quitting smoking has proved to be valuable. Quitters experience significantly fewer subsequent cardiac arrests than patients who continue smoking (19% versus 27% at three years, p=0.038).

Compliance to cessation of smoking

Ockene (1992) reports that of the 30 million smokers who gave up smoking in the United States in the years between 1964 and 1982, 90% claimed that they did not use an organised plan to help them. The factor most likely to help the patient to stop smoking is direct advice from the physician and in 50-63% of cases, patients then stop smoking (Ockene, 1992). The physician's effect on a patient's smoking is also influenced by the patient's clinical status. High quit rates have been demonstrated in patients who have been advised to stop smoking after a myocardial infarct or who have been diagnosed as having CHD. The quit rates are proportional to the severity of the disease (Ockene, 1992). The relationship between quit rates and disease status is consistent with the principles of the health belief model. This model states that a patient who understands that he is vulnerable to the actual effects of smoking and that the benefits of smoking cessation outweigh the emotional cost of giving up, is most likely to be motivated to stop.

A study in 1975 of white South Africans revealed smoking prevalences of 58% for men and 31% for women in a population sample of subjects aged 20-59 years (Van der Burgh, 1979). In 1980 smoking prevalence of 52.7% was found among middle aged white miners (Wyndham et al 1980) and the Rembrandt Tobacco Corporation estimated that 44% of white South African

men and 36% of white adult women were smokers (Steenkamp et al 1988). In the light of white South African's susceptibility to CHD, the high prevalence of one of the major risk factors, smoking, and the beneficial effects of cessation of smoking on CHD risk and mortality, the need to curb smoking in South Africa is quite evident (Steenkamp et al, 1988).

The case for stopping smoking is incontrovertible and providing help for smokers to stop smoking is as important an aspect of the management of ischaemic heart disease as any other aspect (Julian, 1994). Since smoking can be eliminated completely, and is in fact cost saving, interventions to promote smoking cessation have greater potential for reducing cardiovascular risk than interventions of any other risk factor.

HYPERTENSION

According to a report by the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (1993), 20% of the American population have high blood pressure. Seedat et al (1980), reported a study of hypertension in the Black, Indian and White populations of Durban, South Africa. At that time they found a prevalence of primary hypertension in 23% of urban Whites, in 25% of Blacks and in 19% of Indians. National figures for hypertension are not available in South Africa.

The primary cause of morbidity and mortality in hypertensive persons are stroke and coronary heart disease. Hypertension is the primary risk factor for stroke and it is one of the major risk factors for CHD (Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, 1993).

Another important observation is that the relationship between blood pressure and medical events for both stroke and coronary heart disease, is absolutely linear. There is no safe level of blood pressure or safe threshold of risk. In

other words, the proportional increase of risk at 80-90 mm Hg diastolic pressure is the same as that at 110-120 mm Hg. An additional important factor is that most of the events that occur in the whole population occur in those whose diastolic pressures are below 90 mm Hg. Most physicians would not advocate treatment at such levels even though the strokes and heart attacks are clearly related to pressure (Sleight, 1996). This emphasises the importance of prevention by using non-pharmacological methods to lower blood pressure.

Hypertensive persons, with total and LDL cholesterol levels similar to normotensive persons, have a higher incidence of atherosclerotic events than their normotensive counterparts (Levy et al, 1990).

Several dietary and other factors related to lifestyle have been identified as causes for hypertension. These factors include obesity, use of alcohol, inactivity, amount of dietary fat intake, high salt intake and chronic stress (The Trials of Hypertension Prevention, phase 1: Collaborative Research Group, 1992).

The value of blood pressure reduction

According to the JNC V (1993), the numbers of hypertensive patients who know that they are hypertensive have increased dramatically in the past two decades (51% to 84%), and the percentage of hypertensive patients taking medication for their condition has also increased (36% to 73%). At the same time, there have been notable decreases in cardiovascular mortality and in the last two decades death from coronary heart disease has declined by 50% and death from strokes by 57% (JNC V, 1993). Considering that high blood pressure is one of the major risk factors for coronary heart disease it can be inferred that the detection, treatment and subsequent control of hypertension has had a major effect on these declining mortalities.

As much as one third of cardiovascular disease attributable to above optimal blood pressure levels, occurs in the normotensive population (TOHP Collaborative Research Group, 1992). This fact emphasises the importance of prevention using non-pharmacological therapy on "normotensive subjects" with a high risk for cardiovascular events (Sleight, 1996). In a study conducted to test the short-term feasibility and efficacy of seven non-pharmacological interventions, 16,821 subjects were screened and of those 2182 men and women were selected with diastolic pressures measuring from 80-89 mm Hg (TOHP Collaborative Research Group, 1992). The subjects' ages ranged from 30 years to 54 years. Three lifestyle interventions (weight reduction, sodium reduction and stress management) were each compared with unmasked non-intervention controls over 18 months. Four nutritional supplement groups were also included (calcium, magnesium, potassium and fish oil).

The results indicated that weight reduction was the most effective intervention for reducing blood pressure in normotensive patients. The weight loss produced in this cohort was 3.9 kg ($p<0.01$) the diastolic pressure decreased by -2.3 mm Hg ($p<0.01$) and the systolic pressure by -2.9 mm Hg ($p<0.01$). In the sodium reduction intervention group, urinary sodium excretion was lowered by 44 mmol/ 24 hours ($p<0.01$), diastolic pressure by 0.9 mm Hg ($p<0.05$) and the systolic blood pressure by 1.7 mm Hg ($P<0.01$). The stress management and the nutritional supplements had no significant effect on the blood pressure.

Weight reduction: From the above study it can be concluded that that weight reduction is the most effective strategy for reducing blood pressure in normotensive patients. Beilin (1990) also found modest amounts of weight loss in the order of five kilograms to be associated with significant decreases in blood pressure.

Alcohol restriction: There is a clear relation between excessive alcohol intake and hypertension and patients should be encouraged to lower their consumption to two drinks per day (MacMahon and Norton, 1986). In an analysis of 30 studies on alcohol consumption and blood pressure, MacMahon and Norton (1986) state that among persons who drink three to four drinks per day, systolic pressure was 3 to 4 mm Hg greater and diastolic pressure was 1 to 2 mm Hg greater than the pressures in non-drinkers. In patients taking five to six drinks per day systolic pressure was 5 to 6 mm Hg greater and diastolic pressure was 2 to 4 mm Hg greater than in non-drinkers. In seven of the 30 cross sectional studies reviewed by MacMahon and Norton (1986) the blood pressures of patients taking less than three drinks per day was greater than that of non-drinkers, 11 of the studies showed no difference and in the remaining studies the blood pressures of patients consuming less than three drinks per day was lower than the blood pressures of non-drinkers. This inconsistency, according to MacMahon, was possibly due to random variation with very little difference in blood pressure between light drinkers and non-drinkers (MacMahon and Norton, 1986).

Increased physical activity: Physical activity is a nonpharmacological treatment that is frequently prominent in the treatment of Stage 1 or 2 hypertension (Hagberg, 1997). In an analysis of 47 publications reporting on the effects of endurance exercise training, Hagberg reports that 70% of the group with a systolic pressure greater than 140 mm Hg initially, had a significant reduction in casual blood pressure with exercise training. The average reduction was 10.5 mm Hg from an average systolic pressure of 154 mm Hg. The groups that had an initial diastolic blood pressure greater than 90 mm Hg also showed a significant reduction in diastolic blood pressure. The average reduction in diastolic pressure was 8.6 mm Hg from an initial value of 98 mm Hg. It is clear that whereas endurance exercise training does seem to lower blood pressure significantly it does not "normalise" the blood pressure (Hagberg, 1997). Hagberg also draws the attention to the fact that

ambulatory blood pressure readings are a better indicator of cardiovascular disease risk and end-organ damage.

Sodium restricted diet: In the report of the JNC V (1993) an association between dietary sodium intake and blood pressure is reported. Based on the evidence from epidemiological studies, a lower than average sodium intake (<100 mmol/24 hrs) will result in a decrease of the systolic blood pressure of up to 10 mm Hg. The average sodium intake for the American population is in excess of 150 mmol/ 24 hrs. (JNC V, 1993). It has also been reported that the reduction of sodium intake in individuals that have high normal systolic and diastolic blood pressure values results in significant reductions of both systolic and diastolic values. These results suggest that the reduction of salt intake may in fact prevent the onset of hypertension (The Trials of Hypertension Prevention Collaborative Research Group, 1992).

Other dietary changes: A high **potassium** diet can protect the patient against the development of hypertension (Intersalt Co-operative Research Group, 1988). A deficiency in potassium can increase blood pressure and precipitate ventricular ectopy (Linas, 1991). There is currently no support that increased dietary **calcium** intake will lower blood pressure in all patients, although calcium deficiency is associated with an increased prevalence of hypertension (Hamet et al, 1991). There is also no convincing data to justify an increase in **magnesium** intake to lower blood pressure (JNC V, 1993).

Large amounts of **omega-3 fatty acids** may lower blood pressure but the consumption of large amounts may also be associated with other adverse effects and they are therefore not recommended for the treatment or prevention of hypertension (Knapp and Fitzgerald, 1989). It is known that **caffeine** can raise the blood pressure but tolerance to this effect develops rapidly, and so unless the patient is particularly sensitive to caffeine there is no need to restrict the caffeine intake.

Anti-oxidant vitamin intake: A study to determine the effects of supplementary and dietary vitamin E and C intake, on the progression of coronary artery disease, was under taken by Hodis et al (1995). They established that compared with the placebo treated subjects, drug treated subjects had significant decreases in total serum cholesterol concentrations, LDL-C concentrations, triglyceride levels and significant increases in HDL-C concentrations. In addition they also found significantly lower diastolic blood pressures in the group who had high anti-oxidant vitamin intake.

Biofeedback and relaxation: These programs have shown promising results in selected groups of hypertensives (Health and Public Policy Committee, 1985) however the available information in the literature does not indicate the use of relaxation therapy as a specific treatment for hypertension (Van Montfrans et al, 1990).

Antihypertensive Drug therapy

If the blood pressure remains at or above 140/90 during a period of active life-style modification lasting between three and six months, then antihypertensive drug therapy should be commenced. The aim of antihypertensive drug therapy should be to lower the resting levels of the systolic and diastolic pressures to below 140 mm Hg and 90 mm Hg respectively (JNC V, 1993). The Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure (1933) recommends that initial drug treatment be selected from one of two classes of drugs: diuretics or β-blockers. The alternative drugs (calcium channel antagonists and angiotensin-converting enzyme (ACE) inhibitors, α_1-receptor blockers and the α-β blockers) are equally effective in reducing blood pressure (Treatment of Mild Hypertension Research Group, 1991). There is concern that some of the antihypertensive drugs could have an adverse effect on the plasma lipoprotein profiles. Almost all beta-blockers can lower HDL cholesterol levels (Johnson and Danylchuk, 1989). There are also concerns that thiazide

diuretics could be less beneficial than other agents and can even increase cardiovascular risk in some patients (Johnson, 1992). Factors such as the cost of the medication, metabolic and subjective side effects and drug interactions should also be considered when prescribing antihypertensive drugs.

OBESITY

An increased body weight for height (body mass index) is associated with a number of risk factors for CHD and may also be a precursor for the development of CHD (Hubert, 1986). Obesity has been shown to be positively related to elevated levels of blood cholesterol and to blood pressure. The prevalence rates of diabetes are also higher in overweight compared to normal weight persons (Van Italie, 1985).

However widely discrepant results have been reported following on research in this area. The Pooling Project claimed that there was no positive association between obesity and CHD risk (The Pooling Project Research Group 1978) , whereas in a review of the major longitudinal studies from North America, carried out mainly on men, a significant independent relationship between obesity and the incidence of CHD was found in the younger groups studied (Hubert, 1986). In the Framingham study, a significant association was found between excess body weight and sudden death and angina pectoris but not with myocardial infarction (Ashley and Kannel, 1974).

In studies of obesity and CHD in women, either a lack (Tuomilehto et al, 1987) or a strong positive association was found between relative weight and CHD (Hubert et al, 1983). Manson et al (1990) also found a strong and consistent relationship between the extent of overweight and the risk of fatal and non-fatal CHD events in a cohort 115,886 middle aged nurses.

As obesity is a major contributor to the presence of illnesses such as hypertension, hypercholesterolaemia and diabetes (National Institutes of Health. Consensus Development Conference Statement, 1985) as well as an independent risk factor for CHD, the treatment of obesity is very important. The optimal weight loss program includes aerobic and resistance training combined with reduced calorie intake (Segal and Pi- Sunyer, 1989) .

The addition of an exercise programme to weight loss increases calorie expenditure, results in a feeling of well-being, assists in the maintenance of resting metabolic rate, reduces fat-stores and maintains lean body mass. It has also been suggested that subjects who include exercise in a weight loss program tend to keep their lower body mass for longer (Dahlkoetter et al, 1979).

Cox et al (1996) compared the effects of restricting calorie intake and exercise of vigorous intensity independently and additively. They found that by restricting the calorie intake in overweight sedentary males there was a significant loss of body mass ($p<0.05$). Systolic and diastolic blood pressures were also significantly reduced by 5.6 mm Hg and 2.4 mm Hg respectively ($p<0.05$). The effect of vigorous exercises only on blood pressure was inconsistent . However when combined with calorie restriction, regular vigorous exercise had an effect on reducing blood pressure which was sustained throughout a 24 hour period ($p<0.05$). They concluded that the combination of weight control and exercise training would reduce the risk of the establishment of hypertension in overweight sedentary subjects with high normal blood pressures (Cox et al, 1996).

PHYSICAL ACTIVITY

Physical activity is directly related to physical fitness. Lack of physical activity and the resultant lack of physical fitness is directly associated with increased

mortality from cardiovascular disease. This increased mortality can not be fully explained by considering the effect of physical inactivity on hypertension, smoking and lipids (Leon, 1997). In May 1996 the National Institutes of Health consensus development panel on physical activity and cardiovascular health, concluded that physical inactivity is a major risk factor for cardiovascular disease (NIH consensus statement, 1996).

A meta-analysis of the literature reporting on an association between physical activity and the incidence of initial clinical manifestations of CHD, especially myocardial infarction and sudden death, was done by Berlin and Colditz (1990). They found in this analysis that physical activity has a protective effect against the occurrence of major cardiac events rather than in the reduction of the severity of the events that do occur. When active people do develop CHD it is at a later age and it tends to be less severe. They concluded that the lack of physical activity is a modifiable risk factor for CHD and that it should receive greater emphasis so as to reduce the impact of this disease on society.

Primary prevention: It is important to realise that moderate amounts of exercise can be protective against CHD (Haskell, 1997). A level of energy expenditure of 7 kcal/min may be protective and by increasing the daily energy expenditure greater protection will be provided (Lee I-M et al, 1995). Blair et al (1992) advocated increasing physical activity by "lifestyle exercise" which is based on the premise that lower intensity physical exercise also benefits health and that multiple shorter bouts of exercise spread over a day may in fact produce the same effects as intensive exercise sessions. As many individuals dislike strenuous exercise, these patients can be reassured that they will still derive important benefits from this form of exercise (Gordon et al, 1993).

Secondary prevention: A "spontaneous" increase in aerobic fitness generally occurs three weeks after coronary artery bypass surgery if the recovery after

surgery was clinically uncomplicated. This improvement also occurs in patients who have suffered a myocardial infarct or have undergone PTCA and will occur even if the patient has not undergone any formal exercise training (Franklin et al, 1992). Improvement will continue to take place in the next six months if a patient attends an exercise programme or simply complies to a home-based physical exercise programme. Those patients who were physically unfit will derive the greatest benefit from these programmes (Balady et al, 1994). It has been suggested that in order to achieve the optimal benefit from exercise training it should take place at least three times per week, with sessions lasting 20-40 minutes, and the training intensity should be 70%-85% of the maximal heart rate (Franklin, 1997). Such exercise programmes will decrease angina pectoris in patients with CHD and improve symptoms of heart failure in patients with left ventricular systolic dysfunction (Franklin, 1997).

The effects of active exercise

Regular physical activities have an effect on certain physiological and metabolic variables and related risk factors (Bouchard et al, 1994).

Body weight and body fat: Obesity is usually defined as being 20% over ideal weight (BMI >30) and a person is regarded as severely obese when the BMI is >35. Obese persons are often regarded as being less active than those with lower weight. Exercise training in obese patients has a number of benefits such as increased cardiorespiratory fitness, reductions in cardiovascular disease risk factors, increased energy expenditure, and an enhanced psychological sense of self-efficacy and well-being. While physical inactivity plays a role in the development of obesity (Bray and Gray, 1988), exercise alone, without a concomitant restriction in calorie intake, is insufficient to result in any significant weight loss. Weight loss will only occur in individuals extremely motivated to commit themselves to prolonged workouts over long periods of time (Segal and Pi-Sunyer, 1989). Upper body

and abdominal fat are predictors of metabolic anomalies and can be correlated with undesirable alterations in glucose, lipid and lipoprotein, and insulin metabolism (Després et al, 1990). Visceral fat can be greatly diminished by regular exercise even when there is no associated decrease in caloric intake. The loss of abdominal fat is also correlated to an improvement in insulin, glucose and lipid metabolism that occurs with regular aerobic exercise (Bouchard et al, 1994).

Insulin Metabolism: The vascular complications of diabetes include not only CHD, which is the most frequent cause of death in diabetic patients, but also peripheral vascular disease, nephropathy, retinopathy, and other conditions. Regular exercise tends to improve glucose tolerance and to modify favourably certain risk factors for cardiac disease. An apparent effect of regular exercise is that the liver, skeletal muscle and adipose tissue develop an increased sensitivity to insulin action. With regular exercise therefore, a decrease in the basal level of plasma glucose in the hyperglycaemic person, a decrease in fasting insulin levels as well as a reduction of the insulin response to glucose loading is observed (Gudat et al, 1994).

Blood Pressure: Studies have shown that regular physical activity can reduce the systolic and diastolic pressures by 10 mm Hg. This reduction is of clinical significance in many instances (Fagard and Tipton, 1994). According to Bouchard (1997) the blood pressure response to exercise is not always favourable but currently the available data suggests that in the majority of cases when regular endurance exercise is performed at 40%-60% of the VO_2 max, the reductions in blood pressure claimed by Fagard and Tipton, can be achieved.

Lipid Oxidation: Exercise training increases the activity of skeletal muscle and the adipose tissue lipoprotein lipase and as a result the use of circulating triglycerides as a fuel source in trained muscles, is facilitated. This will promote the clearance of circulating triglycerides even at rest (Tremblay et al,

1994). The overall result is an improved capacity to remain in fat balance in the face of a high dietary fat intake.

Lipid and lipoprotein metabolism: Regular physical activity increases HDL cholesterol and decreases plasma triglycerides in subjects who have initially high triglyceride concentrations (Stefanick and Wood, 1994) . Regular physical activity may also occasionally be associated with decreases in LDL cholesterol and total serum cholesterol concentrations.

An increase in lipoprotein lipase activity may account for the augmentation of the HDL cholesterol. As a result of regular activity, insulin sensitivity is increased and plasma insulin levels are reduced, leading to altered plasma lipoprotein levels (Bouchard and Després, 1995).

Coagulation and Haemostatic Factors: Blood coagulation, fibrinolysis and platelet aggregation are all intimately involved in the different stages of atherosclerosis. According to Rauramaa and Salonen (1994), there is evidence of decreased plasma fibrinogen concentrations, increased fibrinolytic activity and diminished antifibrinolytic activity after intensive exercise in clinically healthy older men. It has also been suggested that in middle-aged, overweight mildly hypertensive men, platelet aggregability is inhibited with regular exercise training of a moderate intensity.

Cardiac Performance : With regular endurance exercise, there is an resultant increase in maximal oxygen uptake because of an increased stroke volume and an increased total body arteriovenous oxygen difference. Aerobic training increases the vascular transport capacity in both skeletal and cardiac muscle by increasing the peak blood flow and capillary exchange capacity (Laughlin et al, 1994).

DIABETES

The term "diabetes" covers a group of conditions that share the same features of decreased insulin action and high blood sugar. These include insulin-dependent diabetes and non-insulin dependent diabetes. Insulin dependent (IDDM) diabetes mellitus is an auto-immune disease that results in complete insulin deficiency. Non-insulin dependent diabetes mellitus (NIDDM) is a condition where the patient may have high, normal or low insulin concentrations and it accounts for over 80% of all cases of diabetes (Orchard, 1990).

Within a few years of having been diagnosed with non-insulin dependent diabetes mellitus, patients will, on average experience a high overall incidence (20%) of cardiovascular events and a high (5%) annual incidence of major events (Colwell, 1996). The mechanism linking diabetes to an increased risk of atherosclerosis is not yet fully clarified although it has been recognised for many years that diabetics are more likely to have multiple cardiovascular risk factors than the non-diabetics (Wingard et al, 1983). Diabetic patients were more likely to have high blood pressure, high triglyceride levels and be obese (Wingard et al, 1983). They also had more multiple risk factors than the control groups. Clustering of risk factors is believed to contribute independently to the risk of cardiovascular disease (Wingard et al, 1983).

There is clear evidence that NIDDM has a negative effect on the prevalence, severity and prognosis of cardiovascular disease. Studies have confirmed the relationship between NIDDM and the occurrence of coronary artery disease and cardiac failure (Julien, 1997). There is also a high rate of silent ischaemic events. Diabetes is clinically associated with impaired endothelial function which is worsened by severe hyperglycaemia (Johnstone et al, 1993).

If diabetes itself is a strong risk factor for CHD, then it would seem reasonable to suppose that patients who have had diabetes for a longer period of time will have a greater risk of heart disease. There does seem to

be this relationship with IDDM but not with NIDDM. This lack of duration effect has led to the proposal that diabetes is not truly a cardiovascular risk factor but that there must be an underlying metabolic disorder that predisposes certain individuals to both heart disease and diabetes (Orchard, 1990). The finding that cardiovascular risk factors such as lipoprotein concentrations and blood pressure predict the subsequent development of diabetes supports this theory (Wilson et al, 1985). In 1995, Farrer et al, claimed that after CABG surgery patients were at a high risk of impaired glucose tolerance and diabetes mellitus and that 29% of a cohort of 353 patients had impaired glucose tolerance at 12 months. Of these patients only 6% were known to have diabetes mellitus preoperatively. This impaired glucose tolerance may reflect an altered natural history after CABG surgery and could possibly be secondary to pancreatic injury (Farrer et al, 1995).

Intervention for prevention of coronary heart disease in diabetes

Two most important aspects of the management of patient with diabetes is to:

1) Prevent the development of coronary heart disease
2) When CAD is confirmed, to prevent all major cardiac events

Simply by treating the abnormal glucose levels of patients who are at risk for, or already have cardiovascular disease confers benefit to the patient, since the methods used to treat abnormal glucose levels are beneficial to achieve weight loss and often result in improved lipoprotein concentrations as well as control of the elevated blood pressure (The working group on hypertension in diabetes, 1987).

STRESS

The word stress is derived from "distress" which in turn is derived from the Old French "estresse", which means "oppression" or also "pressure exerted on an object". Psychological stress is an exceedingly complex phenomenon

that is difficult to define, difficult to measure and as a result is difficult to subject to scientific scrutiny (Allan and Scheidt, 1996).

Stress can be broadly defined as a negative internal state of the individual that is dependent on the individual's interpretation or appraisal of events (threat, harm or demand) [Dimsdale, 1991]. Recent stress research emphasises the crucial role of interpretation of events for the perception of stress and the evoking of certain physiological responses (Dimsdale, 1991; Krantz et al, 1996). Events such as the death of a spouse, marriage, divorce, or loss of a job are considered highly stressful, whereas events such as changes such in working hours, going on vacation and trouble with the in-laws are considered less stressful (Holmes and Rahe, 1967).

The stress response results in release of catecholamines and corticosteroids with resultant increases in heart rate, ventricular contractility, cardiac output, and blood pressure. Acute stress, according to recent research, can affect processes such as haemostasis and thrombus formation. It has been suggested that acute stress results in increased platelet activation. increased blood viscosity, and acute decreases in circulating blood (Tofler et al, 1987).

In 1987, Feigl demonstrated vasoconstriction of atherosclerotic coronary artery segments when psychological stressors were present. A study was conducted by Yeung et al (1991) in which a stressful arithmetic task was given to patients undergoing cardiac catheterization. A subgroup of patients were given acetylcholine. Smooth coronary artery segments dilated in response to the arithmetic task and the acetylcholine. In irregular and atherosclerotic artery segments there was paradoxical constriction to both the mental stress and the acetylcholine. Yeung and his co-researchers concluded that an abnormal vasomotor response, which is probably related to endothelial dysfunction, may be an important determinant of emotionally induced ischaemia (Yeung et al, 1991).

In animal studies, where the animals have been subjected to experimentally manipulated psychological stress, the importance of stress in the development of atherosclerosis has been demonstrated (Clarkson et al, 1987).

In a review of the literature to determine the relationship between psychological stress and serum lipids, Niaura et al (1992) came to the following conclusions:

- The results of studies of episodic stressors such as medical school exams showed positive, though inconclusive results.
- Recent studies of personality traits showed no positive correlation with serum lipid concentrations.
- Studies of acute laboratory stressors showed temporary increases in free fatty acids but the relationships between such increases and subsequent changes in serum cholesterol concentrations was unclear.

It must always be remembered that the stressors used in each of these studies were very different and that individuals respond in different ways to stress. It does seem, however, that various stressors do elect a variety of physiological responses. What is not clear is which of these stressors are most important and how individuals' personalities and their responses to stress, affect the process. Some acute coronary events can be triggered by acute emotional states (Powell et al, 1991).

ALCOHOL CONSUMPTION

The consumption of alcohol has not been shown increase risk of CHD. In fact, rather the reverse has been shown and in the Framingham study a beneficial effect of moderate alcohol consumption on mortality from CHD and as well as from other causes was demonstrated. This was particularly the case for males (Friedman and Kimball, 1986).

More recent research on a cohort of men enrolled in the American Cancer Society Prospective Study has also demonstrated reduced overall death rates as well as death rates from CHD when moderate amounts of alcohol was consumed (Bofetta and Garfinkel, 1990).

In order to determine the relation of moderate alcohol consumption to the risks for angina pectoris and myocardial infarction, a prospective cohort study was undertaken In 22071 apparently healthy male physicians. The findings were that moderate drinking reduces the risk for angina pectoris and myocardial infarction in apparently healthy men. Although moderate alcohol consumption may have some antithrombotic properties (Ridker et al, 1994), the similar benefit for angina and myocardial infarction suggests that anti-atherogenic mechanisms largely account for the cardiovascular benefit of moderate alcohol consumption (Camargo et al, 1997).

Experimental studies have shown that alcohol consumption does increase HDL cholesterol levels and this pharmacological effect remains the presumptive mechanism for the observed reduction of risk. Alcohol may also have an effect on increased fibrinolysis and it also causes peripheral dilatation (Ellison,1990).

In spite of the decreased risk for angina pectoris and myocardial infarction, the potential hazards of even moderate alcohol consumption is so great that any policy encouraging lifelong abstainers to start drinking, or occasional

drinkers to increase their alcohol consumption, would be totally unacceptable (Camargo et al, 1997).

EPIDEMIOLOGY OF CORONARY HEART DISEASE

According to Goldberg (1992) every major prospective study carried out in the United States over the past few decades, has shown a marked increase in the risk of CHD with increasing age. Women under the age of 50 years experience about one-sixth the CHD incidence rate of men, with the incidence of CHD rising dramatically after the menopause. With age death rates from CHD rise in a linear fashion and heart disease is the leading cause of death among men by their fourth decade and among females by their sixth and seventh decades.
White South African men and women have a higher mortality rate for ischaemic heart disease (IHD) than the populations of other Western developed countries (Wyndham et al, 1987).

In an analysis of mortality rates, Wyndham concluded that cardiovascular diseases are as much an epidemic among Asian South Africans as they are among white South Africans (Wyndham,1979). There is also some evidence that the Afrikaner may be at greater risk for IHD. Familial hypercholesterolaemia is at least 5 times as frequent in the Afrikaans - speaking sector of the South African white population as in other populations (Seftel et al, 1980). Patients suffering from familial hypercholesterolaemia die prematurely from this disease.

Family history of CHD is an important predictor for the risk of subsequent CHD, particularly in men. The risk is at least one and one-half to two times greater for those with a parental history of CHD. Family members share more than their genes and family ties may account for unhealthy personal habits. Some examples of such habits are smoking, inactivity and an unhealthy diet.

These habits can be altered and the patient can do a great deal to counterbalance any genetic predisposition (Gordon and Gibbons, 1991)

CHRONIC ILLNESS

Coronary heart disease is not an inevitable consequence of ageing but rather a disease process based on physiological mechanisms related to an abnormal concentration of blood lipids and is accelerated by a number of other risk factors, most of which are related to the diet and lifestyle associated with an industrialised, urban society (Ockene, 1992). The goal of therapy for most patients with chronic disease is not "cure" but improvement of function as a result of decreased symptoms or severity of illness or limitation of the disease process. The focus of the long term treatment of coronary heart disease is on the management of the risk factors.

There is no cure for a chronic illness and as a result the patient experiences a sense of hopelessness and looses confidence (Smith and Nicassio, 1995). In addition depression, disrupted marital and family relationships and decreased ability to work are commonly seen in patients with chronic disease (Kaplan et al, 1987; Smith and Nicassio, 1995). The patient's self-perception is affected by changes in the body and the functional performance of the body. Persistence of medical symptoms leads the patient to the realisation that the medical treatment is limited and as a result medical advice is not accepted with much assurance Clinical status has to be set against the background of life and of functioning at home or at work. The knowledge of chronic suffering is much less widespread than the knowledge of acute disease and the result is that the patient's real plight is not fully appreciated, nor understood (WHO, 1980).

With people living longer, the population is increasing and more people are exposed to the development of chronic diseases (Jette, 1993). Chronic

disease has superseded acute disease as the major medical problem (Fries, 1980). The practical focus on health improvement over the next decades will be on chronic instead of acute disease, on morbidity and not mortality, on quality of life rather than on duration of life, and on postponement rather than on cure. Because of the complex nature of major diseases, attention is drawn to the factors that influence outcomes, particularly social and psychological outcomes. Outcome is related to choice, assumption of personal responsibility, and education for making decisions about personal health and self-care. Patients should be encouraged to, rather than discouraged from, exercising their personal choice. However returning responsibility to the patient may not be easy to achieve and may cause the patient distress (Fries, 1980).

Health education and preventive medicine can effectively lower the incidence of age-specific chronic disease (Rabbit, 1992) and these two factors should demand the attention of all health care workers. The risk factors for poor health status need to be identified so that they can be modified by health care workers in order to promote better patient outcomes.

REHABILITATION

Rehabilitation is defined in the Oxford Dictionary (1992) as "The process of restoring the individual to effectiveness or normal life by training after illness" but for the purpose of this discussion rehabilitation is regarded in the broad sense on the lines suggested by the WHO and includes the total medical care of the patient from the time that the patient presents for medical care until the final discharge of the patient. The WHO defines cardiac rehabilitation as the "sum of activity required to ensure patients the best possible physical, mental and social conditions so that they may regain as normal as possible a place in the community and lead an active and productive life" (WHO, 1964).

Rehabilitation in chronic disease means restoring or creating a life of acceptable quality for patients who suffer from chronic diseases. Rehabilitation should not be done for people but with them. Rehabilitation is an area in which the natural sciences, behavioural sciences and social sciences meet (WHO 1964). In patients with cardiovascular diseases, the WHO Expert Committee on Rehabilitation of Patients with Cardiovascular Diseases was in agreement that every thing possible must be done to rehabilitate such patients in order to restore them to as normal a life as possible in the society in which they live. These patients should be granted the dignity and the right to security in the same way that it is granted to normal individuals and individuals with other major disabilities.

Gordon and Gibbons (1991) stated that "cardiac rehabilitation programmes are designed to restore a patient to optimal physiological and psychological health compatible with the extent of the patient's heart problem". The rehabilitative approach should begin at the onset of illness and remain a continuing feature in the long-term care of the patient; however, "the initiation and co-ordination of rehabilitation efforts must be the responsibility of the patient's primary physician..."(Wenger and Hellerstein, 1992).

Therapy for patients with chronic disease is designed to limit the disabling consequences of the illness. Quality of life encompasses the ways in which the patient's life is affected by the illness and by the "components of its care" (Spitzer, 1987). The clinical effectiveness of rehabilitation in chronic diseases, according to Oldridge et al (1991) needs to be judged not only in terms of mortality and morbidity but also in terms of health - related quality of life. Research on the quality of life in the field of rehabilitation has become increasingly popular (Fabian, 1991). **The measurement of outcome of treatment for the patient is the keystone of modern medicine, and its importance is being recognised throughout clinical practice.** This is especially the case when costly invasive treatments are involved. Survival figures, clinical judgement of outcome, return to work and test results have

been the prevalent methods of assessing outcome. The main reason for their use may be that they are easier to measure (Caine et al, 1991). For instance it could be that return to work is more closely related to personality type and that the patient may want to work, but if the financial circumstances of the patient permitted, then not to return to work may in fact have improved the patient's quality of life more.

There has been a change of emphasis in the assessment of patients with coronary atherosclerotic heart disease recently and the trend is more towards assessing outcome in terms of patients' perceptions of changes in their state of health over a period of time.

REHABILITATION AND QUALITY OF LIFE

The traditional and accepted definition of rehabilitation is that it is the reduction of disability and handicap with or without a change in the underlying impairment. These changes are not unrelated to the individuals in whom they occur although not much attention has been given to the reaction of the patient to them. The effects of the disease process can never be partitioned between body and mind (WHO, 1980).

Rehabilitation means a goal directed and time limited process aimed at enabling an impaired person to reach an optimum mental, physical and/or social functional level, thus providing him or her with the tools to change his or her own life. It can involve measures to compensate for a loss of function or a functional limitation (for example technical aids) and other measures intended to facilitate social adjustment or readjustment (United Nations, 1983).

In patients with cardiac disease, the reduction of disability and handicap are considered more appropriate determinants of outcome than a reduction in mortality or morbidity. There is also consensus that criteria such as function

in daily life, productivity, emotional stability and life satisfaction can be considered as indicative of the improved quality of life of the patient (Wenger et al, 1984).

In coronary artery disease the impairment is coronary atherosclerosis, the disability is the presence of angina and the handicap is the inability to function normally in the community. The presence of these factors leads to a poor quality of life (Oldridge, 1986). A common interpretation of rehabilitation for patients with cardiac disease is that they should be "restored and maintained" at optimal clinical, social , vocational and psychological status. This implies that all this would be done for the patient, possibly by a health professional, and that the role of the patient would be passive. The definition of the WHO is slightly different and implies that the patient should assume some responsibility for their rehabilitation in the process of regaining as normal as possible a place in the community (WHO, 1964).

Perhaps health care workers need to look at their perspectives on rehabilitation and should consider five important conceptual changes that are suggested by Sartorius (1992).

The **first** concept is the improvement of overall quality of life as perceived by the patient as well as the patient's family.

Secondly, if the quality of life is going to become a criterion for assessing improved rehabilitation, the opinion of those whose life is being changed must become a decisive factor, rather than an interesting point of observation.

A **third** important point is that people are different and so are impaired people, and rehabilitation workers should be tolerant to these differences. The outcome of rehabilitation should not be judged by the patient's ability to abide by rigid, predetermined rules of "normal" behaviour. Being able to find a

job is still considered confirmation of a patient's worth and activities such as help and support to others, the upbringing of children and creative art, are given much less attention and respect than the ability to function in a traditional job.

Fourthly it must be borne in mind that people and impairments change over time. These changes, as well as the changes in the world in which patients live, should be respected. It has to be appreciated that rehabilitation is a long-lasting process and people must be accommodated as they move forward in this process. Rules and judgements will have to keep changing while all are moving forward in time.

Fifthly, as we come to understand more fully that rehabilitation is an intervention to improve the quality of life, so it becomes important to appreciate that there is not a strict distinction between services dealing in rehabilitation and those that aim to help people in other ways. This connection does not only imply the differences between health and rehabilitation services but also between these services and other community services. The result will be unity of purpose and aim and a higher priority for rehabilitation. Improving the patient's quality of life will include certain factors that are important to all of us and certain factors that are important specifically to the patient (Cohen, 1982).

QUALITY OF LIFE AS A HEALTH CARE ISSUE

The major objective of medical care is to preserve life and to assure its optimal quality. Medical and surgical interventions have become so advanced that the mortality rates of certain elective procedures are very low (Jenkins et al, 1996). As survival rates increase adverse consequences following interventions have become evident. In the final outcome the quality of life of the patient may be affected. For this reason it becomes important to assess

the patient's judgement of the medical treatment and the resultant outcome. Life expectancy has increased dramatically in this century from 47 years to 73 years and chronic diseases of the later years are often responsible for the most premature deaths (Fries, 1980). Quality of life measures are important to determine the impact of chronic diseases on patients lives (Guyatt et al, 1993).

The challenge of ascertaining quality of life as an outcome of rehabilitative care lies in the assumption that the bulk of medical and surgical treatment is not life-saving but on the contrary aimed at improving the state or quality of life. Most diseases are not fatal but they erode the patient's comfort and happiness and in this way they affect patients' quality of life. The treatments of some of these diseases often impact on patients' comfort and lifestyle (Mosteller et al, 1980). Patients are increasingly expected to become partners when decisions are made regarding their therapy. In order for them to make informed decisions, information on how treatment will affect their lives, is important (Kinney et al, 1996).

To determine whether an intervention has been successful it is essential that the improvement of the medical status of the patient as well as the patient's perception of this outcome is considered, in other words the quality of life of the patient must be assessed. Moving away from an emphasis on mortality, health researchers are now focusing more on the causes and consequences of disability. The evaluation of the quality of life provides much greater understanding of the impact and treatment of the illness than traditional outcome measures (Ferrans, 1990).

DEFINING QUALITY OF LIFE

One of the major problems with quality of life research is that there is no universal definition of quality of life. Failure to define quality of life has been identified as a major weakness in many studies (Kinney et al, 1996). Gill and

Feinstein (1994) reported that in only 15% of the literature reviewed by them, quality of life was defined. Without defining quality of life there is no blueprint for the measurements taken to support the definition. Knapp and McClure (1978) regard quality of life as a multidimensional concept that can be viewed as a transaction between individuals and their social and physical environment. Personality traits such as "expectancy of success", adaptability and competence are some of the individual differences observed in patients' attempt to master their environment.

Quality of life is a dynamic construct and one should bear in mind that attitudes are not constant and are continually modified by phenomena such as adaptation, coping and self-control. Individuals also change the standards by which they assess quality of life during a prolonged disease process and this must be kept in mind (Allison et al, 1997).

Analysis of the literature resulted in identifying two important factors affecting an individual's quality of life. These two factors are the health of the patient and the ability to achieve and maintain maximal functional independence and autonomy
(King et al, 1992; Williams, 1994). Quality of life has been described by LaMendola and Pelligrini (1979) as a complex concept used by patients to subjectively assess the desirability of a particular way of life. The quality of that way of life is the satisfaction it provides the individual (Ferrans and Powers, 1992).

According to Flanagan (1982) health and subjective well-being are of central importance in the assessment of quality of life. Health includes the objective evaluations of disease and the patient's perception of symptoms. Subjective well-being includes measures such as the patient's assessment of life in terms of happiness, life satisfaction and positive effects. Health has been reported as the most important aspect of happiness (Campbell, 1970). Palmore and Luikart (1972) stated that self-rated health was the predominant

variable to influence life satisfaction. However, it is important to note that the relationship between satisfaction with health and well-being is only moderate. It seems that the influence of health on well-being does not merely reflect how people feel physically, but to some extent what their health allows them to do in terms of functional capacity.

Note has to be taken of the suggestions by Wiklund et al (1987) that subjective measures of health are more strongly related to happiness (satisfaction) and that objective measures have only a limited relationship to subjective assessments. It is therefore essential to include both kinds of indicators when measuring health.

Happiness is associated with the good life. Happiness for Aristotle stemmed from virtuous activity of the soul throughout a complete life, with external goods adding lustre to it (Aristotle: Ethica nicomachea, 1947). Happiness and satisfaction are not synonyms and behave differently across the life span in the general population. Happiness decreases with age whereas satisfaction increases. Happiness suggests short term positive feelings whereas satisfaction implies longer term cognitive experience resulting from a judgement of life's conditions (Patrick and Erickson, 1993). Campbell (1993) states that there is no doubt that happiness and satisfaction have something in common but there is also a difference. Satisfaction in his view involves an act of judgement, whereas happiness is characterised by a spontaneous "lift-of-the-spirits". For this reason it is argued that satisfaction comes closer to capturing the concept of quality of life than does happiness (Ferrans, 1990).

Along with life satisfaction and happiness as indicators of psychological well-being, perceptions of physical well-being are also important, particularly when assessing quality of life of individuals who have experienced disruption in their physical health status (Packa, 1989; King et al, 1992).

A simple but astute definition of quality of life is offered by Ory et al (1994) They define quality of life as a "multidimensional concept that refers to an individual's overall life satisfaction and total well-being". They go on to say that one of the most important factors that affects the patient's quality of life is the patient's health and ability to function. The aim of medical intervention should be to obtain optimal function and to decrease disability and therefore health-related quality of life has become an increasingly important measure to assess the impact of disease and the outcome of treatment on individuals and their families. The domains (areas, fields) commonly thought to comprise health-related quality of life and considered important by Ory et al (1994) are: physical health, functional ability, emotional health (depression, anger, anxiety and perceived stress), sexual functioning, work productivity, social performance and life satisfaction.

Quality of life is a particularly relevant outcome for coronary rehabilitative care in that it also reflects the patient's personal value system, life satisfaction and judgements on perceived health status. Perceived health status in turn has been demonstrated to correlate better with mortality risk than many other objective measures (Kaplan and Camacho, 1983; Ruberman, 1984).

Health is one of the most important components of quality of life (Cleary et al, 1991). The term "Health-related quality of life " refers to physical, psychological and social domains of health, seen as distinct areas that are influenced by a person's experiences, beliefs, expectations and perceptions. Each of these domains can be measured in two dimensions: 1) objective assessments of functioning or health status and 2) subjective perceptions of health. Although the objective dimension is important in defining a patient's degree of health, the patient's subjective perceptions and experiences translate the objective assessment into the actual quality of life experienced. When a patient becomes ill almost all aspects of life become health related (Guyatt et al, 1986).

The patient's own value system is important in assessing quality of life. There is growing consensus that the individual himself is the only proper judge of his/her quality of life (Guyatt et al, 1986; Ferrans, 1990; Denollet, 1994) and it has been postulated that self-rated health is the predominant variable to influence satisfaction with life in middle age (Palmore and Luikart, 1972). Quality of life is a reflection of the way a person feels and functions (Guyatt et al, 1986). Clinicians tend to overestimate the role of life skills and to underestimate the role of social needs. The term "quality" simply implies an evaluation or subjective rating by the individual. The subjective ratings can be of life in general or various components of life such as social life, financial situation or work (Stewart and King, 1994). Subjective states are difficult to measure and thus investigators tend to bypass personal evaluations and infer quality of life through knowledge of aspects of the individual's behaviour that can be observed and measured. Presuming subjective quality of life or well-being from external circumstances does not fully take into account the values, needs and adaptability of individuals to various life situations (Flanagan, 1982).

The spouse's evaluation in the assessment of the patient's quality of life is important. It has been suggested by some researchers that the opinion of the spouse or caregiver should be included in quality of life assessments (Wenger et al, 1984; Kinney et al, 1996). The patient's opinion of his/her quality of life is considered to be the only true reflection of that particular life experience. The opinion of the spouse/caregiver is also of importance because the reliability of assessments is increased by another respondent's perspective. The patient also does not usually live in isolation and therefore the way they perceive their life experience will be reflected by those around them. Mayou and Bryant (1993) however feel that there may be a problem with disagreements and that it is best to consider only the opinion of the patient. However, to lose the information on how the intervention affects the family, would result in an incomplete evaluation, and in spite of the possibility of disagreement it would be desirable to include the spouse/caregiver.

THE DOMAINS THAT CONSTITUTE QUALITY OF LIFE

According to Gill and Feinstein (1994) the domains under investigation in quality of life research are frequently not identified (identified only in 47% of cases). There is as yet no universal definition of quality of life but it is generally felt that quality of life can be represented by four important areas (domains) [Kinney et al, 1996]

- Symptoms and side effects
- Physical function
- Social function
- Psychological status

Although Kinney et al (1996) feel that these domains fully represent quality of life the author is of the opinion that these domains are incomplete because information is lacking on sexual activity, cognitive functioning, and life satisfaction. There is also too little emphasis of the patient's own perception of his/her health and therefore the suggested definition by Ory et al (1994) is more inclusive.

The domains recognised by the Coronary Artery Surgery Survey Principal Investigators and their Associates (1983) were: Functional status; improvement of cardiac related symptoms; return to gainful employment and recreational activity. The Veterans Administration Study recognised the following domains as important to determine quality of life: Severity of angina, exercise performance and the New York Heart Association functional classification (Peduzzi et al, 1987). The domains used by the CASS Principal Investigators and the Veterans Study are incomplete as there is no recognition of the patient's evaluation of health and personal life satisfaction outcomes.

According to Stewart and Ware (1992) the domains commonly thought to comprise health related quality of life are: physical health, emotional health,

cognitive functioning, sexual functioning, social role performance, work productivity, and life satisfaction. These domains correlate well with those described by Ory (1994) except for cognitive functioning, and they cover all areas that are essential for the evaluation of quality of life. The cognitive function of the patient is said not to be affected by bypass surgery (Klonoff et al, 1989) and therefore it is suggested that the most relevant and acceptable domains are those described by Ory (1994). They are: Physical health, functional ability, emotional health (depression, anger, anxiety and perceived stress), sexual functioning, work productivity and social performance and life satisfaction.

Quality of life as a dynamic construct is frequently ignored in medical research. When assessing quality of life it is assumed that the point of reference does not change, meaning that an individual's attitude towards a certain construct (concept) remains the same. However, it is important to bear in mind that attitudes are not constant and are constantly modified by phenomena such as adaptation, coping and self-control. Researchers in quality of life issues have recognised between-subject differences when determining the content of the measuring instrument. However, according to Allison et al (1997), within-subject differences (i.e. the fact that the individual changes the standards by which he/she assesses his/her quality of life) have been largely ignored. To explain the foregoing statement consider the following: In a study on transplant recipients and haemodialysis patients by Evans (1991) he reported that these patients were often happier, more satisfied and reported a better quality of life than healthy patients. The standard by which these patients assessed their quality of life was different from the "normal" population because of a process of adaptation, coping and self-control.

A possible way to overcome this problem when researching quality of life is to compare the post intervention measurement with reference to the pre-intervention measurement e.g. Are you as active (functional) as before the operation?

The use of individualised questionnaires should also be considered. Patients should be given the opportunity to decide for themselves which aspects of their lives they value more (weigh the importance of the domains) but not actually choose the questions themselves. Patients may decide that their social function is more important than their physical function. However, the researcher should still design the questions to determine social and physical function.

Finally, pre-intervention characteristics should be evaluated. In 1982, Cohen suggested that patients' "life-plans" in terms of their goals and hopes should be taken into account when considering quality of life and also whether interventions resulted in the fulfilment of their "life-plan" or resulted in frustration. This would be difficult because phenomena such as coping strategies, adaptation, expectations and optimism would then be ignored. Goodinson and Singleton (1989) have suggested that the information appropriate to a patient's improved quality of life can not be separated from coping strategies and past experiences of illness. If these characteristics could be determined before the intervention the data obtained would not be compromised due to their temperament or attitude.

SHORTCOMINGS OF QUALITY OF LIFE MEASUREMENTS

It is no longer adequate to demonstrate that medical interventions result in physiological changes unless a accompanying change in life function can also be demonstrated (Lomas et al, 1987). It seems that quality of life measures that have relied on clinical judgement alone, may have inadequately represented patient values. Frequently the focus was on objective measures and not on subjective indicators of quality of life (O'Young and McPeek, 1987) and these measures were taken only as a single evaluation (Hollandsworth, 1988).

There is widespread scepticism whether quality of life can be measured in any meaningful manner because of inadequate measures used to assess the impact of cardiac disease and its treatment on the lives of patients. However, methods are constantly improving and there are a number of standard measures of quality of life available making quality of life assessments possible and worthwhile (Mayou and Bryant, 1993).

The relevance of the quality of life measures are frequently not explained to the practising clinician. The principal goal of clinical care is to improve patient outcomes. In order for physicians to embrace the concept of measuring health related quality of life the validity of these measures must be proved and it must be clear to them how they will be able to use this data (Wilson and Cleary, 1995).

An interesting opinion expressed by Gill and Feinstein (1994) is that, because quality of life is such an "uniquely, personal perception", it can be measured only by determining the opinions of patients and supplementing existing methods. Any assessment instrument should allow patients to add additional items they consider important which may not have been included in the questionnaire (Gill and Feinstein, 1994).

A summary of the shortcomings of improved quality of life measures

- Quality of life is not adequately defined.
- The focus is mainly on physical function, symptoms and side effects.
- Measurements are taken at one point in time only
- There is no evidence of the validity, reliability or sensitivity of existing measures to detect change
- The relevance of the findings for the clinician is not indicated
- There is usually no opportunity for patients to add on to the measuring instrument, items that they consider important.
- The domains are not clearly defined

IMPORTANT INFORMATION GAINED FROM THE LITERATURE REVIEW

1. C Young and McPeek (1987), when doing an analysis of quality of life as a outcome variable after cardiac surgery, found that few studies included subjective indicators of quality of life and that many focused on objective indicators.

2. Hollandsworth (1988) on investigating the effect of medical care on quality of life of patients (varied medical conditions) identified that there is an absence of subjective indicators of quality of life. He also found a reliance on one time evaluations only.

3. It has been suggested by some researchers that the opinion of the spouse or caregiver should be included in quality of life assessments (Wenger, 1984; Kinney et al, 1996). The patient's opinion of his/her quality of life is the only true reflection of that particular life experience but the opinion of the spouse/caregiver is also of importance because the reliability of assessments is increased by another respondent's perspective.

Reasons for self reported improved quality of life: The three statements above support the research approach for this study, which is mainly based on the subjective information obtained from patients in three interviews over a period of one year. The spouse/caregiver was also interviewed at six months and one year post-operatively.

The risk factors for poor health status need to be identified so that they can be modified by health care workers in order to promote better patient outcomes.

HEALTH AND RESPONSIBILITY

SELF-EFFICACY, SELF-CARE, AND SELF-RESPONSIBILITY

The concepts of self-care and self-efficacy have been documented and discussed in the medical, psychological and sociological literature (Bandura, 1977b; Barofsky, 1978; Hickey, 1988; Mahler and Kulik, 1990; Mahler and Kulik, 1991). However it is the perception of the author that neither of these two concepts accurately describe the behaviour required of a patient with a chronic disease to ensure the best outcome of medical treatment. The concept of self-responsibility seems to be more appropriate. The three concepts self-efficacy, self-care and self-responsibility, as well their definitions will be discussed in the following section. An argument why self-responsibility is of importance in patients who have undergone bypass surgery will be presented.

The concept of self-efficacy

Self-efficacy has been defined as "the conviction that one can successfully execute the behaviour required to produce the outcomes" (Bandura, 1977a). This means that patients have to believe that they can do what is required of them, to ensure that the outcome of the medical treatment is successful. Self-efficacy is regarded by some as the most important prerequisite for behavioural change, because it affects how much effort the patient will invest in a given task (Ewart et al, 1983). Successful repetition of simple tasks will enhance a person's performance expectancy and therefore his/her sense of self-efficacy. By simplifying each step of the required health behaviour and allowing the patient to practise each step in isolation the result will be that the patient builds a sense of self-efficacy about performing each step (Glanz et al, 1997). As the patient gains confidence in accomplishing each step, the steps can be put together so that a sense of self-efficacy for accomplishing the entire task will prevail. One of the important goals of health education is to bring the performance of health behaviour under the control of the patient (Glanz et al, 1997). Self-efficacy has an important role in self-control because

it will affect the extent to which patients will make an effort to change their behaviour patterns.

Definitions of self-efficacy

Bandura (1977b) defined self-efficacy as "the conviction that one can successfully execute the behaviour required to produce the outcomes". Self-efficacy is the most important prerequisite for behavioural change (Ewart et al, 1983) and a lack of self-efficacy prevents patients from taking a recommended health action (Glanz et al, 1997).

THE CONCEPT OF SELF-CARE.

In the 1970's the concept of self-care caused a controversial discussion amongst American health care workers (DeFriese et al, 1994). These health care workers regarded this as a counter medical message that advocated a stronger and more central role for patients in clinical decision making. Health care workers felt that they were reduced to secondary status by the concept of self-care and that, as such, they would be in a submissive and inferior role to the patient.

Investigators in the field of self-care envisaged self-care as a form of lay education to improve personal health functioning that could empower and protect the individual from "the sometimes negative consequences of professionalization and medicalization" of health in our modern society (Barofsky, 1978; Butler et al, 1979).

Some researchers defined self-care in a way that included the active participation of the patient in a collaborative partnership with the health care worker. Such a health interaction would subsequently relieve the health care worker of the total responsibility for health care decisions that affected patients' lives (Stoller et al, 1993).

Towards the end of the 1980's the concept of self-care was formally accepted in the literature and within the practice of medicine (Hickey, 1988; Dean, 1986). According to DeFriese et al (1994) findings from many studies of self-care educational programmes showed that patients were being instructed on certain skills that were low risk and easily taught to the lay public, that would enhance health.

Haug et al (1991) describes self-care as a response behaviour to a perceived symptom without the involvement of physicians. It has been suggested that the decision not to accept medical care in certain situations could also be classified as self-care (Stoller et al, 1993). In contrast to the two above statements, the WHO describes self-care as an interaction between the patient and the physician implying that the patient would take positive action for his/her own health (DeFriese et al, 1994).

The following is a summary of the significant points of the WHO's definition (WHO, 1983):

1. It states that self-care is intentional with the aim of making a positive contribution to health through certain actions that will prevent disease, limit illness and restore health. It also implies that the individual will make a positive effort to improve the existing state of health which may be a chronic condition.

2. To implement these strategies the individual would have to have technical knowledge and skills. This means the knowledge of the required health behaviour and the knowledge to implement these and in this way effect changes in lifestyle.

3. This definition implies participative collaboration between the individual seeking medical assistance and the health-care worker, with the purpose of enhancing diagnosis and therapy as well as the maintenance of optimum levels of health.

The definition of the WHO implies that the patient will act in a responsible manner and for their definition the term "self-responsibility" could be considered more appropriate than "self-care". Because of the free interpretation of self-care in the literature, it is not considered an appropriate term to describe the required action of patients to ensure the optimal outcome of a medical intervention.

The definition of self-care

The definition of self-care as suggested from the literature is that the patient will act in a responsible manner with regard to the maintenance of optimal health and that the patient will take positive action.

THE CONCEPT OF SELF-RESPONSIBILITY

In the Oxford Dictionary (1992) **responsibility** is defined as being morally accountable for actions. Therefore self-responsibility means that an individual can be held **morally** accountable for his/her or her actions regarding the self. This can be in a physical sense, a psychological (attitudinal) sense or an educational sense. "Moral" is described in the Oxford Dictionary (1992) as "being concerned with the accepted rules and standards of human behaviour (of rights and duties)". Self-responsibility implies the moral duty of the patient to successfully execute the required health behaviour for improved health.

If a patient makes a decision not to have any treatment when treatment that has been known to have value is available, and this behaviour is identified as a part of the definition of self-care (Dean, 1986; Stoller et al, 1993), then self-care cannot possibly have the same meaning as self-responsibility. Haug et al (1991) defined self-care as a response behaviour to a perceived symptom without the involvement of physicians. Such a definition would imply that there is a difference between self-care and self-responsibility. Self-

responsibility implies knowing the correct action to take and also taking the correct action.

Self-efficacy is the subject's appraisal of his/her ability to cope with a specific situation. It is the patient's perception of his/her control over the disease (Cunningham et al, 1991). Self-efficacy may be an aspect of self-responsibility but self-responsibility is more than the belief in the ability to control a situation, it implies a responsibility for control of the situation.

Definition of self-responsibility

Self-responsibility is the necessary action for an optimal health outcome and can be defined as the moral duty of the patient to successfully execute the required health behaviour for improved health.

Responsibility for health

The issue of who is responsible for the health or illness of an individual is one which has not yet produced an answer but has elicited many opinions (Walston and Walston, 1982). As stated before, many patients and indeed most physicians regard doctors as the ones who are primarily responsible. A medical problem is after all for the doctor to rectify. There are however people who believe that the ultimate responsibility for health lies with the individual and if it does not, it should. Ginzberg as far back as 1977, stated that improvement in any health care system would not be effective unless the citizen became responsible for his/her own well-being.

Most people are not concerned about their health until they lose it. In many cases preventing disease means that the individual must give up certain habits, of which smoking is a good example, or do things which require an effort such as exercising regularly. The freedom of the individual to make his/her own decisions regarding his/her health puts tremendous pressure on government resources for health care. This results in an increase in taxes so that "one man's freedom in health is another man's shackle in taxes and

insurance premiums" (Knowles, 1977). Eventually this becomes a national and not an individual responsibility. Knowles argues that the 'right" to health should be replaced by a moral obligation to preserve one's health. The individual then would have the "right" to :

- Better and more information
- Accessible services of good quality
- Minimal financial barriers to these services

More doctors and more expensive hospitals will not improve health. Individuals who are willing to take responsibility for themselves and follow reasonable rules for healthy living can possibly extend their productive working life by avoiding disease and disability.
If this is the case for the healthy individual, then the individual that has had costly intervention because of disease processes should be responsible enough to follow the prescribed lifestyle changes to maintain his health.
If a human person is "a life lived according to a plan" then it seems logical that the person should take responsibility for that plan especially when chronic disease interferes with lifestyle. This sense of self-responsibility in chronic disease is probably the best predictor of reduction of disability and handicap (Oldridge, 1986).

It is important to bear in mind that persons with chronic disease are often more reliant on family members and health professionals for care (Walston and Walston, 1982). In order to successfully become responsible the patient and the family members should be considered members of the medical team and be provided with information about the disease, the treatment of the disease and the rehabilitation process.

In conclusion it can be said that self-responsibility is the successful execution of the required behaviour. Most outcomes flow from actions (Bandura, 1986). Being proactive means recognising the responsibility to make things happen. A proactive patient will be responsible for his own life.

Relevance of the concept of self-responsibility in patients who have undergone CABG surgery

In 1986, Neil Oldridge reflected on the goals . cardiac rehabilitation and suggested that cardiac rehabilitation should not only focus on issues such as improved quality of life but also on the issue of the acceptance of self-responsibility for rehabilitation. He also drew attention to the commonly accepted definition of cardiac rehabilitation that reinforced the concept that the surviving cardiac patient should be "restored to, and maintained at" optimal clinical, psychological, vocational and social status. This definition implied that the healthcare worker would do this for the patient. The definition of the World Health Organisation (1964) on the other hand suggested that patients took some responsibility for their rehabilitation so that they could regain as normal as possible a place in the community and lead an active, productive life. To be consistent with the WHO concept of rehabilitation patients should be encouraged to become increasingly self-responsible for their own active and productive life (Pashkow et al, 1988). This means that they essentially have to become responsible for improving their own quality of life (Oldridge, 1986).

Important concepts from the literature on health behaviour that may influence self-responsibility

The importance of behavioural and psychological factors in the cause and treatment of disease is becoming clear. In addition there is a growing feeling that patients should become more involved with their own care (Mahler and Kulik, 1991).

Two methods by which patients can become involved in their own treatment have been identified by Krantz at al, in 1980. Patients may seek "information involvement" by learning everything about the condition such as the diagnosis, prognosis, treatment plan and medication. The second way in

which patients may desire involvement is by "behavioural involvement" and this is manifested by getting involved in self treatment whenever possible, requesting specific medications and delaying seeking treatment by a health care worker.

Information-seeking copers are generally believed to be more distressed than patients who seek behavioural involvement, especially when there has not been adequate preparation of the patient prior to the medical treatment. In contrast, patients who seek behavioural involvement before surgery have been shown to start walking (ambulate) sooner after the operation and are also discharged sooner (Mahler and Kulik, 1990).

The bulk of the research investigating information involvement and behavioural involvement is in the acute care setting. The only study examining these two patterns in a chronic setting that could be identified in the literature was one by Mahler and Kulik (1991). They stated that as chronic diseases place greater responsibility on patients, it is most desirable that these patients become involved in their own treatment. They studied 83 male patients admitted for non-emergency CABG surgery using the Health Opinion Survey (HOS). The HOS was administered to patients pre-operatively, and at one month, four months and 13 months postoperatively. The significant results from this study were that patients with high behavioural involvement had less ambulation dysfunction at one month postoperatively ($p=0.006$); fewer social interaction problems at four months postoperatively ($p=0.01$); and had consulted a doctor significantly less often in connection with "heart problems" at 13 months ($p=0.02$). They concluded that patients who desired behavioural involvement with their treatment were "motivated by a basic desire to exert some control over the situation" whereas patients who have a desire for information involvement reflected a "desire to reduce uncertainty and arousal rather than control disease per se" (Mahler and Kulik, 1991).

At this stage one should probably also consider the theory that the focus of attention influences health care outcomes. Focusing attention on objective, concrete aspects of an experience will be more beneficial than focusing on the emotional or affective aspects especially in terms of long-term outcome (Suls and Fletcher, 1985).

In a study by King et al (1992) two groups of patients were identified who thought that the surgery was worth it. One group believed it was worth it because they experienced improved function and the other because it saved them from death or myocardial infarction. In these two groups, patients who reported improved functional capacity had more positive scores on life satisfaction and mood states. Those who believed they were saved from death or a more serious illness scored the same on life satisfaction and mood states as the patients who reported no benefit from the surgery. The following questions come to mind:

- Are self-responsible patients more focused on objective and concrete aspects of medical care?
- What is the relationship between focus of attention and involvement preferences?

In conclusion one can therefore say that self-responsibility is the successful execution of the required health behaviour to bring about improved health. The concept includes aspects of self-care and self-efficacy but extends beyond both concepts. **It implies that the individual is morally accountable for his/her actions regarding his/her health.**

The patient's acceptance of self-responsibility for his/her medical care will impact on the social behaviour of the patient and will have an effect on all who comes in contact with patient. For this reason the spouse should be included when doing a survey on self-responsibility.

If the patient accepts the responsibility for his/her health care when suffering from a chronic disease, then the focus of the health care team should be on the patient playing the most active role and the health care worker becoming more passive but always remaining supportive.

BEHAVIOUR AND BEHAVIOUR CHANGE

In 1996 McGinnis stated that certain behaviours that lead to a decline in the well-being of individuals, communities and populations, although most disturbing, were fundamental to civilisation (McGinnis, 1996). He goes on to say that poor individual behavioural choices have been documented as the source of perhaps half of all premature deaths that occur (McGinnis, 1996).

The evidence is overwhelming that CAD is not a consequence of old age but is a chronic lifestyle disease. It is also evident that the tempo of the atherosclerotic process can be changed even in the presence of significant disease if attention is given to risk factor management (Smith, 1997). In order to successfully rehabilitate patients with coronary atherosclerotic heart disease, certain behaviours that are detrimental to health, have to be changed. This requires knowledge, skills and the active participation of the individual involved. What makes this process difficult is that patients are generally resistant towards attending special programmes which assist in changing unhealthy lifestyle behaviours. What makes it even more difficult is that behavioural intervention does not result in immediate gratification; change comes slowly and sometimes it seems that very little is being achieved (National Centre for Health Statistics, 1987).

Preventative and health promoting behaviours aim at achieving the maintenance of good cardiac health, a reduction in the likelihood of developing CAD, and favourably intervening in the rate of progression of the existing CAD.

The problem of regimen adherence is well documented in the medical literature and it has not changed much in the past twenty years . Up to 80% of patients will not follow the prescribed treatment programme sufficiently to attain therapeutic benefit (Dunbar-Jacob et al, 1995). This problem extends over different age groups, diagnoses, socio-economic strata as well as different treatment regimes. All patients may be at risk for non-adherence to the therapeutic regimen prescribed and the practitioner needs to advise patients in a way that will support adherence.

DeBusk (1996) states that many physicians are not comfortable with risk factors modification based on behavioural principles. He feels that they lack the competency required for successful risk factor modification and also because the results of risk factor modification can not be as easily observed as the results of an acute intervention. When making these statements he reinforces the statement by Mumford et al (1982) that "The elaborate services provided in the surgical recovery room or the coronary care unit leave little to chance. They contrast markedly with the minimal attention systematically provided to educate patient and family for recuperation following hospitalisation. In an action-oriented society, reports of modest interventions may command less attention than reports of the modest effects of more flamboyant interventions".

A review of the literature on CABG surgery, risk factor modification, quality of life and self-responsibility would thus not be complete without a brief commentary on aspects of behaviour modifications. According to Ockene and Ockene (1992) there are four important theories to consider when hoping to achieve behavioural change in patients with CAD. These four theories are: The Consumer Information Processing Theory, Social Cognitive Theory, The Health Belief Model, and the Stages of Change Model.

The following is a summary of these theories as explained by Ockene and Ockene (1992) with the addition of one more model, The Theory of Reasoned Action, regarded by Glanz et al (1997) as important.

THE CONSUMER INFORMATION PROCESSING THEORY

This theory explains the factors that influence the processing of knowledge and the effect of knowledge on health behaviour. In order to make rational decisions, knowledge is essential. Knowledge also has an important influence on human behaviour. Although knowledge is very important, it alone is not sufficient to ensure health-enhancing behaviours (Rudd and Glanz, 1990). To illustrate this point, Schucker et al (1987) reported that although many adults believe that cholesterol reduction would have a favourable effect on CAD, they continue to eat high fat diets. There are a number of essential conditions necessary for a patient to make use of available information. These are: the information must be available; the patient must want the information and believe it; the patient must have the time, the energy and ability to comprehend this information; and it must not be confusing. Once the patient has the necessary information they may still lack the motivation, the skills, the support or the resources to act on the information. The factors that will enable them to do so are explained by the social learning theory and the health belief model.

THE SOCIAL LEARNING THEORY (SOCIAL COGNITIVE THEORY)

This theory emphasises that as most behaviours are learned, they can also be unlearned or changed (Perry et al, 1990). It states that a person is able to self-manage behaviour and that active participation is needed in learning and the application of behaviour-changing skills. Health is constantly interacting with - and being influenced by - many different determinants. No single factor is sufficient to totally influence behaviour. These multiple determinants are:

personal characteristics of the patient (cognitive factors, personality and demographic factors); environmental influences (social, cultural and economic factors); other associated behaviours e.g. a patient trying to stop smoking and taking alcohol instead. Physiological and/or pharmacological factors such as drug addiction or other addictive patterns such as smoking, over-eating and alcohol abuse may also be associated factors (Bandura, 1977b).

Cognitive factors include knowledge, thoughts, attitudes and skills. The social learning theory states that when attaching thoughts or feelings to certain behaviours, these behaviours can become habits. Therefore thoughts or feelings can trigger behavioural responses. To illustrate this point, consider individuals who eats when becoming anxious because they have experienced in the past that eating allays anxiety. Eventually the urge to eat may appear so rapidly that they no longer realise that there is an association with anxiety (Ockene and Ockene, 1992). These patients need to be helped so they can identify triggers and reinforcements of behaviour. Not only do they need to identify them but must learn how to control them and find reinforcements for appropriate preventative behaviours.

THE HEALTH BELIEF MODEL

According to Rosenstock (1990) an appreciation of the knowledge and the attitude of a patient will facilitate the understanding of the patient's motivation and the likelihood that the patient will adhere to a specific health behaviour change. **This model emphasises that beliefs held by an individual form the basis of that person's decisions regarding health care.** In the health belief model several factors are suggested that may influence the likelihood that a patient will comply with preventative action. Patients are more likely to take action if they believe that they are personally vulnerable to a given condition such as CAD. They will also take action if they believe that there will be serious consequences if they do not take action.

They will take action if they believe that by doing so they will decrease their risk and that the cost of the action will be outweighed by the benefits (Rosenstock, 1990).

These concepts help to explain why individuals who have had a myocardial infarct are more likely to stop smoking or change their eating habits than patients who still have no symptoms of any illness. By providing a patient with information on the atherosclerotic process and explaining the personal relevance to him, a health behaviour change may be induced if the patient understands the personal risk involved.

THE STAGES OF CHANGE MODEL

This model emphasises that behaviour change is an extended process and occurs in stages. Using smoking as an example: it can often take a patient five to ten years to successfully break the habit of smoking and there may be a number of attempts before the patient finally succeeds (Prochaska and DiClemente,1983).The stages of behaviour change include precontemplation, contemplation, preparation, action and maintenance of the altered behaviour. Maintenance of the altered behaviour is usually regarded as successful if the patient can maintain the altered health behaviour for a period of at least six months. These stages are cyclical rather than linear and so if a patient relapses into his/her old behaviour it is common to cycle back to the precontemplation or contemplation phases.

This model is important because the health worker's intervention and encouragement in the various stages may spur the patient on to taking action. It is also important that health workers realise that this is a process so that they do not alienate the embarrassed relapser. The smoker who has managed to quit smoking for three months and then resumes the habit should not be regarded as a failure but rather as someone who is learning and does not find the process easy.

THE THEORY OF REASONED ACTION

From the above behavioural models it is clear that in order for a patient to modify their health behaviour they have to have the knowledge to do so but knowledge alone is not enough and does not guarantee behaviour modification. The Theory of Reasoned Action is concerned with the relations between beliefs, attitudes, intentions and behaviour (Glanz et al, 1997). According to this theory the most important determinant of behaviour is the person's behavioural intention. The behavioural intention is determined by the person's attitude and his subjective norm. Attitude is determined by an individual's beliefs about the outcome of performing a certain behaviour and the importance they attach to that outcome. The subjective norm of a patient is determined by his/her normative beliefs (whether people he regards as important would approve or disapprove of the behaviour) and motivation to comply (whether he is motivated to comply with the wishes of those referents).

Behavioural beliefs and normative beliefs are linked to behavioural intention which in turn would lead to a specific behaviour (Montano et al, 1997). This may be the reason why patients respond favourably to recommendations made by their physicians.

SUMMARY

From the literature review one can conclude that CAD is a chronic disease, for which CABG is indicated only in special cases. The operative outcome will not be successful if the patient does not comply with lifestyle and risk factor modification. The surgical intervention is costly and in a climate where health costs are under scrutiny and attempts are being made to make the available

funding accessible to a greater percentage of the population, there is a moral responsibility for patients who have undergone expensive interventions to accept the responsibility for their rehabilitation to ensure the optimal outcome of these interventions.

It is obvious that the barriers to the assumption of self-responsibility for one's own health are lack of knowledge, lack of sufficient interest in what is preventable, and a culture which progressively erodes the idea of individual responsibility while stressing individual rights. Patients have to overcome these barriers and become self-responsible in order to experience an improved quality of life (Knowles, 1977). The hypothesis can thus be made that for patients with chronic diseases to be considered successfully rehabilitated, they should accept responsibility for their own rehabilitation.

Measuring the acceptance of self-responsibility is however not a well-researched area and very little information exists in the literature to guide this process. To achieve this aim a number of surveys were conducted of patients (and their spouses/care-givers) who had undergone CABG surgery in order to determine if self-responsibility was an important factor in the successful outcome of CABG surgery. A series of questionnaires were developed over a period of six years. The development and the design of the questionnaires used in the final survey will be discussed in the following section.

CHAPTER III

THE DEVELOPMENT OF QUESTIONNAIRES FOR A SURVEY DETERMINING SELF-RESPONSIBILITY AS A FACTOR OF IMPROVED QUALITY OF LIFE.

In this chapter the development of six questionnaires to determine improved quality of life and the acceptance of self-responsibility will be discussed. The importance of the acceptance of self-responsibility as a factor in the successful outcome of patients who have undergone CABG surgery has not been determined. It has been established from the literature that improved quality of life is the optimal measure of the successful outcome of CABG surgery. The concept of improved quality of life will therefore be used in this study to determine a successful outcome following CABG surgery.

A survey was undertaken of patients who had undergone CABG surgery. The aim was to establish a group of patients who had an improved quality of life after the surgery and then to examine this group to establish whether the acceptance of self-responsibility was a factor in those patients.

Questionnaires had to be designed to measure improved quality of life as well as acceptance of responsibility. Questionnaires to determine quality of life are designed to assess the impact of disease and patients' responses to the intervention. Quality of life after CABG surgery is an area that is well researched (CASS Principal Investigators and their Associates, 1983a; Jenkins et al, 1983; Booth et al, 1991; Oldridge et al, 1991; King et al, 1992; Speziale et al, 1996). The existing quality of life questionnaires do not provide adequately for evaluations of patient-perceived outcomes, which is increasingly becoming the cornerstone of assessing clinical effectiveness (Weaver et al, 1998). Little is also known about sociodemographic and clinical characteristics that predict baseline quality of life or changes with time or intervention (Oldridge et al, 1998). A decision was made to use an

established method for determining quality of life but to add to this a number of sociodemographic and clinical characteristics as well as patients' perception and their spouses/caregivers' perception of the success of the outcome.

There were no existing guidelines for identifying the factors that determined self-responsibility, and as a result the designed questionnaires had to cover a very wide range of socio-economic, medical, behavioural, and attitudinal aspects of the patient's life and disease. The opinion of the spouse/caregiver was also sought as it was felt that improved quality of life as well as responsibility could not be judged in isolation. In addition the assessment of patients' knowledge, as well as the knowledge of the spouse/care-giver, with regard to the disease, surgical procedure and risk factor modification was essential. It was considered important to obtain the subjective assessments of patients on the outcome of the operation because no matter how successful CABG surgery may be from a purely medical point of view, patients' futures are based on how they feel about themselves and what they feel they are able to do (Clancy et al, 1984). To this end a series of interviewer-administered questionnaires were designed.

Prior to the description of the subject selection and method, the development of the various questionnaires will be discussed.

It was necessary to design questionnaires in a way which would be suitable for personal interviews with patients at the time of the operation followed by telephonic interviews at six months and 12 months post-operatively, with both the patient and the spouse/care-giver. Improved quality of life was the measure of a successful outcome.

ASSESSMENT OF IMPROVED QUALITY OF LIFE

Improved quality of life was assessed by the method suggested by the Principal Investigators (CASS, 1983a). They considered quality of life of substantial importance but felt it was difficult to evaluate because the descriptors of quality of life were mainly subjective and were influenced by factors other than the therapeutic intervention. They considered the following three categories to be sensitive to determine improved quality of life:

- Improved functional status.
- Amelioration of cardiac related symptoms.
- Return to gainful employment and recreational activities after the intervention.

For this study sociodemographic and clinical characteristics were added as well as patients' and their spouses'/care-givers' perceptions of the outcome.

ASSESSMENT OF SELF-RESPONSIBILITY

Responsibility is defined as being morally accountable for one's actions. Therefore self-responsibility means that the individual can be held morally accountable for his or her actions regarding their "own self". This can be in a physical sense, a psychological (attitudinal) sense or an educational sense (Oxford Dictionary, 1992).

It was felt that the following characteristics had to be considered in a patient who had undergone bypass surgery:

- Knowledge about the chronic nature of the disease.
- Knowledge about the risk factors involved in CAD.
- Knowledge of the operation.
- Knowledge of the medication.
- The ability to manage their "stress" as perceived by them.

- A positive attitude to recovery.
- Compliance to a programme for risk factor modification.
- Positive decisions leading to responsible health behaviours. These decisions would be checked against the spouse's perception of the patient's acceptance of self-responsibility.

DEVELOPING THE QUESTIONNAIRES

Questionnaires had to be designed that would provide the required information to determine Improved Quality of Life and Acceptance of Self-Responsibility.

QUESTIONNAIRES WERE DESIGNED IN THE FOLLOWING WAY

- Questions were taken from the literature.
- Brainstorming sessions were held with colleagues, experts and patients with experience in cardiac rehabilitation.
- Five pilot studies were undertaken over a period of four years (1989 - 1993).

A decision was made to use person to person interviews rather than mail questionnaires for the following reasons:

- More complete information could be obtained.
- It was a better method for elderly and infirm (ill) patients.
- The data could be obtained from patients 4 -6 days after bypass surgery.
- Pacing of threatening questions could be guided by observing non-verbal responses from the patients and in this way, candour of verbal responses was achieved.

The disadvantages of personal interviews are that the process of personal interviews is time consuming and costly and as a result limited numbers of patients can be admitted into the research process.

Telephonic interviews were conducted with patients and spouses at six months and one year post-operatively.

QUESTIONS FROM THE LITERATURE

When reviewing the literature, questions were identified that were essential to include when considering improved quality of life. Questions that could reveal aspects of the acceptance of self-responsibility were also identified. This section provides the motivation for including these questions in the questionnaires. The questions are identified by firstly the questionnaire **(Q)** that they are taken from followed by the number of the questionnaire **(Q1)** and this in turn is followed by the number of the question on the specific questionnaire e.g. What educational level have you achieved? **(Q1; 14).** The questionnaires appear in Appendix I (page 274).

Pre-operative employment status and return to work: It appeared to be very important to establish the patient's intention to return to work after the operation. Stanton et al (1983) claim that most adults associate their personal worth with their ability to fulfil a socially useful occupation and find much of their personal satisfaction in the workplace. Return to work is an indicator of functional benefit to the patient and it has social benefits to the community for return on the resources expended. Employment prior to surgery was one of the variables most frequently associated with return to work (Stanton et al, 1983).

It was thus important to establish the patients pre-operative work status (Q1; 13) as well as their response to the question : " Do you feel that you will be able to go back to work after surgery?" According to Stanton et al (1983) one

of the strongest predictors for return to work was a positive response to this question. Of the patients responding "yes" to this question, 82% returned to work whereas only 39% of the negative responders returned to work (Stanton et al, 1983). A similar observation that a pre-operative desire to work correlated well with return to work was made by Boll et al (1987). Where the patient had already retired, or was not working, it was necessary to establish the patient's recreational activities and the intention to return to those activities post-operatively (Q3 ;1 and 3).

The age of the patient: Establishing the age of the patient was important when evaluating pre-operative work status and the patient's return to work after CABG surgery (Q1;5). It was likely that patients who were near to their retirement age would most likely not return to work whereas one would expect younger patients, who had families to support, to return to work if at all possible (Anderson et al, 1980).

The medical status of the patient: The questions on the medical status of the patient were chosen from the literature for the following reasons:

- It has been suggested that medical status before the surgery correlates well with return to work after bypass surgery especially in patients with less severe angina and less fatigue, but that the more severely patients were diseased the less likely it became that they would return to work (Stanton et al, 1983; McGee et al, 1993).
- Other variables that were consistently associated with early retirement were post-operative angina and fatigue (Q3; 1a, b and c) and the period of unemployment before surgery (Danchin et al, 1982; Kinchla and Weiss, 1985; Hymowitz et al, 1985; McGee et al, 1993).
- Left Ventricular Ejection Fraction (LVEF) and the number of diseased vessels does not consistently predict whether or not a patient would return to work or not (Niles et al, 1980), but it was nevertheless important to include these questions (Q6; 3,4).

Socio-economic variables: Occupational level, family income and educational status are important variables to consider when predicting return to work, while the type of job is less important (Q1;13 and 14). Occupations that are physically demanding are often associated with a lower level of education and income and the latter two variables are associated with non-return to work (Davidson, 1983; Boll et al, 1987).

Religion: There have been indications that the use of religion and prayer as moral support had predictive importance (Q1; 15) for patients' return to work and ability to cope with the stress of cardiac surgery and therefore a question was included on the importance of religion to the patient (Stanton et al, 1983; Saudia et al, 1991).

Social outcomes: Changes in sexual activity after CABG surgery have been identified. These changes may be attributed to patients' post-operative energy levels (Kinchla and Weiss, 1985; Boll et al, 1987). Patients reported either increased or decreased energy levels and their sexual activity would be affected accordingly (Q3; 4 and Q4;19).

Psychological Outcome : There are many sophisticated psychological tests to determine patients' psychological status but they do not fall within the scope of this study. Kornfeld et al (1982) stated that the psychological outcomes that lend themselves best to direct measurement are the behavioural risk factors for example smoking, exercise and weight control (Q4;10, 11 and 16).

The patient's perception of the outcome of CABG surgery: It was necessary to establish the patient's perceived outcome of the operation because that would have an effect on the patient's quality of life (Jenkins et al, 1983). Patient-perceived outcomes have become the cornerstone for the determination of clinical effectiveness (Weaver et al, 1998). Patients were

asked whether they were satisfied with the outcome of the operation (Q4;1 and Q5;1)

Improved functional status: Because improved functional status is a goal for most patients undergoing bypass surgery (Allen et al, 1990), it was important to establish how the patient perceived his functional capacity post-operatively (Q4; 13).

Depression: Patients who are anxious and depressed prior to open heart surgery exhibited a higher post-operative cardiac complication rate (Mumford et al, 1982; Pintor et al, 1992). Thus emotional factors may influence the course of existing disease and recovery from medical crises. It was therefore also important to identify patients who were stressed pre-operatively (Q2; 6) and those who were depressed and moody post- operatively (Q3; 5 , 6 and Q4;12 and 15).

Attitudes: An attitude is a real or imagined entity toward which a cognitive, evaluative or intentional orientation of an individual is directed. An entity becomes an attitude when a person sets himself the task to state an evaluative judgement (Bandura, 1986). Attitude has been found to be a strong indicator of adherence to medical treatment for bypass patients (Miller et al, 1983). The following questions were included to determine patients' attitudes towards the chronic nature of the disease, return to work, satisfaction with the outcome of the operation (Ferrans, 1990; Fitzgerald et al, 1993) and whether the operation afforded a complete cure:

- Pre-operatively: Do you feel that you will be able to return to work after your operation? (Q3; 5).
- Post-operatively:
  Are you satisfied with the outcome of the operation? (Q4; 1 and Q5; 1).
  Do you feel that the operation has cured you completely? (Q4; 13 and Q5; 15). Both these questions were also put to the spouses or care-givers.

Knowledge of medical action for improved health: There are five medical actions, listed below, that a patient should take in order to comply with the medical regimen as identified from the literature (Miller et al, 1983):

1. diet
2. medication
3. cessation of smoking
4. exercise
5. stress management (modify responses to situations that are exciting or upsetting).

These five aspects of knowledge were included in the post-operative questionnaires (Q4; 8, 9, 10, 11 and 12). In the questionnaire for spouses or care-givers these were included as questions Q4;2, 3, 4, and 5.

Stress management (stress control) was important because it was considered an important aspect of the acceptance of self-responsibility.

The spouse/care-giver was not asked about the patient's ability to manage stress but to identify depression and moodiness as it was felt that they would be more able to comment on the latter [Q4 and Q5 (spouse);9]. The patient was also asked to rate his/her level of depression or moodiness (Q4; 15 and Q5; 15).

Emotional responses of patients: According to Mumford et al (1982), the patient's emotional responses to symptoms and to medical advice can influence their ability to subsequently manage their own disease.

- How patients were going to manage their disease was covered in the question: "What are you going to do to stay well when you go home?" This was one of the few open ended questions in the questionnaire and was included to encourage patients to express their opinion of their rehabilitation freely. This question was asked during the initial interview prior to discharge (Q3; 7).

- The patient's emotional response to their symptoms and medical treatment was covered in the question: Are you satisfied with the outcome of the operation? (Q4; 1).
- The questions about whether patients considered themselves responsible for complying to the modification of risk factors or not would indicate the patients ability to manage their own disease (Q4; 8,9,10,11).
- The question about the patient's stress levels and level of depression/moodiness post-operatively was also an indicator of the patients' emotional response to their disease and treatment (Q4; 12 and 15).

BRAINSTORMING

In addition to the questions taken from the literature the design of the questionnaire was discussed with the following experts:

1. Professor Theo Meyer, consultant at the time that the questionnaire was developed, and later head of the Department of Cardiology at the University of the Witwatersrand.
2. Dr Andres Digenio and Dr R Morris from the Cardiac Rehabilitation Centre of the Johannesburg Health and Housing Department.
3. Dr J Sim previously from the Cardiac Rehabilitation Centre.
4. The senior nursing sisters and the physiotherapists employed at the Cardiac Rehabilitation Centre.
5. A patient, who had been attending the Cardiac Rehabilitation Centre for a period of more than one year, and his wife.

A meeting was set-up with the above mentioned panel and the questionnaire was discussed and analysed in detail. This was done to ensure that the questionnaire would adequately measure patients' knowledge, attitudes to recovery and acceptance of self-responsibility. Questions that would provide the data to measure the quality of life as suggested by the CASS researchers

were included. At the panel discussion the questionnaire to the spouse was also evaluated to ensure that no important aspects were omitted.

REPORT ON 5 PILOT STUDIES

Once the design of the original questionnaires had been completed they were tested for validity in five separate pilot studies. As flaws emerged in the design of the questionnaires, they were corrected. For instance, after the first pilot study it was decided to include the spouse/care-giver, and in subsequent studies it was decided not to include patients from the public sector only but also from private hospitals. In the final pilot study the validity of the assessment of self-responsibility was tested.

Five pilot studies were conducted over a period of four years (1989 - 1993) These studies are described to illustrate the historical development of the questionnaires and the evolution of the concept that self-responsibility is an important aspect of the successful outcome of bypass surgery.

Pilot Study 1 (1989)

Objectives:

1. To test the sensitivity of the questionnaire to determine the medical status of the patient, and the patient's knowledge of the medical condition, operation and risk factor modification.
2. To determine whether the questionnaire was understandable to both the patient and the health professional.

Method:

Fifteen patients who had undergone bypass surgery at a Provincial Hospital were included in this study. Patients were interviewed pre-operatively, on the fourth post-operative day in the ward and two weeks after discharge at the cardio-thoracic surgery follow-up clinic (Eales, 1989).

Knowledge of risk factors in all the pilot studies were evaluated in the following way: There were four marks assigned to each risk factor

0/4 = no knowledge

2/2 or less = fair

> 2/4 = good

Results:

The average age of the sample was 60 years and there were 14 males and one female. Eighty seven percent of the sample had pre-operative angina, 53% had experienced a previous myocardial infarction, and one (7%) patient had previous CABG surgery. The presence of risk factors was identified as follows: hypercholesterolaemia was diagnosed in 33% of the sample, 27% were hypertensive, 67% were smoking and 67% had a family history of cardiac disease

Patients had poor knowledge about their medical condition (93% did not realise that they had a chronic disease), but good knowledge of the surgical procedure (40% knew exactly what the surgical process entailed and 47% had a fair knowledge). They had poor knowledge of the medicines they were taking (67% had no knowledge) and of the exercise programme they should be following (47% had no knowledge). The patients were reasonably knowledgeable about diet (all the patients knew some dietary facts) and the fact that smoking was bad for their health (87%). But, surprisingly the patients did not consider smoking as having any effect on their cardiac condition. It was obviously too soon to assess return to work.

Problems identified:

Patients were interviewed pre-operatively which meant that only patients that were booked for elective surgery were included in this sample. This was not a representative sample as all emergency cases were excluded.

The majority of the patients were from a low income group and did not belong to a medical aid scheme. This implied that they had a certain socio-economic status and therefore they represented a biased sample.

During the interview at the follow-up clinic it became quite clear that the spouse/caregiver was anxious to contribute to the interview.

Patients had poor knowledge about the medicines they were taking and the exercise they should be doing. Although they knew that smoking was detrimental to their health, they did not realise that smoking affected the cardiovascular system.

Conclusions:

- Detailed questions on the socio-economic and work status of the patient had to be included.
- Patients should be interviewed on day 4-6 post-operatively to include emergency referrals .
- It was important to include the spouse/care-giver.
- Questions on smoking should focus on the effect of smoking on the cardiovascular system.

Pilot Study 2 (1990)

A second pilot study was designed to include the changes to the questionnaire considered necessary as a result of the first study and to determine whether it would be possible to improve the poor knowledge of the patients. This would be done by motivating patients to read the instruction booklet and during individual teaching sessions at the 14 day follow-up clinic.

Objectives:

1. To determine whether it was possible to increase the patient's knowledge by encouraging them to read the instructional booklet provided to them on admission for surgery.

2. To provide the patient and the spouse with the knowledge of risk factor modification and the medical status of the patient, at the surgical follow up clinic.
3. To encourage the patient to attend a phase 11 Cardiac Rehabilitation programme at the Cardiac Rehabilitation Unit twelve weeks after the operation.

Method:

Forty three patients were included in this study. They were interviewed 4 to 6 days after bypass surgery and 14 days later at the surgical follow-up clinic. At this follow-up, their spouses were approached to participate in the study.

The questionnaire on day 4-6 included questions on knowledge of medical condition and surgical procedure.

The questionnaire administered at the follow-up clinic, 14 days after CABG surgery, included questions on modification of risk factors, patient compliance and patient responsibility. This questionnaire was administered to both the patient and the spouse and information was given to the patient and spouse if they lacked knowledge.

Patients were encouraged to attend the Cardiac Rehabilitation programme.

Results:

The highest proportion of patients:

- did not know they suffered from a chronic disease (81%).
- had fair or good knowledge of the surgical procedure [44% (fair); 40% (good)].
- had no knowledge of medication and exercise [47% (medication); 44% (exercise)].

The spouse/care-givers were more knowledgeable about medication (no knowledge 29%) and exercise (no knowledge 26%).

Only 44% of the patients received or read the instructional booklet.

The response to the question to whether the operation would be a complete cure (44% said no) was more realistic than in the first pilot study when only 7% (one patient) said the operation would not be a complete cure. The booklet clearly had some value.

The administration of the questionnaire on days 4 to 6 was clearly better than pre-operatively because more patients could be included in the sample. The patients seemed to enjoy the interview and the additional attention.

Problems identified:

Two weeks after the surgery was too soon to conduct a meaningful interview with either the patient or the spouse. The spouse/care-giver was anxious and aggressive and had poor knowledge regarding the patient's medical status but was nevertheless eager to communicate with the researchers.

Conclusions:

1. The questionnaire should not be administered 14 days post-operatively as this was too soon after the trauma of the surgery.
2. It was essential to include the spouse/care-giver in the questionnaire because they provided valuable information on the patient's behaviour and compliance. It also became clear that the spouse needed support and that an education programme for spouses and care-givers was essential.

Pilot Study 3 (1990)

The third pilot study was a continuation of the second to determine whether the patients had acquired additional knowledge from the interview and the educational session at 14 days and whether they were attending the Cardiac Rehabilitation Unit. This was the first telephonic interview with the patient and the spouse/care-giver and was conducted three months post-operatively.

Objectives:

To contact the patient and spouse/care-giver by telephone three months post-operatively and to determine the following:

1. The presence of cardiac-related or other symptoms.
2. Return to work or recreational activities.
3. The patient's and spouse's satisfaction with the outcome of the operation.
4. Was the operation regarded as a complete cure.
5. Knowledge of risk factor modification.
6. Attendance at Cardiac Rehabilitation

Method:

Forty three (43) patients and 38 spouses/care-givers were contacted by telephone three months after their CABG surgery. The amended questionnaire, including questions as specified in the objectives, was administered to both groups.

Results:

Only 23 patients and 23 spouses could be traced. The mean age of the sample was 60 years and there were 20 males and three females.

There was a poor return to work. Of the 10 patients who had worked pre-operatively, five (50%) had returned to work.

The knowledge of the patients was poor (30% had no knowledge of their medication; 52% had no knowledge of exercise requirements).The knowledge

of the spouses were as poor with regard to medicines and exercise (39% had no knowledge of the medication and 61% had no knowledge of exercise). The poor knowledge scores led us to believe that the information given at 14 days did not influence patients' or spouses' knowledge.

Attendance at the Cardiac Rehabilitation Unit was also poor (9%).

Problems identified:

The necessity to accurately record telephone numbers and the need to establish alternate contact numbers became apparent.

Three months was still too early to observe return to work and improvement in functional activities and the second interview would be more informative if it was conducted at six months.

Although attendance at the Rehabilitation Unit was particularly poor from this sample of patients from the Provincial Hospital, there seemed to be a number of patients from the private sector attending the Unit.

Conclusions:

- Great care should be taken to record telephone numbers and alternate numbers because patients were easily lost to follow up.
- The follow -up should be conducted six months post-operatively.
- The sample would not be representative if patients from the private sector were not included. Two cardio-thoracic surgeons operating at private hospitals, Drs Kinsley (Morningside Clinic) and Girdwood (Milpark Hospital) would be approached for permission to approach their patients for inclusion in the final study.

Pilot Study 4 (1991)

The main aim of this pilot study was to conduct an interview one year after bypass surgery, with the patients identified in the two 1990 pilot studies. It was not possible to interview these patients at six months due to the time lag between the pilot studies.

Objectives:

1. To determine the improvement in cardiac related symptoms one year after bypass surgery.
2. To determine whether patients had returned to work one year after bypass surgery or if those not working pre-operatively had returned to work or to the same level of recreational activities as before the operation.
3. To determine whether the pre-operative activity levels remained the same or were improved post-operatively.
4. To determine patients' satisfaction with the outcome of the operation.
5. To determine whether patients believed that the operation had cured them completely.
6. To determine patients' knowledge of the modification of risk factors one year after the bypass surgery.
7. To determine from patient whether they complied with risk factor modification.
8. To establish whether patients were attending a Cardiac Rehabilitation Programme.

The spouse was also questioned on objectives 4, 5, 6 and 7.

Method:

Patients and their spouses were contacted by telephone one year after the bypass surgery.

Questionnaires on medical information, socio-economic status and knowledge of the disease had been completed at the interviews on days 4 to

6 post-operatively (pilot study 2). At twelve weeks after discharge from the hospital knowledge of risk factors and risk factors modification had been established (pilot study 3).

Questions on the chronic nature of the disease were not repeated at one year. It was felt that these question would not be relevant because if they did feel that the operation cured them completely they obviously did not understand that they suffered from a chronic disease.

The questions on the knowledge of risk factor modification was included in the questionnaire to the patient as well as the spouse.

Self-reported weight was recorded and it was postulated that the comparison with weight at the time of the operation may be considered as a measure of the acceptance of self-responsibility.

The presence of depression was recorded as a self-reported feeling. The spouse was also asked to comment on the presence of depression in the patient.

Spouses were questioned on patients' acceptance of responsibility with regards to medication, diet, smoking and regular exercise.

Results:

Sixty-six patients who had been interviewed for the second and third pilot studies on days 4 to 6 post-operatively were included in this study. Only 26 patients (18 males: 8 females) could be followed up at one year due to incorrect telephone numbers, change of address and changed telephone numbers. Four of the sample of 26 had died leaving a total of 22 patients.

Four patients (18%) still experienced some angina, 61% of the patients had worked pre-operatively and 68% had returned to work, 20 (91%) were

satisfied with the outcome of the operation and 16 (73%) considered the operation a complete cure. Patients had good knowledge of diet but poor knowledge of exercise (55% had no knowledge), medication (no knowledge 23%), and smoking (no knowledge 32%).

Of the four patients that had died not one had been doing any exercise at the time of the operation and only one had been physically active after leaving school. It was an interesting finding that more patients went back to work than had worked pre-operatively.

Three of the sample (14%) were attending a cardiac rehabilitation programme one year post-operatively.

Problems Identified:

The necessity for accuracy when documenting contact telephone numbers as well as the need for alternate contact numbers of either family or friends, had now become very obvious as too few of the original sample could be followed up after one year.

It would have been interesting to know in the case of patients who were not exercising at the time of the operation, how long before the operation they had stopped exercising. This information would have to be included in the final questionnaire.

Ideally patients and spouses should not be interviewed on the same occasion and there should be a few days delay between interviews. This would possibly prevent interference in the responses of spouses and patients who would perhaps express themselves more freely when alone. If patients were interviewed together they would consult with one another when they could not answer questions. This situation should be avoided at all cost.

Pilot Study 5 (1993)

The final pilot study addressed the issue of identifying acceptance of self-responsibility after bypass surgery and whether the proposed method would identify patients who were judged to be self-responsible by the staff of the Cardiac Rehabilitation Unit (Eales and Stewart, 1994).

Definition of Self-responsibility:

Responsibility is defined as being morally accountable for actions. Therefore self-responsibility means that the individual can be held morally accountable for his or her actions regarding the self. This can be in a physical sense, a psychological (attitudinal) sense or an educational sense (Oxford Dictionary, 1992).

Patients would therefore be considered self-responsible if they had:

- Knowledge about the chronic nature of the disease.
- Knowledge about the operation
- Knowledge about the risk factors involved in ischaemic heart disease.
- Knowledge of the prescribed medication.
- The ability to manage stress.
- A positive attitude to recovery.
- Compliance to a programme to modify risk factors.

This was checked against the spouse's perception of the patient's acceptance of self-responsibility.

Objective:

To determine whether the design of the questionnaires was valid for the assessment of improved quality of life and the acceptance of self-responsibility.

Method:

Ten patients who had undergone CABG surgery one year previously and their spouses were identified from the files at the Cardiac Rehabilitation Centre of the Johannesburg Health and Housing Department. Five of these patients were considered self-responsible by the staff and judged to have had a successful outcome. The staff were very experienced and consisted of a medical officer, nursing personnel and a physiotherapist. The objective of the study was to determine whether the designed questionnaires would be sensitive enough to identify the self-responsible patients. Detailed medical information was available from patients' records kept at the Cardiac Rehabilitation Centre.

The criteria used by the staff to identify self-responsibility were the following:

1. Regular attendance at the Cardiac Rehabilitation Unit.
2. Compliance with the exercise programme.
3. No smoking.
4. Weight loss.

The five responsible patients were then assigned to Group A. The five patients that were considered not to be responsible and not to have a successful outcome were assigned to Group B.

The patients' medical and socio-economic information was available from the records of the Rehabilitation Unit. In addition there were accurate data on exercise stress tests and serum cholesterol levels for each patient.

The ten patients were contacted by telephone and questionnaire 5 was administered to the patient, and a few days later, to the spouse/care-giver.

Self-responsibility was determined as follows:

1. Is the operation a complete cure? (The patient and the spouse).

2. Compliance to risk factor management (patient's report).
3. Spouse's perception of the patient's acceptance of responsibility for risk factor modification.
4. The presence of stress occasionally or not at all (the patient's response).

Improved Quality of life was determined by:

1. Return to work (regardless of the capacity) or to recreational activity (the same or more as before the operation).
2. Amelioration of cardiac related symptoms
3. Improved functional capacity

Results:

One year after the operation there were distinct differences between the two groups in:

- serum cholesterol concentrations,
- Body Mass Index
- Knowledge of medication
- Knowledge of exercise programmes
- Smoking
- Exercise after school
- Presence of stress
- Levels of activity
- Spouse's perception of the patient's acceptance of self-responsibility.
- Return to work
- Post-operative angina
- Functional capacity

The Assessment of Improved quality of Life

1. Functional Capacity:

   Higher in Group A [metabolic equivalents (METS) = 7.6] than Group B (METS = 5.5).

2. Amelioration of cardiac related symptoms:

Group A: Patients with no symptoms 5

Group B: Patients with angina..... 2

Patients with excessive fatigue 2

Patients with no symptoms..... 1

3. Return to work and/or recreational activities:

Group A: full-time employment 4

Pensioner..... 1

Group B: Full-time employment 2

Unemployed..... 2

Pensioner..... 1

Acceptance of Self-Responsibility

On admission there were differences between the educational levels of the two groups. Group A (average grade at school: 11) had a slightly higher level of education than group B (average grade at school: 9)

One year after the operation there were distinct differences between the two groups in:

1. Attitude to the operation as a complete cure

The patients and spouses in Group A realised that it was not (all five regarded it not as a cure) and this was probably the reason for their continued attendance at the Rehabilitation Centre. Three patients in Group B were of the opinion that the operation was a complete cure and four spouses regarded the operation a cure. One patient in Group B had to be re-grafted. As a result, he and his spouse realised that he was not cured.

2. Knowledge of risk factor modification

Knowledge of medication

All the patients in group A and their spouses knew the exact number of medicines they had to take daily, the names and the effects of the medication. Only two patients in group B and not one of the spouses knew the names and the effects of the medication.

Knowledge of exercise programmes

All the patients in Group A knew the benefits and the management of the exercise programme and only one of the spouses did not. Only two of the patients in group B knew the benefits and management of the exercise programme and the remaining three and all the spouses had no knowledge of the exercise programme.

Smoking

No patients in group A were smoking whereas two patients in Group B were still smoking.

3. Presence of stress

Three patients from group A and all the patients from Group B reported constantly or occasionally stressed one year post-operatively.

4. Spouse's perception of the patient's acceptance of self-responsibility.

In both groups the spouses consistently rated patients less responsible than the patients did themselves. Four patients in Group A were regarded responsible by their spouses compared to two in group B.

Conclusion:

The questionnaires identified distinct differences between two groups that had been considered either self-responsible or not responsible. The criteria that were considered important for acceptance of self-responsibility for this study seemed to be sensitive to identify self-responsibility. The staff of the Cardiac Rehabilitation Unit knew the patients well and had been dealing with them for one year, and it was considered that their judgement although

arbitrary, would be sound. Their judgement was only relevant for patients that had been referred to the Cardiac Rehabilitation Unit and had from that point on demonstrated successful rehabilitation. The criteria designed for the final study included the factors deemed important by the staff of the Rehabilitation Unit, but was more comprehensive and applied to all patients whether or not they had attended a cardiac rehabilitation programme.

CONTENT OF THE QUESTIONNAIRES

(THE FINAL QUESTIONNAIRES APPEAR IN APPENDIX I)

Questionnaire 1. Questionnaire one was designed to provide information on the social and economic status of patients as well as the basic demographic information. This questionnaire included questions on: age, sex, population group, home language, marital status, total family income per annum, referral centre, occupation, employment status, educational level and religion.

Questionnaire 2. This questionnaire was designed to provide information on the risk factor profiles for CAD of the patients. Patients' subjective responses were recorded and where possible these were confirmed from the physicians' files as well as the ward files. Questionnaire two included information on: the presence of hypercholesterolaemia and serum cholesterol concentrations, hypertension and blood pressure levels, smoking history of the patient, the physical activity of the patient from the time that the patient was at school until the time of the operation, family history of heart disease, the stress that the patient perceived in his life, the presence of diabetes mellitus, the weight profile of the patient from school leaving up to the time of the operation, and the level of the daily and weekly alcohol consumption of the patient.

Questionnaire 3. This questionnaire included questions on the symptoms that caused the patient to seek medical help and that resulted in the operative procedure. It also determined the medical history of as well as patients' knowledge of their medical condition and the surgical procedure.

The patient's knowledge of the chronic nature of his/her medical condition was established by seeking their responses to the following questions:

- Does this disease involve occlusion or narrowing of the arteries
- Has the disease been present for a long time
- Does this disease involve other arteries in addition to the arteries of your heart
- Do you know what caused the disease

The patient's knowledge of the operative procedure was established by asking them what they knew about the operation. Patients were expected to know that it involved a vessel transplant of a blocked (narrowed) vessel, that they would undergo prolonged anaesthesia, be on a heart-lung machine, would be admitted to ICU post-operatively and would not be aware of their surrounding for a few hours.

This questionnaire also established patients' attitudes towards return to work and/or activities of daily living and recreational activities. What patients intended to do about their health once they had returned home was also determined. In addition patients were requested to assign a score for their post-operative depression/moodiness.

Questionnaire 4. This questionnaire was administered to patients six months after their CABG surgery as well as to their spouses' or care-givers but in a slightly modified version. The patient's satisfaction with the outcome of the operation was established and if the patient was not satisfied, the reasons were recorded. Patients were asked if they believed the operation had cured them completely, and if not, to specify why not.

Work status or reasons for not working, the presence of stress, depression, sexual activity, activities of daily living and present weight were also

recorded. The patient's knowledge of, and compliance with the prescribed medication was recorded as well as their compliance with an exercise programme, diet, and abstaining from smoking. This questionnaire also established the number of visits to doctors and the number of readmissions to hospitals. Questions on the patient's sexual activity was not asked of the spouse.

Questionnaire 5. This questionnaire was exactly the same as questionnaire 4 the only difference being that it was administered twelve months after CABG surgery.

Questionnaire 6. This questionnaire provided information on the medical status of the patient. This information was extracted from the physicians' and surgeons' files as well as from the hospital ward files. When available, the information was recorded.

- affected coronary arteries and the percentage stenosis
- left ventricular ejection fraction
- number of vessels bypassed
- donor sites
- bypass time
- aortic cross-clamp time
- days in ICU
- days in ward
- information on an exercise stress test
- serum cholesterol concentrations
- medication

EVALUATING THE QUESTIONNAIRES TO DETERMINE THE KNOWLEDGE OF THE PATIENT AND THE SPOUSE/CARE-GIVER

In order to determine the knowledge of the patient, the responses to the questions on diet, medication, exercise, smoking, ischaemic heart disease and the operative procedure were scored. These questions appeared in questionnaire 3 (knowledge of ischaemic heart disease, operative procedure) and questionnaire 4 and 5 (knowledge of risk factors at six months and twelve months).

The spouse/care-giver was given scores on his/her knowledge of diet, medication exercise and smoking. The responses of the spouse at six months and twelve months were scored (questionnaires 4 and 5).

EVALUATION OF PATIENTS' KNOWLEDGE SCORES ON ADMISSION TO THE STUDY

(QUESTIONNAIRE 3; 3A, B, C)

1. Occlusion or narrowing of the arteries of the heart..... 1
2. Has been present for a long time..... 1
3. Does this disease involve arteries other than the arteries of your heart.....2
4. Knowledge of the cause of the disease 1

Total score: 5

It was considered important that the patient realised that the medical condition was diffuse and not limited to the arteries of the heart. This knowledge could affect the patient's attitude to rehabilitation. It was therefore decided to assign a score of two to the correct response.

PATIENT'S KNOWLEDGE OF THE OPERATION

(QUESTIONNAIRE 3; 4)

The patients were judged on their knowledge of the operation by scoring the following facts:

1. Vessel transplant 1
2. Bypass of the blockage 1
3. Prolonged anaesthesia 1
4. Heart/lung machine 1
5. ICU post - operatively 1
6. Confused/unaware for the first few hour 1

Total score: 6

RESPONSE TO THE QUESTION: WHAT ARE YOU GOING TO DO TO STAY WELL?

(QUESTIONNAIRE 3; 8)

One mark was awarded for each of the following mentioned:

Knowledge of compliance with:

1. Medication 1
2. Exercise 1
3. Diet 1
4. Abstain from smoking 1

Total score: 4

PATIENTS' SCORE FOR KNOWLEDGE OF RISK FACTORS

(QUESTIONNAIRE 4; 8, 9, 10, 11, 12)

Medication

1. Knows the number of medicines to be taken day..... 1
2. Knows the names of the medicines..... 1
3. Knows the effects of the medicines..... 1
4. Knows to get new supply of medicine 1

Total score: 4

Diet

1. knows that the diet must be low in cholesterol..... 1
2. Diet must be low fat..... 1
3. Low calorie..... 1
4. Low salt..... 1

Total score: 4

Exercise

1. How much exercise the patient should be doing..... 2
2. Indications for stopping the exercise..... 2

Total score: 4

The response of the patient on how much exercise they should be doing was evaluated on the patient's ability to give information on the exercise prescription based on the heart rate response to exercise. The patient would have to know the resting heart rate should increase during exercise and should reach a predetermined target heart rate. The patient should be aware of the indications for stopping the exercise programme such as chest pain and feeling faint or dizzy.

Smoking

1. Patient should stop..... 2
2. Has an effect on the heart and blood vessels..... 2

Total score: 4

It was important that the patient knew that they had to stop smoking and that smoking had an effect on the cardiovascular system. No additional details of smoking were required from the patient.

PATIENTS' KNOWLEDGE OF THE CHRONIC NATURE OF THE DISEASE: (QUESTIONNAIRE 4; 13)

Has the operation cured you completely..... 4

Total score: 4

A negative response to this question was considered very important because it was considered unlikely that the patient would be responsible for his/her rehabilitation post-operatively if he/she did not understand that the operation did not offer a complete cure.

Total score for the patient's knowledge: 35

THE SPOUSE/CARE-GIVER

The score for the spouse was made up of the knowledge of the risk factors. It was scored exactly in the same way as for the patient. Questions were from questionnaires 4 and 5 (2, 3, 4, 5).

Total score..... 16

The knowledge of the chronic nature of the disease was scored positively if the spouse knew that the operation had not cured the patient completely. As in the case of the patient this was a **score of 4.**

Total score for the spouse/care-giver: 20

The knowledge scores of patients and spouse/care-givers were determined at six months(Q4) and twelve months (Q5).

ESTABLISHING IMPROVED QUALITY OF LIFE

The final factors considered for improved quality of life were the same as those suggested by the CASS principal Investigators (1983a):

1. Return to work (regardless of the capacity) or to recreational activity (the same as or more than before the operation).

2. Amelioration of cardiac related symptoms (patients who had angina before as well as after the operation). I did not include breathlessness because this was not measured accurately and patients confused this with inactivity. There were also many heavy smokers who experienced breathlessness as a result of chronic lung disease.

3. Improved functional activity (more active than before).

Patients with an improved quality of life had returned to work, had no cardiac related symptoms (angina) and had an improved functional capacity.

EVALUATING THE ACCEPTANCE OF SELF-RESPONSIBILITY

The patient's and the spouse's responses were considered in the following way:

1. Is the operation a complete cure? (The patient and the spouse).
2. Compliance to risk factor management (patient's report).
3. Spouse's perception of the patient's acceptance of responsibility for risk factor modification.

4. The presence of stress occasionally or not at all (the patient's response).

If patients and spouses considered the operation a complete cure it was unlikely that they would consider risk factor management necessary. If patients reported compliance to risk factor management it was decided not to consider whether they regarded themselves responsible but to rely on the caregiver's opinion of their acceptance of responsibility.

A patient who had accepted self-responsibility would know that the operation did not offer a complete cure, would comply to a programme of risk factor management, which would be confirmed by the spouse/care-giver and would have some control over the perceived stress in their lives.

In addition information was sought on the knowledge of patients. Knowledge alone could not be the most important indicator for self-responsibility. It is well known that patients with excellent knowledge, such as cardiologists and physicians, smoke, eat what they like, do not exercise regularly and lead very stressful lives.

The combination of knowledge and the intention and actual execution of the required behaviour is what is of great importance. In order to determine the behaviour of the patient it was thus very important to include the spouse/care-giver in this research project.

SUMMARY

Questionnaires were designed in the following way:

1. Questions were taken from the literature.
2. Brainstorming sessions with colleagues, experts and patients with experience in Cardiac Rehabilitation
3. Five pilot studies were undertaken over a period of four years (1989 - 1993).

The five pilot studies took place over a period of four years. In this process the questionnaires were developed and validated The purpose of this study was to identify those patients who had a successful outcome measured at one year after CABG surgery. Successful outcome was measured in terms of an improved quality of life. Furthermore the acceptance of self-responsibility was investigated as an important factor in improved quality of life and thus in the successful outcome of CABG surgery.

The pilot studies were essential because they assisted in the formulation of the concept of self-responsibility but served as a guide only and the final study became the definitive study.

In the next chapter, a detailed discussion of the sample selection for this study and the methods employed to administer the above questionnaires, will be presented.

CHAPTER IV

METHODS

The objectives of this research project were to determine if the acceptance of self-responsibility was an impo ¬t factor in the improved quality of life of patients one year after coronary artery bypass surgery. In addition, information was sought on the extent to which certain sociodemographic and medical factors influenced improved quality of life and self-responsibility. This chapter presents the methods used to:

- establish the sociodemographic and medical profiles of patients participating in the project.
- Identify patients with improved quality of life one year after the operation.
- Identify the patients who were self-responsible one year after the operation.

The various statistical tests used to analyse the data will be explained.

PROCEDURE

Seventy five patients who had undergone CABG surgery and their spouses or care-givers agreed to participate in the study. The first interview with patients was conducted in the hospital four to six days post-operatively. At the time of this interview the ward files, as well as the operation notes of patients, were studied to provide information on their medical condition as well as the operative procedures. Patients were subsequently contacted by telephone at six months and again at 12 months after the operation. The spouses (or care-giver in the case where there was no spouse) were also interviewed by telephone at six and twelve months after the operation.

This study was passed by the Ethics Committee for Research on Human Subjects of the University of the Witwatersrand (Ethics clearance number: 36/9/92).

From here on the spouse or care-giver will be referred to only as the spouse. All patients will be referred to as "him" or "his".

SELECTION OF THE SAMPLE

Patients and their spouses were selected from three different hospitals in Johannesburg, Gauteng:

- Morningside private hospital.
- Milpark private hospital.
- Johannesburg state hospital.

Permission to include their patients in the study was obtained from three cardio-thoracic surgeons operating at these hospitals. They were Dr RH Kinsley (Morningside), Dr RW Girdwood (Milpark) and Professor SL Cronje (head of the Cardio-thoracic Unit at the Johannesburg Hospital). Patients were interviewed four to six days after CABG surgery. The days selected for conducting interviews depended largely on the surgeons' theatre allocations, the ward routine and the staff. The spouse was contacted telephonically and asked to participate if they had not been contacted during the patient's stay in the hospital. Patients and spouses were assured that they would remain anonymous and that they could withdraw from the study at any stage.

Patients and spouses who were willing to participate signed a consent form. The consent form of the spouses, who could not be contacted during the time that the patient was hospitalised, were posted to them after they had been contacted telephonically. The selection of patients was regarded as random

as it was assumed that patients were admitted and operated on in a random manner.

Only patients that had undergone coronary artery bypass surgery and did not have any other form of cardiac surgery were included. All patients who could understand English or Afrikaans and were willing to participate, were interviewed.

EXCLUSION CRITERIA

The following factors excluded patients from the research project:

- If the patient was still intubated on day six.
- If the patient was unable to communicate with the researcher, either due to a language barrier or because the patient was too ill.
- If any surgical procedures other than coronary artery bypass surgery, such as valvular surgery, had been performed.
- If the patient did not reside in South Africa.
- If the patient was not willing to participate.
- If the patient was older than eighty years.
- If the researchers would not be able to contact the patient telephonically at six months and one year post-operatively.

SAMPLE SIZE

The sample size for this study was calculated using the Epi Info v6 computer programme. The calculated core sample size was 54. This calculation was based on an estimated population of 420 patients. The expected percentage of patients with improved quality of life one year after bypass surgery is 91% which is based on research by Caine et al (1991). It was felt that this percentage was high and the calculation was made on 80%. The worst acceptable frequency was 70%. This percentage was considered acceptable

because according to Jones et al (1983) 70% of patients could be expected to have no angina after bypass surgery and patients with angina cannot be considered to have improved quality of life. At a 95% confidence interval the core size of the sample for this study was 54. In order to have a core sample size of 54 after twelve months, a decision was made to interview 75 patients and their spouses as it was expected that it would not be possible to follow up all the patients for one year.

ADMINISTRATION OF QUESTIONNAIRES

PATIENTS

Questionnaires were administered to patients on three different occasions:

1. Post-operatively, on the 4th to 6th day after the operation, when the patient had returned to the ward after being in the I.C.U. The researcher assisted patients in completing the questionnaire.

2. Six months after the operation, patients were contacted telephonically. It was felt that the outcome of the bypass surgery would only assume importance after six months. Six months was selected as the "lag time" needed to permit convalescence after the trauma of the surgery (Bass, 1984).

3. One year after the operation patients were contacted telephonically.

SPOUSES OR CARE-GIVERS

According to Wenger et al (1984) a neglected area of research is comparing the spouse's or significant other's (care-giver's) perception of the outcome of the operation with that of the patient. To this end the spouse was interviewed telephonically at six months and one year.

MEDICAL PROFILE

The medical questionnaire was completed by extracting the required information from the ward files, visiting the cardio-thoracic surgeons' and physicians' rooms and recording the relevant information from their files.

- affected coronary arteries and the percentage stenosis
- left ventricular ejection fraction
- number of vessels bypassed
- donor sites
- bypass time
- aortic cross-clamp time
- days in ICU
- days in ward
- information on an exercise stress test
- serum cholesterol concentrations
- medication

The initial interview with the patient in the hospital was lengthy and lasted approximately 40 to 60 minutes. The duration of the telephonic interviews were 20 to 30 minutes each. It was decided to use two assistants to help with the data collection because these interviews were so time-consuming. The use of research assistants would also serve as a control to possible bias of the researcher.

Of the original **75 interviews with patients on days 4 to 6 post-operatively:**
The researcher interviewed 64 patients
The assistants interviewed 11 patients

Of the **120 telephonic interviews at six months post-operatively** to patients and spouses:
The researcher conducted 100 interviews

The assistants conducted 20 interviews

Of the **108 telephonic interviews conducted at 12 months post-operatively** to patients and spouses:
The researcher conducted 76 interviews
The assistants conducted 32 interviews

ESTABLISHING REPEATABILITY

The questionnaire was designed for reliability because most answers were simply a "yes" or "no" , or else a statement of fact. Responses to open-ended questions were coded and analysed (see appendix II). The data could therefore not be subjected to statistical analysis for reliability.

As there were three interviewers a reliability check was necessary to ensure that the data was consistent and dependable. Two methods were used as an interrator reliability check. Firstly an interview was conducted with a patient by the main interviewer in the presence of a second interviewer with both completing the questionnaire. The second interviewer did not ask any questions. The responses of the patient were then discussed and the recorded responses were compared. Secondly a tape recording of an interview with a patient was made. The recording was then played to the second interviewer. The second interviewer then completed the questionnaire from the recording. The two completed questionnaires were then compared.

For the telephonic interviews, reliability was checked by allowing the second interviewer to listen in to the interview which the main interviewer was conducting with either the patient or the spouse and at the same time completing the questionnaire. The two questionnaires were then compared.

The responses required for most of the questions was either "yes" or a "no".

There were questions where patients had to report on certain facts such as income, number of children, sporting activities and their weight. The only questions where patients needed to express an opinion were those requesting information about post-operative rehabilitation, or those when they had chosen a "no" response and they had to give reasons for their response. In these instances they were asked to specify why they had done so. These responses were then coded for analysis. The questions were designed so that the meaning would be clear to the interviewee and so facilitate the scoring of responses.

At no stage were there any discrepancies between the recorded responses of the interviewers.

DETERMINING THE SOCIODEMOGRAPHIC AND CLINICAL PROFILES

Information on the sociodemographic characteristics such as age, gender, marital status, work status, total annual income, home language, occupation and education was determined on entry into the trial. Information on the clinical characteristics such as previous myocardial infarct, previous CABG surgery, angina, breathlessness, fatigue and the presence of stress (anxiety) was also determined. The medical information available from the ward files was very scanty. Information on blood cholesterol levels, blood pressures and the presence of diabetes was infrequently recorded. The physicians' medical files also provided limited and inconsistently documented medical information. One of the major limitations presented by these files was the absence of information on exercise stress tests and incomplete or absent information on blood cholesterol levels. The surgical procedures however were carefully documented by the surgeons and provided the most consistent and reliable source of information and the decision was made to rely on the information from these files only.

DETERMINING IMPROVED QUALITY OF LIFE IN PATIENTS AFTER CORONARY ARTERY BYPASS SURGERY

Having evaluated the research literature on improved quality of life three aspects were considered important for this project (page 49).

- **PATIENTS' SUBJECTIVE EVALUATION WAS CONSIDERED IMPORTANT**

  Considering the growing consensus that the individual himself is the only proper judge of his quality of life (Guyatt et al, 1986; Ferrans, 1990; Denollet 1994) a decision was taken to consider patients' subjective evaluations of the domains described by the CASS Principal Investigators. Quality of life is a reflection of the way a person feels and functions (Guyatt et al, 1986). Subjective states are difficult to measure and thus investigators tend to bypass personal evaluations and infer quality of life through knowledge of aspects of the individual's behaviour that can be observed and measured. Inferring subjective quality of life or well-being from external circumstances does not take fully into account the values, needs and adaptability of individuals to various life situations (Flanagan, 1982).

- **THE SPOUSE'S EVALUATION OF THE PATIENT'S QUALITY OF LIFE IS IMPORTANT**

  It has been suggested by some researchers that the opinion of the spouse or caregiver should be included in quality of life assessments (Wenger et al, 1984; Kinney et al, 1996). The patient's opinion of his quality of life is the only true reflection of that particular life experience but the opinion of the spouse/caregiver is also of importance because the reliability of assessments is increased by another respondent's perspective. Mayou and Bryant (1993) however feel that there may be a problem with disagreements and that it is best to consider only the opinion of the patient. However, to lose the information on how the intervention affects the family, will result in an incomplete evaluation, and in spite of the

possibility of disagreement it would be desirable to include the spouse/caregiver (Mayou and Bryant, 1993).

- **DATA SHOULD BE TAKEN OVER A PERIOD OF TIME AND NOT AT ONE POINT IN TIME ONLY**

  Researchers of quality-of-life issues have recognised between-subject differences when determining the content of the measuring instrument, however according to Allison et al (1997), within-subject differences (i.e. the fact that the individual changes the standards by which he assesses his quality of life) have been largely ignored. A possible way to overcome this problem is to compare the post-intervention measurement with reference to the pre-intervention measurement e.g. Are you as active as before the operation? (question asked 12 months after the intervention).

At the time of this research project a specific health related quality of life instrument for patients who had undergone CABG surgery had not been designed. The research question was to determine if the acceptance of self-responsibility influenced the successful outcome of bypass surgery one year after the intervention. Successful outcome was measured in terms of improved quality of life and a decision was made to follow the indicators of improved quality of life as suggested by the Coronary Artery Surgery Survey (CASS) Principal Investigators in 1983.

According to the CASS Principal Investigators and their Associates (1983a) improved quality of life can be assessed in patients with ischaemic heart disease by using the following three criteria:

1) Return to gainful employment and/or recreational activities after the intervention.
2) Amelioration of cardiac related symptoms.
3) Improved functional status.

THE FACTORS CONSIDERED FOR IMPROVED QUALITY OF LIFE IN THIS STUDY WERE

1. **Return to work or recreational activities**

   This was considered positive irrespective of the capacity in which the patient returned to work (part-time or full-time). Return to recreational activities and activities of daily living, in the same capacity as before the operation, was considered to have the same value as return to work.

2. **Amelioration of cardiac related symptoms**

   Patients tend to confuse the pain and discomfort of the sternotomy with angina and for this reason only patients who had angina before the operation and no angina after the operation were considered to have amelioration of cardiac related symptoms. For the purpose of this study, where the main thrust of the research was to identify whether self-responsibility was a factor in improved quality of life, it was essential that the sample of patients identified with an improved quality of life was a "pure" sample. The criteria for improved quality of life were thus more stringent in this study than those applied by the CASS researchers. This could mean that the number of patients identified with improved quality of life in this study, could perhaps be fewer than in other studies which determined improved quality of life. Patients who experienced an improvement in breathlessness were not considered to have amelioration of cardiac related symptoms although this was regarded to be the case by the CASS researchers. In this study breathlessness was not assessed accurately in terms of cardiac failure and patients could have confused breathlessness with being unfit. There were also many heavy smokers who experienced breathlessness as a result of chronic lung disease.

3. **Improved functional capacity**

   The question "Are you as active as before the operation?" when answered as "More" was considered an indicator of improved functional capacity. This gave a subjective evaluation of functional capacity. The subjective evaluation of the spouse was also considered and if both spouse and

patient reported improved activity levels it was documented as "improved functional capacity". The absence of data in their physicians' files on a stress test, made the objective evaluation of the functional capacity determined during a stress test impossible. A stress test tends to give a more positive result of the patient's functional ability than the patient's self-estimated ability (Ågren et al, 1993). This seemingly paradoxical relationship between physical improvement as demonstrated by improvement in anginal symptoms and treadmill performance, and the patient's reported lack of improvement in performance of activities of daily living was first reported by the CASS Principal Investigators (1983a). However it was felt that the patient himself is probably the best judge of his activity levels.

In addition the questionnaires covered other aspects of quality of life as suggested by Ory et al (1994). These included stress, sexual functioning, and satisfaction with the outcome of the operation. Information was also gathered on the medical status of the patient. These aspects were not used to determine (diagnose) quality of life but would yield valuable information.
Patients with improved quality of life were assigned to Group 1 and patients whose quality of life was not improved were assigned to Group 2.

DETERMINING SELF-RESPONSIBILITY

Self-responsibility was assessed at twelve months after bypass surgery. Persons with chronic disease are often more reliant on family members than on health professionals for care (Walston and Walston, 1982). In order to successfully become responsible the patient and the family members should be considered members of the medical team and be provided with information about the disease, the treatment of the disease and the rehabilitation process. The spouse's attitude and knowledge of the disease was considered important when determining the patient's acceptance of self-responsibility.

Patients were judged to be self-responsible if they met the criteria determined in pilot study five (Eales and Stewart, 1994).

The criteria important to determine self-responsibility were :

- Did the patient and his spouse realise that the operation was not a complete cure and that the patient was suffering from a chronic disease.
- The patient's report on his compliance to risk factor management.
- The spouse's perception of the patient's acceptance of responsibility for risk factor modification.
- The patient's response on the presence of constant stress.

Patients' and spouses' knowledge scores were determined at six months and twelve months post-operatively as described in Chapter 3, page 104.

Patients' knowledge was scored on:

- Knowledge of the disease (total score: 5).
- Knowledge of the surgical procedure (total score: 6).
- Knowledge of the expected behaviour when leaving the hospital (total score: 4)
- Knowledge of risk factor modification (total score: 16).
- Knowledge of the chronic nature of the disease (total score: 4).

Overall total score for patients' knowledge: 35

Spouses' knowledge was scored on:

- Knowledge of risk factor modification (total score: 16)
- Knowledge of the chronic nature of the disease (total score: 4)

Overall total score for spouses' knowledge: 20

The patients (58) who remained in the trial 12 months after the operation were assessed for acceptance of self-responsibility and assigned to one of two groups. Patients in Group 1 had accepted self-responsibility and those in Group 2 had not accepted responsibility for themselves. The acceptance of

self-responsibility as a possible significant factor in the group of patients with improved quality of life, was examined.

Groups were compared with regard to the variables at days 4 to 6, at six months and at 12 months after CABG surgery. This was followed by a stepwise logistic regression to determine the predictive factors for acceptance of self-responsibility.

The following was also determined:

- To what extent the socio-economic status of the patient influenced the patient's ability to accept responsibility for his own rehabilitation.
- To what extent the medical status of the patient had an influence on the patient's ability to become self-responsible
- To what extent the patient's attitude towards his disease influenced his acceptance of self- responsibility.
- Whether the patient's knowledge of the chronic nature of his disease and modification of risk factors had any effect on the acceptance of self-responsibility.
- The knowledge of the patient was compared to the knowledge of the spouse.

STATISTICAL ANALYSES

Having identified two groups (improved quality of life; no improved quality of life) a statistical analysis was done to determine which factors were significantly different between the two groups at days 4 to 6 post-operatively, six months and twelve months. When two groups are compared with regard to categorical variables (improved quality of life; no improved quality of life), the Chi-square test is commonly used. If the calculated χ^2 value is greater than the tabulated value, the null hypothesis (no difference between groups) should be rejected at the 5% level of significance (Bland, 1996).

Analysis of variance (ANOVA) is used to assess the effect of one or more categorical independent variables on a continuous dependent variable. It serves to compare group means to determine if a statistically significant difference exists. ANOVA can handle two or more groups (Bland, 1996; Kirkwood, 1994). The method is based on assessing how much of the overall variation in the data is attributable to differences between the group means, and comparing this with the amount attributable to differences between individuals in the same group. Hence the name, analysis of variance (Kirkwood, 1994). We express by the ratio of one variance estimate to the other, between groups or within groups. This is called the variance ratio or the F-ratio.

This was followed by a stepwise logistic regression to determine the factors that could predict successful outcome. A number of immediate post-operative parameters were observed (days 4 to 6). These parameters consisted of a number of socio-economic factors, a number of medical and a number of attitudinal factors. Since the response variable, which could be influenced by the observed parameters was binary (successful, unsuccessful), a stepwise logistic regression analysis was performed to determine the factors that could predict successful outcome one year, post-operatively.

Stepwise logistic Regression

In a stepwise logistic regression the dependent variable (outcome variable) is dichotomous. The dependent variable is coded as 0 or 1 (Bland, 1996). In this case it was Improved Quality of Life (yes or no) and Self-responsible (yes or no). The independent variable can be continuous or categorical. Logistic Regression enters independent (predictor) variables in a stepwise manner and it will also fit specified models.

The logistic regression will predict the proportion of individuals who will have the characteristic or estimate the probability that an individual will have the symptom. If the probability of an outcome is **p** then the odds (**o**) of that

outcome can be represented as o= p/(1-p). The odds has advantage for certain types of analyses since it is not constrained to lie between 0 and 1, but can take any value from zero to infinity. Statistical analysis often uses the logarithm (to base e) of the odds, which is called the log odds or logit.

As stated above an ordinary linear regression equation cannot be used because this might predict proportions less than 0 or greater than 1, which would be meaningless. Instead the logit of the proportion is used as the outcome variable. The logit is a linear function of the independent variables and the coefficients in the logistic equation can be interpreted as regression coefficients.
The logit of a proportion p is the log odds:
$y = \log_e (^p/_{1-p}) = b_0 + b_1 x_1 + b_2 x_2 + \ldots\ldots + b_n x_n$

In logistic regression the predicted proportion of success p (s/n) is assumed to follow the logistic model
$p = s/n = e^y/1+e^y$

Where s is the sum of binary (0,1) dependent variable values, n is the total sample size and y is a linear function of one or more independent variables.

The expected value of s/n (the predicted proportion of success) can be denoted by p so the model becomes:
$p= e^y/1+ e^y$

A cutpoint p_0 is selected to ensure maximum sensitivity and specificity. Outcome is classified as successful if $p > p_0$ and not successful if $p \leq p_0$.

Sensitivity is the ability of the test to predict the true positives which in this case are patients who have an improved quality of life.

Specificity is the ability of the test to identify the true negatives. A judgement must be made on the relative importance of sensitivity and specificity in a particular case. Sensitivity and specificity are often multiplied by 100 to give percentages. A cutpoint is selected at a point of optimal sensitivity and high specificity (Bland, 1996).

The computer software that was used for the statistical analyses:

Data was analysed using the Statistical Analysis System (SAS) computer software and the BMDPLR software for Stepwise Logistic Regression. Logistic regression is a computer intensive analysis. The computer analyses were performed by Biostatisticians from the South African Medical Research Council.

CHAPTER V

THE SOCIODEMOGRAPHIC AND RISK FACTOR PROFILES OF THE SUBJECTS

The objectives of this study were to determine whether self-responsibility was a factor in the successful outcome of coronary artery bypass surgery and also to determine the extent to which the socio-economic status, the medical status, and patients' knowledge of and attitudes towards the disease influenced the outcome. The knowledge of spouses/care-givers on the chronic nature of the disease and risk factor modification was also determined. Extensive data was collected for this study and it was considered appropriate to present the results and the discussions of the results, in three consecutive chapters.

In this chapter (chapter 5) the sociodemographic characteristics of patients in the selected sample as well as their risk factor profiles will be presented and discussed. The data for this chapter was collected and documented at baseline entry into the trial. At this stage only patients were interviewed. This chapter will be followed by two chapters, one on quality of life (Chapter 6) and one on self-responsibility (Chapter 7). In each one of these chapters the results followed by a discussion of the results, will be presented.

The materials and methods are described in detail in Chapters 3 and 4. A brief summary of the method is given at this stage. Seventy five patients who had CABG surgery, and their spouses or care-givers, agreed to participate in the study. Interviews were conducted four to six days post-operatively, in the hospital. Patients were subsequently contacted by telephone at six months and again at 12 months after the operation. The spouses (or care-givers, in the case where there was no spouse) were also interviewed by telephone at

six and twelve months after the operation. Information on patients' medical condition and surgical procedures was extracted from their files.

RESULTS

SOCIODEMOGRAPHIC DATA

The results presented in this section are obtained from the questionnaires administered to patients on entry into the trial (4 to 6 days after CABG surgery). In addition information is provided on the numbers of patients that were followed up and interviewed at six months and twelve months after CABG surgery. Information on the numbers of patients who had returned to work six months and 12 months after the operation will also be presented. The available medical information will also be presented. The questionnaires as well as all these results are presented in Appendix I.

Seventy five patients were interviewed on entry to the trial. Two patients were discarded from the sample because of the age extremes that they represented. One of these patients was 18 years old and one 85 years old. Sixty two patients were operated on in private hospitals and 13 in a public hospital.

The mean age of participants was 57 years (range 31-78 years; SD ±12).

In table 5.1 the numbers of patients on admission, followed up at six months and 12 months after CABG surgery, are given. The numbers of the participating spouses are also given.

TABLE 5.1

NO OF SUBJECTS AND SPOUSES

On admission	Patients 6 months	Patients 12 months	Spouses 6 months	Spouses 12 months
73	64	58	56	50

Table 5.1 shows that over the period of one year 15 patients and six spouses were lost to follow up. Of these, five patients died. This number represents 7 % of the total sample. Three patients died within the first six months post-operatively and two died in the following six months.

Ten patients could not be traced one year after the operation. Six of these patients were lost to follow-up in the first six months after the operation and a further four were lost in the second six month period. At six months, a total of 92% of the patient sample was followed up and at 12 months 86% of the sample was contacted.

Of the six spouses who could not be followed up, one refused to be interviewed six months later and the remaining five could not be traced.

In Table 5.2 the ratio of males to females is given as documented on admission, at six months and 12 months after CABG surgery.

TABLE 5.2

MALE: FEMALE RATIO

On admission	6 months	12 months
M:F 63:10	54:10	48:10

The ten females remained in the sample. The patients who were lost to follow up or who had died were all males.

Table 5.3 reflects the marital status of the subjects

TABLE 5.3

MARITAL STATUS

married	single	divorced	widowed
55 (75%)	3 (4%)	8 (11%)	7 (10%)

The majority of patients were married and only a very small sample were single. Twenty one percent of the sample were either divorced or widowed.

These patients had a mean number of 2.6 children (range: 0-9). Eighteen patients (18) had three children each and 22 patients had two children each.

In Table 5.4 the population distribution of the sample is given.

TABLE 5.4

POPULATION DISTRIBUTION

White	Black	Asian	Coloured
60 (83%)	4 (5%)	8 (11%)	1 (1%)

The majority of the 73 subjects participating in this study were White South Africans. There were relatively few Asians compared to the White population. The classification "coloured" indicates an individual of mixed racial descent, primarily of White and Black origin.

FIG. 1 DISTRIBUTION OF LANGUAGES SPOKEN AT HOME

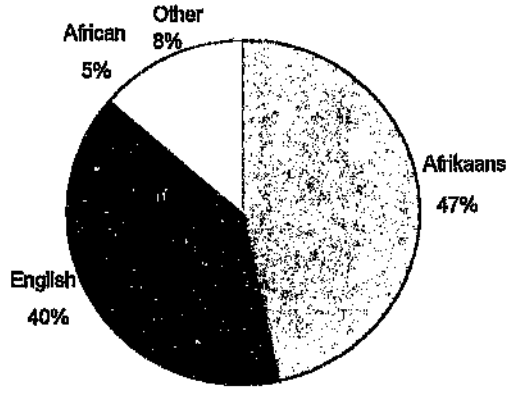

Figure 1 shows that English and Afrikaans were the predominant languages with slightly more Afrikaans speaking subjects. Other languages spoken were German and Greek. Five percent of these subjects were black and spoke an African language.

Table 5.5 reflects the total annual income of families. The amount is the total for the income earned by the patient and or the spouse.

TABLE 5.5

FAMILY INCOME

Combined annual family income in rands(thousands)	<15	15-<20	20-<30	30-<50	50-<80	80-<120	>120
no of subjects	6	11	9	19	8	6	14

The highest proportion of patients (62%) had an annual income less than R50,000. Only 19% of the sample was in an income bracket higher than R120,000 p.a. The cost of the surgery ranges from R30,000-R100,000 or more if there are serious complications.

TABLE 5.6

EDUCATIONAL LEVEL

educational grade	< 7	< 11	12 / equiv.	12 +1,+2,+3	Univ. degree
No of subjects	5	27	20	10	11

Table 5.6 shows that 29% of the sample were educated beyond grade 12. The income for 62% of the sample was less than R50,000 (Table 5.5).
When relating income to level of education an annual income of less that R50 000 ($8 000) p.a. was significantly associated with an education level of grade 12 or less. Chi-square test: df = 1, $\chi^2 = 9.95$; p = 0.002

In Table 5.7 the numbers of patients who were working prior to the operation, six months after CABG surgery and 12 months later, are given. No differentiation between full-time and part-time work was made.

TABLE 5.7

EMPLOYMENT STATUS

	Pre-operatively	6 months	12 months
Employed: FT/PT	51 (70%)	32 (43%)	27 (37%)

FT: full-time; PT: part-time

Thirty percent of the sample were not employed, on pension or on a disability pension. None of the patients who were out of work at the time of the operation returned to employment. In addition, 19 who were working on entry in to the trial were not working six months after their CABG surgery and 12 months after the operation an additional five were also not working.

Six months after the operation four patients were not working because of poor health and 12 months after an additional three were not working because of poor health (see appendix I).

The Occupational Status of the 73 patients admitted into the study was classified according to Schlemmer and Stopforth (1979). They compiled a guide for the coding of occupations based on a South African research survey conducted over 15 years. According to them an occupational status is a very adequate indication of social standing in the community.

OCCUPATIONAL GROUPS OR CATEGORIES

Code 1-5 is the rank and coding order of occupational categories and represents levels of achievement in work status

1. Professional and managerial positions : n = 16
2. Middle white collar : n = 23
3. Skilled artisans, manual foreman, farmers: n = 22
4. Routine manual and semi-skilled manual : n = 12
5. Unskilled manual and menial : n = 0

The highest proportion of patients were middle white collar workers or skilled artisans, manual foremen or farmers (62%). There were relatively few professionals and managers (22%).

RELIGION

Patients were simply asked whether they considered themselves religious and fifty of the patients (69%) considered religion to be an important aspect of their lives.

RISK FACTOR PROFILE OF THE 73 PATIENTS

The information on risk factors was self-reported by the patients. Only limited medical information was available from the ward files as well as from the physicians' files (see appendix I). Information on blood cholesterol levels, blood pressures and the presence or absence of diabetes was so poorly recorded that a decision was made to rely on patients' responses only.

Hypercholesterolaemia

Thirty four patients (47%) reported that they had elevated serum cholesterol concentrations. Of the entire sample 20 (27%) knew their total serum cholesterol concentrations. No other lipid fractions were known by the patients. The mean total serum cholesterol concentration was reported to be 6.29 mmol/l. The reported range was between 5 mmol/l and 11.2 mmol/l. Hypercholesterolaemia had been present for a mean period of 5 years (SD ±8). Limited information on total serum cholesterol concentration, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) was available from the medical records of the patients. Indeed only four measurements were found.

Hypertension

Thirty patients (41%) reported that they were hypertensive. Of the entire sample 19 (26%) patients knew their systolic and diastolic values. The mean reported systolic value was 143 mm Hg (SD ± 26) and the mean diastolic value was 91.3 mm Hg (SD ± 19). The reported range for systolic pressure was 110 mm Hg to 190 mm Hg and for diastolic pressure was 60 mm Hg to 130 mm Hg.

Blood pressure values were recorded in the ward files for 11 patients. The mean systolic value from the file was 130 mm Hg (SD ± 24) and the mean diastolic 77 mm Hg (SD ± 11). The range for systolic pressure was 110-176 mm Hg and for diastolic pressure 60-100 mm Hg.

Hypertension had been present for a mean period of 12 years (SD ± 9).

Smoking

Seventy five percent of the patients had smoked at some time in their lives and of these patients, 96% had smoked cigarettes. The patients had smoked for an average of 27 years (range: 3-60; SD ± 12). On average those who gave up had done so 7 years ago. They had smoked a mean of 27 cigarettes (range 10-75; SD ± 14) per day and the mean pack-years for the study group was 40 (range: 2 - 150; SD ± 30). The patients in this sample were heavy smokers. One year after the surgery only 15% of the sample were still smoking.

Physical activity

Sixty six (92%) of the patients in this study reported that they had participated in sport at some stage during their lives. Only six patients had never participated in any sport. Of the entire group, 62 (85%) participated in sporting activities at school and 50 (68%) carried on with some sport after they had left school. The active patients (sport at school and /or after leaving school) had stopped sporting activities an average of 25 years before the operation. As the mean age was 57 years it meant that they had continued with sporting activities to a mean age of 32 years. The patients who participated in sport at school were involved for a mean period of 8 hours per week (range 0-30; SD ± 5). After school this dropped to 6 hours per week (range 0-40; SD ± 6).

In Table 5.8 the numbers of patients participating in specific sport types at school and after school are given. Only the most popular sports are listed. For this analysis 66 patients completed the data.

TABLE 5.8

PARTICIPATION IN SPECIFIC SPORTING ACTIVITIES

Sport type	participation at school (no.)	participation after school (no.)
Rugby	35	17
Soccer	18	13
Athletics	16	2
Cricket	19	8
Tennis	11	12
Golf	0	8
Swimming	0	6

Rugby and soccer were the most popular forms of sport at school, and also after school. The number of subjects participating in tennis stayed much the same and golf and swimming became more popular once the subjects had left school

In Table 5.9 the sporting activities of 21 patients who were still doing some form of sport at the time of the operation, is reported on.

TABLE 5.9

ACTIVITIES AT THE TIME OF THE OPERATION

Activity type	no. participants
golf	6
walking	5
cycling	3
bowls	3
jogging	2
gym	1
rehab. prog.	1

Four patients only were involved in exercise for a training effect (jogging, gym exercise, cardiac rehabilitation). These patients spent an average of 55 minutes per exercise session (range 10-99 minutes; SD ± 43).

Family history of CHD

Forty two (58%) patients reported that they had a member or members of their family with a history of heart disease. In 32 cases the parents were involved, the siblings in 19 and the grandparents in 8. The most common cause of death was reported to be a myocardial infarction (67%).

Stress

Seventy one percent (52 patients) of the sample reported that they were stressed. Constant stress was reported by 45% (33 patients). The majority of patients (65%) who were stressed identified work related issues as the cause of their stress.

Diabetes Mellitus

Eleven (15%) patients were diagnosed as having diabetes preoperatively. One patient (1%) had insulin dependent diabetes mellitus (IDDM) and 10 (14%) were diagnosed as having non-insulin dependent diabetes mellitus (NIDDM). The period of time since diagnosis was a mean of 10 years (range 0-30 years; SD ± 9.0). All (11) the patients with diabetes said that their disease was under control.

Body mass index

The mean BMI of this group was 27.8 kg/m^2 (range 20.0 kg/m^2-37.0 kg/m^2).The weight distribution categorised for BMI was as follows:

<24 kg/m^2 = 15% (normal weight)

24 - 30 kg/m^2 = 60% (overweight)

>30 kg/m^2 = 25% (obese)

The mean weight of the patients at the time of the operation was 82 kg (SD ± 15), compared to the reported mean weight on leaving school of 68 kg (SD ± 15). Patients had a mean weight gain of 14 kg since leaving school.

Alcohol intake

Forty eight percent (35 patients) of this sample reported that they consumed alcohol regularly. The mean daily alcohol consumption for this group was three drinks and the mean weekly consumption was 23 drinks (range 2-70; SD ± 18).

MEDICAL INFORMATION

SYMPTOMS ON ADMISSION

On admission 61 (84%) of the patients reported varying levels of angina and 38 (62%) presenting with angina reported their angina to be either "severe, very uncomfortable" or "the most severe pain ever experienced".

Thirty five patients (48%) reported that they were either "very tired often" or experienced "the worst tiredness one could expect to have".

Forty six patients (63%) complained of breathlessness and 26 (38%) said that they had additional symptoms. Two of the patients had cancer of the prostate and two patients had had a cerebrovascular accident (stroke).

Prior to admission 37 (51%) patients had experienced angina, and 41 (56%) a previous myocardial infarct. Percutaneous transluminal coronary angioplasty (PTCA) was done in 23 patients (33%) and five patients (7%) had had previous coronary artery bypass surgery.

SURGICAL INFORMATION

Information on left ventricular ejection fraction, number of vessels bypassed, bypass time, and aortic cross clamp time was obtained from the patient files kept by the cardio-thoracic surgeons. The mean pre-surgical left ventricular

ejection fraction was 51% (SD ± 15). The mean number of vessels bypassed was 2.8 (range 1-5; SD ± 1), the mean bypass time was 111 minutes (range 32 - 230; SD ± 64) and the mean aortic cross clamp time was 57 minutes, range 14 - 117 minutes (SD ± 26).

DISCUSSION

COMPARISON OF THE SAMPLE DEMOGRAPHICS WITH OTHER INTERNATIONAL STUDIES

Five (7%) of this sample of 73 patients died within the first year after the operation and in addition another 10 were lost to follow-up. In a study by Bandrup-Wognsen et al (1995) an early mortality rate of 3.0% (within 30 days of the operation) and a late rate of 4.2% (30 days to two years) and a total two -year mortality of 7.1%, was reported. The average age of their sample was 64 years. The mortality rates are similar to the results of this study but the average age of this sample was considerably younger (57 years) and therefore this sample seems to have had a worse outcome.

One year post-operative mortality rates of 4% were reported for patients (average age 61.1 years) undergoing CABG surgery by the BARI (The Writing group for the Bypass Angioplasty Revascularization Investigation) Investigators, 1997). The patients in this study were younger (average age 57 years) and had a higher mortality rate than reported by the BARI investigators (1997). There is a possibility that the higher mortality rate was due to a greater percentage of smokers in the current study (75% compared to 25% of smokers in the BARI trial). Patients who smoke are known to have poorer results after revascularization procedures (Payne and Saul, 1997).

When excluding the five patients that died 86% of the sample was followed up one year after the bypass surgery. A return of 86% of a questionnaire in

a follow-up survey is considered to be very good and suggests that the sample is representative of the population studied (Tucker et al, 1996).

The number of females participating in this study (14%) is similar to results of earlier studies. In the study of Jenkins et al (1983) 16% of the patients followed up at six months were women. Ayanian et al (1995) reported that in a cohort of 454 consecutive patients who had undergone CABG surgery, 28% of the sample were females. In 1983, 24% of all bypasses were on women and in 1990, 27% of all bypasses in the USA were performed on women (Allen and Blumenthal, 1995). The number of women undergoing CABG surgery seems to be increasing internationally although this increase is not reflected in this sample.

The tendency is also to operate on older women. The mean ages reported by Allen and Blumenthal (1995) and Ayanian et al (1995) were 64 years and 68 years respectively. The average age of the women in this sample was 59 years. This is younger than the mean age reported in the literature but probably also explains why no deaths occurred in this group of women in the perioperative period and the twelve month follow up period.

The mean age of this sample (57 years) is similar to the mean age of 57.2 years in a study of bypass patients in northern England (Farrer et al, 1997). In a meta-analysis of cardiac patients (not exclusively bypass surgery) over the period 1987 - 1991 an average of 57.1 years was reported (Kinney et al, 1996). In the CASS (1983b) the mean age of the patients undergoing bypass surgery was 52 years but in later studies higher ages have been reported. When analysing the results of 5,175 Canadian patients who had undergone bypass surgery, the mean age for men was 61 years, and for women as 6- years (Jaglal et al, 1995) Similar results (mean age of total sample 61 ye were reported for a Norwegian sample and an Australian study (mean age 64 years) [Steine et al, 1996; Weightman et al, 1997]. According to the Society of Thoracic Surgeons Na' . 'l Cardiac Surgery Database the mean age of

patients undergoing bypass surgery in 1994 was 65 years (Edwards et al, 1997). There seems to be an international tendency to do bypass surgery on older patients than was the case in the 1980's. This sample matched the age of the sample in the north of England but was lower than other reported studies for the 1990's.

Seventy five percent (n= 55) of the sample were married, 11% were divorced the rest of the sample were either single or widowed. Similar data has been reported for either living with a partner (80%) or being married (73%) [Jette and Downing, 1996; Loose and Fernhall, 1995]

In the South African group, 71% of the patients (n=52) had been educated less than or up to grade 12 (high school education). The BARI investigators (1997) reported 72% of the participants in the CABG surgery trial had less than or equal to high school education. The average education for the sample of Jette and Downing(1996) was 13.4 years and Cleary et al (1991) reported an average of 57% of their sample as having high school degrees. There does not seem to be a difference in educational level between the South African sample and other international samples.

Occupational status is an index of achievement of a particular kind (Schlemmer and Stopforth, 1979). According to these two authors, this index of achievement refers to "social status, social prestige or honour, socio-economic status, social standing or (using the term loosely) social class". Kahl and Davis (1955) postulated that occupation was the single index which carried the most weight in modern society and that an occupational status classification was a very adequate indicator of social standing in the community. In this sample 62% of the patients were middle white collar workers, artisans or manual foremen indicating a middle class social status. Subjects working in these occupations do not generally function in a decision-making capacity and would not have decision-making freedom in the work place (Karasek et al, 1988). Research suggests that the social structure of

work, especially not having decision making freedom, is correlated with an increased incidence of myocardial infarction (Karasek et al, 1988). This description would fit the South African group who all had had CABG surgery and had a high incidence of patients who may not have had decision-making freedom in their working environment.

Religion as an important aspect of life

Elderly patients who do not have religious strength and comfort, have a three-fold increased chance of dying after cardiac surgery (Oxman et al, 1995). These authors suggest that apart from considering the biomedical risks for mortality after bypass surgery, psychosocial factors should also be considered. Among the psychosocial variables, having social support and being religious were more important than personality and mood variables. They also stated that social and religious factors can improve the quality of life for many individuals, hence the decision to include this question in the questionnaire. Ruberman (1992) stated that promoting practices that improved the quality of life may also extend the length of life.

In the further analysis of these data no relationship was found between improved quality of life and self-responsibility, and being religious (chapters 6 and 7). This may be due to the lack of variability in subjects because so many (69%) rated religion as an important aspect of their lives. It must be stressed that the time frame chosen for data collection (4 to 6 days post-operatively) could have added to the likelihood that patients regarded religion as an important aspect of their lives.

The cost of the operation versus the benefits of the operation

Sixty two percent (62%) of the patients had a yearly income of less than R50 000. The probable reason why patients with such limited incomes could afford an operation that costs between R30 000-R100 000 is because they were covered by medical aid schemes. Two of the participating surgeons in this study were contracted to medical aids for patients working either in the gold mines or ISCOR (a large steel production corporation). Both these industries are covered by excellent medical aid schemes.

Should patients be able to return to work and function optimally after the CABG surgery then it would be cost-effective for them to undergo this expensive procedure. However this was not always the case in this study. Only 53% of this sample who had worked before the operation returned to work one year post-operatively. Hedback et al (1992) reported return to work after bypass surgery in 60% of patients. Wenger (1986) reported a decrease in the rate of employment after bypass surgery, ranging from 20-80%. The rate of return to work in the South African sample was similar to the findings of Hedback et al (1992).

The fact that there was a poor return to work of patients in this study had further financial implications for patients because in many cases where the patients did not return to work they were no longer covered by a medical aid scheme or if they still were, the available funds had been completely depleted. This put an enormous strain on the available resources of families and added to their stress. One year after the CABG surgery 36% of patients reported that they were constantly stressed and of these, 46% said that the cause of their stress was work related and 14% gave the reason as financial (see appendix I).

Return to work

Work plays a major social as well as economic role (Wenger et al, 1984) so that the ability to work is a critical component of maintaining or achieving a decent quality of life (Graves, 1983). But it has been well documented that bypass surgery has little influence on the rate of return to work (CASS, 1984; Varnauskas, 1986; Wenger, 1986).

The fact that many patients do not return to work may be due to age-related retirement rather than a result of bypass surgery (Klonoff et al, 1989). Considering the mean age (57 years) of this sample it may well have been the case. In the current socio-economic climate in South Africa it is common

for persons to retire at an earlier age than the usual age of 60 years. Patients who have undergone CABG surgery should be encouraged to continue working for as long as possible for the value of maintaining their functional capacity and for the value that work has to improve the quality of life of patients.

In this sample patients with higher incomes and higher levels of education were more likely to return to work. Return to work was used as one of the criteria to judge improved quality of life. Patients who experienced an improved quality of life were also in the group who had a higher income (as evidenced by the analysis of the patients with improved quality of life in chapter 6). Previous employment seemed to be a strong predictor of return to work and in this study only patients who had worked before the operation returned to work after the operation (appendix I). These findings are supported by other authors (Stanton et al, 1983; Kinchla and Weiss, 1985) who found that age, level of education, previous myocardial infarction, pension and retirement benefits were factors that promoted return to work.

Return to work can be particularly stressful for patients after a cardiac event and is often accompanied by "regression", resumption of smoking, weight gain, and disregard for the exercise regime (Frank et al, 1979). For many patients that have stressful or demanding jobs the surgical intervention may create the opportunity to "retire gracefully" (Wenger, 1986). Retiring early may be a secondary benefit of illness and in this way a patient can achieve rest and care (Boll et al, 1987).

Return to work is not necessarily a "good" outcome. Many patients may be demoted from their previous positions and may find themselves working in a job at a lower level where their ability to make independent decisions is limited. A number of researchers have reported increased stress levels for patients functioning in such positions (Bryant and Mayou, 1989; Karasek et al, 1988).

If patients return to work but not in the same capacity as before this may cause job stress. Job stress, has been shown to be associated with both psychological strain and coronary heart disease. According to these researchers psychological strain results when individuals have insufficient control (low control) over their work situation to be able satisfactorily to deal with the level of demands being placed on them (Karasek et al, 1988). There seem to be many factors involved when considering return to work, however it does seem that for patients who are employed prior to the CABG surgery, the return to work in the same capacity after the surgery will result in an improved quality of life and is therefore desirable.

DISCUSSION OF THE RISK FACTORS

HYPERCHOLESTEROLAEMIA

The mean preoperative total serum cholesterol concentration (6.29 mmol/l) for this study was higher than that of 5.28 mmol/l reported by Maines et al (1997). This group reported 6.29 mmol/l and the patients in the study by Maines had a mean level of 5.28 mmol/l. White South African men and women have a higher mortality for ischaemic heart disease than the population of other developed Western countries from which they originated (Wyndham, 1979). In the CORIS baseline study the total serum cholesterol concentrations for an Afrikaner community in the age group 55-64 years, was 6.34 mmol/l which is slightly higher than this study group who had a mean age 57 years (Rossouw et al, 1983). This group consisted of a mixed population but the highest proportion of the patients were Afrikaners (47%) so that the cholesterol values would fall in the expected range. In a study in Germany by Schlierf et al (1995) mean serum cholesterol concentration at the

onset of a rehabilitation programme was 6.28 mmol/l which is similar to this sample. Acceptable serum cholesterol concentration for this age group would be <5.17 mmol/l (Gordon and Gibbons, 1991).

Only 27% of the patients knew their total serum cholesterol concentrations. They did not know their LDL and HDL levels. Of the 73 patients, 47% (34) reported elevated serum cholesterol concentrations. Patients who know their cholesterol values either as a value or as a category (high or normal) are usually accurate in their assessment (Stables et al, 1996). In a study by Stables et al (1996) it was found that patients were not aware of their HDL or LDL cholesterol subfractions, nor were they specifically recorded in the medical records and neither had the physician made any clinical comment. Dyslipidaemias are frequently under diagnosed because full lipid profile measurements are not regularly taken (Teo, 1997).

Exactly the same could be said about many physicians' records and ward files that were encountered in this study. It was not possible to retrieve this information from the files of many patients in this study because it had not been documented. Not one patient could report on their HDL and LDL cholesterol subfractions because they had never been informed (this included a general medical practitioner who was in the study sample).

Patients are more susceptible to advice on risk factor management at the time of the operation (Hiratzka, 1995). At that stage there is a disruption of their normal lifestyle and they are more likely to heed advice than at a later stage when they have returned to a more normal life and are again feeling better. The AHA Council on Cardio-Thoracic and Vascular Surgery, and the Task Force on Cholesterol Issues, met with the Society of Thoracic Surgeons and they agreed that secondary prevention is an important topic for surgeons to emphasise to their patients (Hiratzka, 1995). It has been reported that surgical staff do not frequently document lipid abnormalities established CAD (Miller et al, 1995). There is justification to initiate aggressive secondary

preventive measures prior to patients' discharge from hospital. However, management of modifiable coronary risk factors cannot be instituted when they have not been identified (Miller et al, 1995) as was the case in this study.

HYPERTENSION

The reported incidence of hypertension in this group (41%) is considerably higher than the reported levels in the American (20%) as well as the South African population (Urban Whites 23%; Blacks 25%; Indians 19%) [Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V), 1993; Seedat et al, 1980]. It was to be expected that the levels obtained from the medical files would be lower than the reported pre-operative levels as patients had just been for surgery and were still hospitalised. Their blood pressure levels would be monitored and better controlled while patients are hospitalised.

It would seem that this group would do well on a structured exercise programme. Physical activity is a nonpharmacological treatment that is frequently prescribed for the treatment of Stage 1 or 2 hypertension (Hagberg, 1997). While endurance exercise training does lower blood pressure significantly, it does not normalise the blood pressure (Hagberg, 1997). Hagberg also draws the attention to the fact that ambulatory blood pressure readings are a better indicator of cardiovascular disease risk and end-organ damage, than the traditional blood pressure readings. Only a few studies have been done on the reductions in ambulatory blood pressures with exercise training. The results of these studies are not as consistent, and exercise-induced reductions in ambulatory blood pressures are also smaller than for casual blood pressures.

Weight loss, of the order of five kilograms, have been associated with significant decreases in blood pressure (Beilin, 1990) and so hypertensive patients would also do well on a programme to control their weight.

According to the NHANES 111 Study, only 29% of patients with hypertension are adequately controlled by therapy (JNC V 1993). In this study group patients reported that hypertension had been diagnosed for an average of 12 years (see appendix I). If patients had been put on a risk factor modification programme and their hypertension was adequately controlled, they may not have progressed to a situation where CABG surgery was indicated. There is certainly agreement with Smith (1997) that hypertension is not adequately treated and that the majority of patients with hypertension are at risk for progression of cardiovascular disease.

SMOKING

Smoking was the risk factor with the highest prevalence in this study. Seventy five percent of the study sample, which represented a mixed racial population, smoked. A study in 1975 of white South Africans revealed smoking prevalences of 58% for men and 31% for women in a population sample of subjects aged 20-59 years (Van der Burgh, 1979). In 1980 a smoking prevalence of 52.7% was found among middle aged white miners (Wyndham et al, 1980) and the Rembrandt Tobacco Corporation estimated that 44% of white South African men and 36% of white adult women were smokers (Steenkamp et al, 1988). The study of Steenkamp et al (1988) on a large South African rural community revealed that 48% of the men and 18% of the women were currently smoking and that only 29% of the men had never smoked. This study sample has an even higher concentration of smokers.

In a study by Rigotti et al (1994) on 87 patients who had undergone CABG surgery, the study sample was similar to this study with reference to mean age, years of education and dominance of white patients. The Rigotti sample were, however, heavier smokers with a 58 pack-year history. Rigotti et al

(1994) reported smoking cessation after one year in 51 % of cases. Crouse and Hageman (1991) reported similar findings to those of Rigotti et al (1994).

In this study group, 14% of the original smokers were still smoking after one year and 85% had stopped smoking in spite of the fact that they had no formal education on smoking cessation. This is a much higher percentage than reported in the literature. It is possible that persistence of smoking one year after surgery is under reported (although the opinion of the spouse on this matter was also sought) but the reason for it being the case is obscure.

A clinical event is a "window" of opportunity (Ockene and Ockene,1993) and especially in the South African scenario where there is such a high incidence of smokers, this opportunity may be valuable. In the light of White South Africans' susceptibility to CHD, the high prevalence of one of the major risk factors, namely smoking, and the beneficial effects of cessation of smoking on CHD risk and mortality, the need to curb smoking in South Africa is quite evident (Steenkamp et al, 1988). Physicians should caution patients about their smoking habits at every possible opportunity. The ideal time being the period immediately following the CABG surgery.

PHYSICAL ACTIVITY

In this study 91% of patients reported some form of physical activity either at school or after having left school; 85% percent were involved with sporting activities at school and only 50% after school.

According to the NIH Consensus Statement, 54% of adult Americans reported little or no regular physical activity which is very similar to the 50% reported by this cohort (NIH Consensus Conference, 1996). The activity levels reported by scholars in America (50%) are much less than reported by the participants in this study. A figure of 85% was given for participation in sport at school. The majority of the patients in the South African sample were white

and this is therefore not representative of the population of the country. In schools which were for only white children until 1994 there were excellent facilities for organised sport. This was not the case for schools attended by the rest of the population and may account for this discrepancy. It would appear that one could also relate the prevalence of physical activity at school to educated and socially advantaged South Africans.

This study group reported a drop in time spent on sporting activities after leaving school. This drop is to be expected as it is known that as adults age they become physically more inactive (NIH Consensus Statement, 1996). Twenty one patients (29%) regarded themselves as physically active at the time of the operation. Only four patients were doing physical activity for a training effect. The questionnaire was not adequately designed to examine the extent of the leisure activities engaged in by this sample of patients, as it is known that regular exercise of moderate intensity may be of benefit to patients (Gordon et al, 1993).

Outdoor games are popular in South Africa because of the favourable climate. The activities engaged in by the group at school were mainly rugby, cricket and soccer and after school, tennis became more popular than cricket. The reason for this change in preference could possibly be because cricket is a very time consuming game. The leisure activities engaged in by the patients at the time of the operation were mainly golf and walking.

Considering the mean age of the sample in this study (57 years) it is disconcerting that only 29% reported any form of physical activity at the time of the operation. More emphasis should be placed on physical activity as a preventative measure for coronary artery disease. It is also highly unlikely that if these patients were not engaged in physical activities prior to their surgery that they would do so after the surgery. It cannot be over emphasised that this clinical incident (CABG surgery) again should be used as a

"window" of opportunity to encourage and educate patients about the value of exercise in optimising the outcome of the CABG surgery.

FAMILY HISTORY

Coronary artery disease has a strong genetic component. Family history of premature CAD is classified as disease at an age of <55 years in a first degree relative (Miller et al, 1995). Forty two patients (58%) reported that they had a member/members in their families who died from heart disease. In 76% of cases a parent/parents were involved, in 19% of cases a sibling was involved and in only 8% of cases were the grandparents involved. This latter figure could be underreported due to an inability to recall events long ago. In this study the age at which a relative died from heart disease was also established. According to the respondents 13% of deaths occurred before the age of 55 and 38% between the ages of 55 and 65 years.

Familial hypercholesterolaemia is at least five times as frequent in the Afrikaans-speaking sector of the South African white population as in other population groups in South Africa (Seftel et al, 1980). Patients suffering from familial hypercholesterolaemia die prematurely from this disease. In this sample the highest number of patients were Afrikaans speaking (47%). In familial hypercholesterolaemia, the risk of early coronary artery disease is considerably increased by the mutation of a single gene and Humphries et al (1997) suggest that genetic testing may be appropriate to identify this condition. It has been suggested that with cholesterol testing alone 15-20% of relatives may be misdiagnosed (Humphries et al, 1997). The value of identifying these patients would be that they can be offered lifestyle advice and they can also be closely monitored so that when their lipid levels do become elevated they can be treated immediately.

In this study the relatives of 67% of the patients died from myocardial infarcts, 14% died after bypass surgery (daunting information if you yourself had just had a coronary artery bypass) and 4% died of cardiac failure.

STRESS

Stress was self-evaluated by patients in this project. Fifty two patients (71%) considered their lives stressful at the time of the operation and 45% stated that their lives were constantly stressed. The cause most frequently cited for the stress experienced by the patients (65%) was work related. Schnall et al (1994) found a positive correlation between job strain and cardiovascular disease. However, Hlatky et al (1995) when investigating the relationship between job strain and cardiovascular disease, found no correlation in prevalence or severity of coronary artery disease in a cohort of patients undergoing coronary artery angiography. They thus concluded that in patients with angiographically defined coronary artery disease, job strain does not lead to the development of coronary atherosclerosis or to the precipitation of coronary events.

In this study job strain, as suggested by Karasek et al (1988) and which was also the method followed by Hlatky et al (1995), was not measured. Patients were simply asked whether they perceived their lives as stressful and what the cause of the stress was. The fact that the majority of patients perceived the cause of their stress as work related may be due to the political and economic situation in South Africa at the time of the study (1995-1996). The government had at that stage changed to democratic rule and many white workers (most participants in this study were white) were concerned that they may lose their jobs because of the government's policy of affirmative action. The job-related stress they experienced may have resulted from concerns with economic survival rather than the stress caused by the job itself.

DIABETES MELLITUS

Non-insulin dependent diabetes mellitus occurs commonly in middle aged and older individuals. It has been recognised for many years that individuals

with diabetes have an increased risk of developing and dying from cardiovascular disease. In this study there was a high incidence of diabetes mellitus (15%) when compared to the study by Farrer et al (1995). They reported that in a preoperative cohort of 353 consecutive patients there were only 6% known diabetic patients. The prevalence of diabetes is especially high in the South African Asian population. The mortality rate for diabetes mellitus in Asians is 8 times as high as that in Whites (Wyndham, 1979).This was the second largest population group in this study and may account for the high incidence of diabetic patients.

OBESITY

An increased body weight for height (body mass index) is associated with a number of risk factors for CHD and may also directly affect the risk for CHD. Significant increases in risk begin at a body mass index (BMI) of 27.8 kg/m^2 (Van Itallie, 1985). In this study 15% of patients were in the normal weight category (BMI < 24), 60% were overweight (BMI 24-30) and 25% were obese (BMI >30). The mean BMI of this group was 27.8 kg/m^2 which means that the group was overweight and at significant risk for cardiac disease.

Patients in this group reported a mean weight increase from the time of leaving school (68 kg; BMI 22.9) to the time of the operation (82.4 kg, BMI 27.8) of 14.4 kg. Overweight is more prevalent with advancing age (Van Itallie, 1985). Van Itallie (1985) also states that the relative risk for overweight Americans in the age group 20-75 years compared to the non-overweight is: three times for hypertension; 1.5 times for hypercholesterolaemia , and 2.9 times for diabetes. These results would be in agreement with the high incidences of hypercholesterolaemia, hypertension and diabetes identified in this group.

ALCOHOL CONSUMPTION

Forty eight per cent of this sample consumed alcohol regularly. They also reported an average alcohol consumption of three drinks per day. An average of less than three drinks per day offers a protective effect for coronary heart disease as well as the risk of death from leading causes such as cancer and cerebrovascular accidents (Ellison, 1990; Camargo et al, 1997). In the Framingham study moderate alcohol consumption was found to decrease coronary heart disease especially in males (Friedman and Kimball, 1986). However it has also been reported that the consumption of three drinks or more per day is associated with higher blood pressure (MacMahon and Norton, 1986). An increased risk of stroke has been observed in both hypertensive patients and heavy drinkers and it has been reported that alcohol intoxication preceded the onset of symptoms of some patients who suffered a stroke (Hillbom and Kaste, 1983). It has to be considered that it is likely that alcohol consumption is underreported by as much as 50% especially in persons who are moderate drinkers (Friedman and Kimball, 1986).

In non smoking males, those who drink beer and wine show greater reductions in mortality than those ingesting spirits (Friedman and Kimball, 1986). Unfortunately in this study no differentiation was made between the consumption of spirits, wine or beer. It is also very likely that alcohol consumption was underreported in this study because patients had just undergone bypass surgery and may have felt guilty about their alcohol consumption.

DISCUSSION OF THE MEDICAL FACTORS

The medical factors will be discussed as they relate to Improved Quality of Life and Self-Responsibility (see chapters 6 and 7).

SUMMARY

Patients in this study, when compared to other international studies, were very similar as regards to post-operative mortality, marital status, educational levels, and return to work. In this study the mean age for patients undergoing CABG surgery was younger than the ages reported in the literature and the numbers of females undergoing CABG surgery was also lower than those reported in the literature.

The highest proportion of patients were from a lower income group (62% earned less than R50,000 p.a.). In spite of their limited financial resources they were treated with a very expensive intervention (which may not have been necessary to save their lives). Many did not return to work and this placed an heavy financial burden on their families. The cost of the medical intervention depleted the existing medical aid funding and if they had to have further treatment this often became a problem. If patients are not operated on and have to comply with medical treatment, this may act as a reminder that they do have a chronic condition and it is possible that they would be more concerned about maintaining good health. They may be more susceptible to suggestions regarding risk factor modification.

Limited information on serum cholesterol concentrations and blood pressures was available. Patients knew that they were hypercholesterolaemic or hypertensive but nothing more than that. Information was also scantily documented in the physicians' files or ward files. Unless patients are well informed about their existing risk factors it 's

unlikely that they will perceive the relevance of a risk factor modification programme.

CONCLUSION

The patients in this study were a high risk population of mainly white Afrikaans speaking males with multiple risk factors (obese, heavy smokers, hypertensive, hypercholesterolaemic, inactive, family history of cardiac disease, diabetics, regular ingestion of alcohol). They were also in a lower income group. In spite of this they had received a very expensive intervention for CAD. Although the average age of this group was only 57 years many did not return to work. Their knowledge of their serum cholesterol concentrations was limited and although they reported the presence of hypertension for an average period of 12 years their hypertension was still not controlled. Out of this sample of 73 patients only seven attended a cardiac rehabilitation programme.

CHAPTER VI

QUALITY OF LIFE

This chapter deals with the results and the discussion of the quality of life study. In the introduction a short resume will be presented on the important aspects of chronic disease, the aims of health intervention and the importance of "quality of life" measures as a tool to evaluate the success of the intervention. A brief summary will be given of the method used to determine improved quality of life, the results will be presented and then discussed.

INTRODUCTION

Coronary heart disease is a chronic disease related to abnormal concentrations of blood lipid levels and the disease process is accelerated by a number of risk factors. It is not an inevitable consequence of ageing. When dealing with chronic disease the ultimate goal in most cases is not to "cure" the patient but to achieve optimal function by decreasing the symptoms experienced by the patient and/or by limiting the disease process. In this way the life and the quality of life of the patient is preserved.

In the case of patients with coronary artery disease, CABG surgery is a surgical intervention, aimed at prolonging life in selected cases, but in many cases aimed at decreasing the symptoms and improving the functional capacity of the patient. The long-term successful outcome of the operation is dependent on patients' compliance to a programme of risk factor modification.

To determine if an intervention for a chronic disease has been successful we need to consider the improvement of the medical status of the patient as well as the patient's perception of this outcome, in other words, the quality of life of the patient must be assessed. The evaluation of the quality of life provides

much greater understanding of the impact of the illness and treatment than traditional outcome measures (Ferrans 1990).

When considering quality of life the most important factors to be considered is the health and functional independence of the patient and the patient's subjective assessment of the desirability of a particular way of life or the satisfaction this way of life provides the individual. Self-rated health is the predominant variable to influence life satisfaction (Palmore and Luikart, 1972). It has thus been suggested that the influence of health on well-being does not merely reflect how people feel physically, but rather what their health allows them to do in terms of functional capacity. Subjective measures of health are more strongly related to happiness (satisfaction) and objective measures have only a modest relationship to subjective assessments. It is therefore essential to include both kinds of indicators when measuring health.

The domains commonly thought to comprise health-related quality of life are:

Physical health, functional ability, emotional health (depression, perceived stress), sexual functioning, work productivity and social performance and life satisfaction (Ory, 1994). The domains recognised by the Coronary Artery Surgery Survey Principal Investigators and their Associates (1983) were : functional status; improvement of cardiac related symptoms; return to gainful employment and recreational activity. The Veterans Administration Study recognised the following domains: Severity of angina, exercise performance and the New York Heart Association functional classification. (Peduzzi et al, 1987).

The domains used by the CASS Principal Investigators and the Veterans Study are incomplete as there is no recognition of the patient's evaluation of health and personal life satisfaction outcomes.

SUMMARY OF THE METHOD (DISCUSSED IN DETAIL IN CHAPTER 4)

In this study quality of life was assessed using the domains suggested by the CASS Principal Investigators (1983a). Patients' subjective responses were considered because it was felt that quality of life measures that relied on clinical judgement alone inadequately represented patient values. In order to cover the domains that Ory (1994) considered important, questions were also included on sexual functioning, satisfaction with the outcome and emotional health (depression and perceived stress). In addition the spouse/caregiver's responses were also recorded. Consenting patients were interviewed 4-6 days after the operation, six months later and again one year after the operation. Spouses were interviewed six months and 12 months after the operation. Data were thus collected during five different interviews for each patient.

This study design was unique in that it relied on patients' subjective responses about health and satisfaction with the outcome of the operation and it included the spouses' evaluation of patients' functional capacity, emotional health, compliance with risk factor modification and their satisfaction with the outcome of the intervention.

The criteria for improved quality of life twelve months after the operation were:

1. Return to work or recreational activities
2. No angina
3. Improved functional capacity

Using these criteria very few patients had improved quality of life at six months and thus a decision was made to evaluate improved quality of life at twelve months only. The data at twelve months was adequate to analyse for significant differences between the two groups.

Having identified a group with improved quality of life and a group who did not have improved quality of life their data as they presented on admission, six months and at 12 months after the operation were analysed for statistically significant differences. Data gathered from the spouses at six months and at 12 months after the operation were also analysed in this way.

RESULTS: IDENTIFYING PATIENTS WITH IMPROVED QUALITY OF LIFE

Fifty eight patients of the original 73 patients admitted to the study remained in the trial one year after the operation and in 56 of the cases the data was complete to determine improved quality of life. Seventeen (17) patients were judged to have improved quality of life one year post-operatively. All 17 patients were males. Patients with improved quality of life were assigned to Group 1. The remaining 39 patients (Group 2) did not have an improved quality of life one year post-operatively. There were 10 females in this group and 29 males.

All the variables were then analysed to determine whether any statistically significant differences existed between Groups 1 and 2.

In Table 6.1 the variables on admission into the trial that were significantly different between the two groups, are presented. The table is split into two sections with the categorical data in the first section and the continuous data in the second section. For the categorical data the degrees of freedom (df), the Chi-square value (χ^2) and the p-value is given in the table. For the continuous data the mean values are given and then the F-value (variance ratio) and the p-value. A p-value of 0.05 or less is regarded as significant.

TABLE 6.1

ON ADMISSION INTO THE TRIAL

	Chi-square		
Group 1 (Improved quality of life) (Categorical data)	df	χ^2-value	p-value
Male	1	5.31	0.01
Married	1	5.44	0.02
Income > R50 000 p/a	1	4.74	0.03
Normal sex-life	1	5.10	0.04

Group 1 Improved quality of life (n=17)
Group 2 No improved quality of life (n=39)

Patients who had an improved quality of life 12 months after CABG surgery were statistically different from the group whose quality of life had not improved in that they were on admission, married males with an income greater than R50 000 ($8 000) and had reported a normal sex-life prior to hospital admission.

ON ADMISSION INTO THE TRIAL (CONTINUED)

		ANOVA		
Group 1 (Improved quality of life) (Continuous data)		Mean	F-value	p-value
Taller (cms)	Grp 1	176.53	6.68	0.01
	Grp 2	168.36		
Weigh more (kg)	Grp 1	86.71	3.57	0.06 (NS)
	Grp 2	78.77		
More hours of sport at school per week (hrs)	Grp 1	10.68	4.64	0.04
	Grp 2	7.06		
Years sporting activities stopped prior to CABG	Grp 1	15.67	10.14	<0.01
	Grp 2	27.70		

Grp 1 (Group 1; improved quality of life, n = 17); Grp 2 (Group 2; no improved quality of life, n = 39)
NS: not statistically significant

The patients with an improved quality of life were taller than patients whose quality of life had not improved. These patients had also participated more in sporting activities at school and carried on with sport for a longer period prior to surgery than the group who did not have an improved quality of life. The difference in weight between the two groups was not significant. There were also no significant differences between the two groups with regard to BMI (see appendix II).

In Table 6.2 the significant differences at six months between the two groups who either had improved quality of life or no improved quality of life (as established at 12 months) are examined. The only significant differences between the two groups were in the categorical data. Information on degrees of freedom (df), Chi-square (χ^2) - value and p-values are given in the table.

TABLE 6.2

SIX MONTHS AFTER CABG SURGERY

	Chi-square		
Group 1 (Improved quality of life) (categorical data)	df	χ^2-value	p-value
Returned to work	1	5.78	0.02
Activity levels > pre-operative level	1	16.35	<0.01
Sexual performance better than before	1	6.51	0.01
Knew how much exercise to do	1	9.05	<0.01

At six months patients who would have an improved quality of life 12 months after CABG surgery, had returned to work and their activity levels were greater than their pre-operative levels. These two characteristics were part of the definition used at twelve months to identify the patients who had an improved quality of life. They also knew how much exercise they should be doing and they reported a better sexual performance than before the operation.

In Table 6.3 the significant differences one year after CABG surgery, between the patients with improved quality of life and those whose lives did not improve, are presented. The table is split in two. In the first section the results are given for patients who had improved quality of life and in the second section the results are presented for those patients who did not have an improved quality of life.

TABLE 6.3

TWELVE MONTHS AFTER CABG SURGERY

	Chi-square		
Group 1 (Improved quality of life) (Categorical data)	df	χ^2 value	p-value
Returned to work	1	11.39	<0.01
No angina	1	8.14	<0.01
activity levels > pre-operative levels	1	43.06	<0.01
Absence of breathlessness	1	6.90	0.01
Knowledge that smoking had an effect on CVS	1	8.66	<0.01
Sexual performance better than before	1	9.87	<0.01
Spouse knew diet patients had to follow	1	4.33	0.04
Spouse considered operation a cure	1	6.11	0.01
Spouse considered patient's activity levels > pre-operative level	2	8.85	0.01
Group 2 (no improved quality of life) (categorical data)			
symptoms post-operatively	1	5.30	0.02
Were depressed	1	6.84	0.01

Return to work, absence of angina and activity levels greater than pre-operative levels (indicating improved functional capacity) were used to determine if patients had improved quality of life and therefore these parameters are expected to be significantly different between the group of patients with improved quality of life and the group with no improvement in their quality of life.

Breathlessness was not used as an indicator of cardiac disease because many patients had chronic respiratory disease as a result of excessive smoking and patients also confused breathlessness with being unfit. It is important that the absence of breathlessness was significant in the group with improved quality of life providing external validity for the method used to determine improved quality of life.

Spouses considered patients cured, more active and they knew the diet patients should follow.

Patients who were symptomatic and depressed one year after the CABG surgery did not have an improved quality of life. Patients complained of symptoms such as painful sternums, problems with the leg wounds from where the veins had been harvested and sleeplessness.

Table 6.4 compares the mean weight of subjects in Group 1 with the mean weight of subjects in Group 2. Weight was considered important because it could be a possible indicator of compliance. Weight was self-reported by patients and the data was collected for weight at school leaving, on entry into the research programme, six months and 12 months after the operation. The Wilcoxon 2 sample test was used to analyse this data.

TABLE 6.4

WEIGHT PROFILE

	School Leaving	On Admission	6 Months	12 Months
Group 1 (weight in kg)	69	87	82 (75)	82 (78)
Group 2 (weight in kg)	64	79	75 (75)	78 (79)
p-value (Wilcoxon 2 sample test)	0.18 NS	0.06 NS	0.15 (1.0) NS	0.31 (0.85) NS

NS: not statistically significant

There were no statistically significant differences between the two groups at any of the stages considered. The values indicated in brackets at six months and twelve months represent the spouses' estimate of the weight of the patient.

The patients who did not have an improved quality of life one year after the operation weighed less than the patients who did have an improved quality of life (but they were also not as tall). However, the group with an improved quality of life gained less weight (13.41 kg) in the period from school leaving until the time of the operation, than the group that did not have an improved quality of life (14.15 kg). These differences between the groups were not statistically significant.

In Table 6.5 the medical information of the patients in Group 1 is compared to the information of patients in Group 2. Mean values for left ventricular ejection fraction, the number of vessels bypassed, bypass time and aortic cross-clamp time for the two groups are compared. This information was taken from patients' surgical files.

TABLE 6.5

MEDICAL AND SURGICAL INFORMATION

	GROUP 1	GROUP 2	ANOVA	
	IQL	no IQL	F-value	p-value
Pre-operative ventricular ejection fraction (%)	53	54	0.003	0.96 (NS)
No of vessels bypassed	2.9	2.7	0.37	0.55(NS)
Bypass time (mins)	103	117	0.48	0.49(NS)
Aortic cross clamp time (mins)	56	55	0.01	0.94(NS)
Days in ICU	4	3	0.12	0.73(NS)

Improved quality of life (IQL)
NS: not statistically significant

The two groups were virtually identical with regard to their disease profile. The bypass time was slightly longer for patients with no improved quality of life. Patients whose quality of life did not improve spent on average one day less in ICU than patients with improved quality of life one year after the operation.

In Table 6.6 the mean values for the number of hospital readmissions after discharge from the hospital following CABG surgery are compared between the two groups. The mean number of consultations with a medical doctor, excluding the routine surgical follow-up, is also compared between the two groups.

TABLE 6.6

HOSPITAL ADMISSIONS AND MEDICAL CONSULTATIONS ONE YEAR AFTER THE OPERATION

	Group 1	Group 2	ANOVA	
	IQL	no IQL	F-value	p-value
Number of Hospital Admissions (mean)	0.3	0.5	1.22	0.27 (NS)
Number of Consultations (mean)	2.2	2.1	0.03	0.87 (NS)

Improved quality of life (IQL).

There was no significant difference between the two groups with respect of the mean number of hospital admissions or the number of consultations with a medical doctor in connection with their cardiac condition. The extent of the disease, as established from the above factors, had no influence in determining improved quality of life.

In Table 6.7 the results of acceptance of self-responsibility for the Group 1 (Improved quality of life) and Group 2 (no improvement in quality of life) are given. The aim of this research project was to identify self-responsibility as a factor in improved quality of life. Because self-responsibility is identified as a significant factor in improved quality of life it is essential to include this information at this stage, for the analysis of the data for improved quality of life. The method used to identify patients that were self-responsible is discussed in Chapter 4 (page 121) and the results will be discussed in detail in Chapter 7. Adequate data to assess self-responsibility was available in all 58 patients who remained in the trial one year after the operation. Forty one patients were self-responsible and 17 were not responsible. The Chi-square test was used to analyse this data.

TABLE 6.7

SELF-RESPONSIBILITY EVALUATED IN TWO GROUPS OF PATIENTS (WITH AND WITHOUT IMPROVED QUALITY OF LIFE)

	Self-responsible	Not self-responsible	Total
Improved quality of life	17	0	17
No improved quality of life	24	15	39
Total	41	15	56

$df = 1$; $\chi^2 = 8.93$; $p = 0.003$

No single patient who did not accept responsibility for his own health one year after CABG surgery had an improved quality of life. Patients with improved quality of life were self-responsible. Unless patients are responsible for their own health they will not have an improved quality of life. However, the acceptance of self-responsibility does not ensure an improved quality of life.

RESULTS OF STEPWISE LOGISTIC REGRESSION TO DETERMINE THE PROBABILITY FOR IMPROVED QUALITY OF LIFE

Logistic Regression enters independent (predictor) variables in a stepwise manner and it will also fit specified models. For this analysis logistic regression was used to estimate the probability that an individual would have an improved quality of life if a number of variables were considered.

Only the responses of patients with complete data sets of significant variables predicting improved quality of life were used. There were 40 complete data sets.
Of those, 13 had an improved quality of life and 27 did not have improvement in their quality of life.

THE IDENTIFIED PREDICTOR VARIABLES WERE THE FOLLOWING

- Height of patient
- Knowledge that smoking affects the cardiovascular system
- Number of years sporting activities were stopped prior to CABG surgery
- Better quality sex-life after the operation
- Acceptance of self-responsibility
- Married
- Spouse knew what diet the patient should follow

Goodness of fit $\chi^2 = 9.72$, $p = 1.00$

Because the above model contained so many predictor variables a specified model was fitted into the regression model, consisting of variables considered important for the South African sample. The variables were:

1. Better quality of sex-life (categorical - yes or no)
2. Height of the patient (continuous value)
3. Number of years since stopped with sporting activities (continuous value)

4. Had accepted self-responsibility (categorical value - yes or no)

yes = 0; no = 1

The Dependent variable was improved quality of life and the outcome was yes or no (0 or 1). Goodness of fit χ^2 = 10.30 p = 0.98

Statistical information

	coefficient
Height (x_1) :	+ 0.08
Stopped sport(x_2) :	- 0.18
Sexual quality (x_3):	+ 4.06
Accepted self-responsibility (x_4):	-10.10
Constant(b_0):	-11.13

EXAMPLES OF THE CALCULATIONS OF THE PROBABILITY THAT A PATIENT WILL HAVE AN IMPROVED QUALITY OF LIFE

Example 1

The calculation of the probability that a patient will have an improved quality of life when considering the average patient with regard to height and the time since the cessation of sporting activities prior to the CABG surgery.

accepted self-responsibility

was 177 cms tall

had stopped sport 15 years ago

had a better quality sex- life

the probability that the patient will have an improved quality of life would be calculated in the following way:

$y = b_0 + b_1 x_1 + b_2 x_2 + \ldots + b_n x_n$

$= -11.3 + (0.08 \times 177) + (-0.18 \times 15) + (4.06 \times 0) + (-10.10 \times 0)$

$= 11.3 + 14.40 - 2.70$

$= 0.16$

$p = e^y / (1 + e^y)$

$= 1.174/2.174$

$= 0.54$

In this case at a sensitivity of 92.31% and specificity of 81.48% the cutpoint is 0.24. A case is judged to have improved quality of life if the probability is greater than cutpoint. In the example the calculated value is 0.54 which is greater than cutpoint and one can therefore say that the outcome would be an improved quality of life

Example 2

The calculation of the probability that the patient will have an improved quality of life when manipulating the years the patient stopped sport before the CABG surgery:

Examples of calculations will be given for 5 and 30 years

1. In the hypothetical case where a patient
accepted self-responsibility
was 177 cms tall
had stopped sport 5 years ago
had a better quality sex- life
$y = 1.96$
$p = e^y/1 + e^y$
$= 0.88$

then the probability is still greater than the cutpoint ($p = 0.24$) and would indicate that the patient would have an improved quality of life.

2. accepted self-responsibility
was 177 cms tall
had stopped sport 30 years ago
had a better quality sex- life
$y = -2.54$
$p = e^y/1 + e^y$
$= 0.07$

then the probability is less than the cutpoint ($p = 0.242$) and would indicate that the patient would NOT have an improved quality of life.
Thus the years since the patient stopped sporting activities prior to the operation will only affect the outcome if it were extremely long ago.

Example 3

The calculation of the probability that the patient will have an improved quality of life when manipulating the sex-life of the patient:

1. accepted self-responsibility
was 177 cms tall
had stopped sport 15 years ago
had a better quality sex- life
$y = 0.16$
$p = 0.54$
The patient does have an improved quality of life

2. accepted self-responsibility
was 177 cms tall
had stopped sport 15 years ago
had a poor quality sex- life
$y = 4.22$
$p = 0.986$
The patient does have an improved quality of life

The sex-life of the patient does not affect the outcome for improved quality of life

Example 4

The calculation of the probability that the patient will have an improved quality of life when manipulating the height of the patient:

In a hypothetical case where
1. accepted self-responsibility
was 168 cms tall
had stopped sport 15 years ago
had a better quality sex- life
y= -0.560
p = 0.364
The patient does have an improved quality of life

2. accepted self-responsibility
was 127 cms tall
had stopped sport 15 years ago
had a better quality sex- life
y= 3.840,
p = 0.021
The patient does NOT have an improved quality of life
If the patient is extremely short the patient will NOT have an improved quality of life

Example 5

The calculation of the probability that the patient will have an improved quality of life if the patient **is not responsible** and the various predictor variables are manipulated

In the hypothetical case where the patient has

1. not accepted self-responsibility

was 177 cms tall

had stopped sport 15 years ago

had a better quality sex- life

y= -9.94

p = 0.00005

The patient does NOT have an improved quality of life

2. not accepted self-responsibility

was 188 cms tall (very tall)

Still doing sport

had a better quality sex- life

y= -6.36

p = 0.002

The patient does NOT have an improved quality of life

In the last example all the predictor variables were taken as the optimal positive excepting for self-responsibility and still there was no improved quality of life. **Therefore if the patient is not responsible the outcome will not be an improved quality of life irrespective of all other parameters being positive.**

DISCUSSION OF IMPROVED QUALITY OF LIFE

Seventeen patients (30%) were identified with improved quality of life and 39 (70%) patients were judged not to have improved quality of life one year after their CABG surgery. The number of patients with an improved quality of life could have been higher in this sample if the criteria to identify improved quality of life, had not been so strictly applied. The sentiment expressed by Kos-Munson et al (1988) that a successfully repaired heart doesn't necessarily guarantee a successfully repaired life seems particularly fitting for this group of patients.

The most significant finding of this study was that self-responsibility was a factor in improved quality of life. Of the 17 patients with improved quality all had accepted self-responsibility. No patients who had not accepted self-responsibility had an improved quality of life. From the statistical analysis it was significantly evident that if patients did not accept responsibility for their own health they would not have an improved quality of life one year after CABG surgery ($p=0.003$). This finding has important consequences for the treatment of patients with coronary artery disease. It is essential that patients who are not self-responsible be identified and targeted to promote in them the acceptance of self-responsibility for rehabilitation. CABG surgery is not always a life-saving measure but a treatment to improve patients' quality of life by removing symptoms and improving functional capacity. It therefore becomes essential to include in the objectives of the treatment, the establishment of self-responsibility. If this is not the case it is unlikely that the patient will have an improved quality of life and thus the outcome will not be successful. (The results and the discussion for self-responsibility are presented in Chapter 7)

Another important finding of this study was that there were no significant differences between the group with an improved quality of life and the group who did not have improved quality of life as far as any of the observed medical parameters were concerned. This implies that the severity of the disease as measured in terms of left ventricular ejection fraction, the number of vessels bypassed, bypass time and aortic cross clamp time as well as the days spent in ICU after the operation, did not influence the outcome when measured in terms of improved quality of life. There were also no significant differences between the two groups with respect to the mean number of hospital admissions after discharge following the CABG surgery and the number of visits to a medical doctor in connection with their cardiac condition.

ANALYSES OF DATA GATHERED AT ENTRY INTO THE TRIAL, AT SIX MONTHS AND AT 12 MONTHS WITH RESPECT TO THE TWO GROUPS THAT HAD BEEN IDENTIFIED

The following is a summary of the variables that were significantly different between the group of patients whose quality of life had improved and those whose quality of life had not improved. Patients who had an improved quality of life were:

- married ($p = 0.02$)
- males ($p = 0.01$)
- income greater than R50,000 p.a. ($p = 0.03$)
- "normal" (what the patient regarded as normal) sex-life on admission to the study ($p = 0.04$)
- taller than the patients who did not have improved quality of life ($p = 0.01$)
- had participated in sport at school for more hours per week than those who did not have an improved quality of life ($p = 0.04$)
- had stopped sporting activities fewer years prior to the CABG surgery than those without improved quality of life ($p = 0.003$)
- had returned to work at six months after the operation ($p = 0.02$)

- had a better sexual performance at six months and 12 months after the CABG surgery, than on admission (p = 0.01)
- knew that smoking had an effect on the cardiovascular system (p = 0.003)
- spouse knew the diet the patient had to follow (p = 0.04)
- spouse considered the operation a cure (p = 0.01)
- spouse considered the patient more active (p = 0.001)

CHARACTERISTICS OF PATIENTS WITH IMPROVED QUALITY OF LIFE ON ADMISSION INTO THE TRIAL (DAYS 4 TO 6 AFTER CABG SURGERY; TABLE 6.1)

All the patients with improved quality of life were males (p=0.01). This result correlates well with the results reported by Steine et al (1996) indicating male sex to be a significant predictor of enhanced well-being after coronary artery bypass surgery. Not one female was identified with improved quality of life. This may be due to the fact that there were so few females in the sample (14%). However, it has been frequently reported in the literature that men do significantly better after CABG surgery than females (Stanton et al, 1984; Allen, 1996). Penckofer and Holm (1990) found that females experienced less relief of angina and dyspnoea, more psychosocial impairment, and in addition had a poorer long-term bypass graft patency rate. In a qualitative study by Hawthorne (1993) it was stated that women felt that the surgical intervention was quite successful in relieving symptoms and that they were satisfied with the results of surgery. Clancy et al (1984) stated that no matter how successful CABG surgery may be from the medical perspective, patients' futures are based on how they feel about themselves and what they feel they are able to do. If patients do not perceive that their condition has improved the surgery cannot be called successful. It can thus also be argued that if the patient is satisfied with the outcome and that they feel their condition has improved then the surgery can be called successful. **All the females in this**

study either remained symptomatic post-operatively or reported decreased levels of activity.

The in-hospital mortality experienced by females has been reported to be 1.6 times greater than males (Jaglal et al, 1995). Not one of the female patients in the current sample died post-operatively, although there was an overall mortality rate of 6.8% for the entire sample.

A significant number of males in the group with improved quality of life (p=0.020) were married. Psychosocial support is a major component of successful outcome (Jenkins et al, 1983; Williams and Littman, 1996). In several studies patients with reduced social support have been found to have increased morbidity and mortality rates following cardiac events (Ruberman et al, 1984; Case et al, 1992).

It is a common finding that individuals with heart disease experience fear and anxiety regarding sexual performance, and many report sexual dysfunction or abstinence from sexual activity (Seidl et al, 1991). An interesting finding in the current study was that patients, with an improved quality of life, as assessed at one year post-operatively, had a significantly "normal" sex-life on admission compared to those who did not have an improved quality of life (p=0.036). The question asked on admission was whether the patient regarded his sex-life as "normal". At six months and twelve months patients were asked if their sex-life had improved, was the same, or worse. At six months and twelve months patients with an improved quality of life reported their sexual performance to be better than before the operation. This was significantly different from the group who did not have an improved quality of life (p=0.011).

Jenkins et al (1983) stated that the goal of the rehabilitation process was to focus on satisfaction rather than "sheer amount of activity". They reported that 50% of the patients in their study compared to 40% of the patients in this

study, reported that their sex-life was the same as before the operation. Only 13% percent reported an improvement in their sex lives. Contrary to the findings in this study, Kornfeld et al (1982) found that sexual adjustment improved the least. In the current study sexual frequency was not evaluated but it remains important that there was a significant difference between the sex-life of the group with an improved quality of life and those whose quality of life did not improve. The reason may simply be that all the patients with an improved quality of life were all married. Studies by Papadopoulos et al (1986) and Miller et al (1990) indicated a positive effect of the marital relationship on sexual functioning. They found that the return to sexual activity was positively influenced by a strong emotional relationship between husband and wife.

One must also bear in mind that the criteria for improved quality of life in this study included improved physical activity, and this may also be a reason for the difference in sexual performance between the groups. Jenkins et al (1983) found a close association between improved physical activity and improved sexual performance and Kavanaugh and Shepard (1977) found that with exercise programmes, sexual activity was the same or improved.

The patients with an improved quality of life had a significantly higher annual income than the group who did not have an improved quality of life ($p=0.030$). Health and risk of premature death are determined by socio-economic factors acting throughout life (Smith et al, 1997). A lower socio-economic status has an adverse impact on the prognosis of patients with coronary heart disease (Gundle et al, 1980; Kinchla and Weiss, 1985; Williams and Littmann, 1996). According to Smith et al (1997) it has recently been demonstrated that it is important to consider the cumulative effect of socio-environmental exposures over a life time and that the risk of cardiovascular death at an early stage is particularly sensitive to socio-economic influences acting in early life. These findings were not supported by Hasle (1990) and Lynch et al (1994).

Socio-economic factors in childhood will also affect growth and poor growth in childhood is associated with higher mortality rates from cardiovascular disease in adulthood (Allebeck and Bergh, 1992). The current study established a significant difference in height between the group with improved quality of life and those who did not have improved quality of life ($p=0.01$). The patients with improved quality of life were taller (mean height: 177 cms) than the patients whose quality of life had not improved (mean height: 165 cms). Those patients with improved quality of life also tended to weigh more although this was not significant ($p=0.06$). There were no statistically significant differences in body mass index between the two groups (see appendix III).

Several studies have observed an increased risk for coronary disease in shorter men (Herbert et al, 1993; Walker et al, 1989; The Steering Committee of the Physicians Health Study Research Group, 1989). The reasons for this may be the coronary artery lumen diameter (Herbert et al, 1993). Men have larger diameters of the mid-left anterior descending artery than have women and small mid-LAD (left anterior descending) arteries are associated with a substantially increased risk of in-hospital mortality ($p<0.001$) with CABG surgery (O'Connor et al, 1996). The study by O'Connor et al (1996) was a well controlled, prospective study on 1325 patients undergoing CABG surgery and provided information on coronary artery size. These observations may also explain the higher perioperative mortality in women and smaller people (Rich-Edwards et al, 1995). However, Kannam (1994) reported that in a study of 5209 individuals, although the shortest individuals had a significantly higher death rate from cardiac disease, the difference in death rates was due to an inverse association between height and age.

The population group in the study by Kannam (1994) consisted of patients measured in the 1950's with an age range of 28-62 years at that time. Some of these patients had therefore been born somewhere between the 1890's and 1920's and grew up in a time when medical treatment and control of risk

factors were not as advanced as has been the case in more recent years. Height, in the population group studied by Kannam (1994) may not have been a significant indicator of mortality due to the prevalence of risk factors such as untreated hypertension, smoking and hypercholesterolaemia. They were also not able to adequately adjust for two important confounders: ethnic background and socio-economic status. It is acceptable that in present times, with better prevention strategies for management and treatment of risk factors and in patients with a higher socio-economic status, height may in fact be a significant predictor of coronary artery disease. In fact, in 1992, Allebeck and Bergh concluded that there was an inverse relationship between body height and mortality and that the association could be explained almost entirely by social and behavioural characteristics (Allebeck and Bergh, 1992).

The controversy surrounding the inverse relationship between height and mortality from cardiovascular disease has not been resolved. However, from the results of this study it can be concluded that should taller people have CABG surgery, they are more likely than shorter people, to have an improved quality of life one year post-operatively.

Patients who had an improved quality of life one year after CABG surgery spent significantly more hours involved in sport at school ($p=0.04$) and also carried on with their sporting activities for a longer period of time. They had stopped for significantly fewer years before their CABG surgery ($p=0.003$), than those who did not have an improved quality of life. It could be argued that younger patients would have stopped sporting activities fewer years before surgery, but as age was not a significant factor influencing improved quality of life, it could not have influenced the results. This observation probably ties in well with the fact that these patients were also taller and tended to weigh more. It has been documented that physical fitness seems to have a protective effect against the development of coronary artery disease (Ekelund et al, 1988; Chandrashekar and Anand, 1991; Labbate et al, 1995; NIH Consensus Conference, 1996).

Many factors are associated with adopting and maintaining a physically active lifestyle. These factors are: socio-economic status, cultural influences, age and health status (NIH Consensus Conference, 1996). Men are more active than women, girls become less active than boys as they grow older, and as children grow through adolescence they become even less active. Eighty five percent (85%) of the patients in the current study participated in some form of sport at school. This rate dropped to 68% after school and patients stopped participation in sport, on average 24.5 years after having left school. The figures quoted for the American population is that 70% of children at the age of 12 years are physically active, 50% of high school students and at the age of 21 only 42% of men and 30% of women are physically active (NIH Consensus Conference, 1996). As American adults age, their physical activity continues to decline. The South African sample seems to be more physically active but the sample was small and limited mainly to white males. What remains interesting, is that patients who participated in sport at school for approximately 10-11 hours per week, had a significantly improved quality of life compared to patients who spent fewer hours involved in sport at school.

CHARACTERISTICS OF PATIENTS WITH IMPROVED QUALITY OF LIFE SIX MONTHS AFTER CABG SURGERY (TABLE 6.2)

When analysing the data taken at six months significant differences between the group with improved quality of life and those whose quality of life had not improved, emerged. The group with improved quality of life were significantly different in that they had:

- returned to work ($p=0.02$)
- activity levels greater than pre-operative activity levels ($p<0.01$)
- knowledge of how much exercise to do ($p<0.01$)
- sexual performance better than before the operation ($p=0.01$)

All four of these factors represent improved functional capacity. The patients with an improved quality of life had already returned to work (p=0.02). From the results of my study it was apparent that if a patient was going to return to work they returned to wo... as soon as they had recovered from the operation. These findings are in agreement with those of Almeida et al (1983) in that periods of unemployment for longer than six months are described as likely to result in unemployment (Almeida et al, 1983).

Increased activity levels (increased functional capacity) was one of the criteria for selection to the group with an improved quality of life and it follows that the group without an improved quality of life would not be as physically active.

From the above assessment patients that had an improved quality of life as established at twelve months, were already physically more active at six months than the group with no improvement in the quality of their lives. There were no other significant differences between the group with improved quality of life and the group whose quality of life did not improve.

CHARACTERISTICS OF PATIENTS WITH IMPROVED QUALITY OF LIFE TWELVE MONTHS AFTER CABG SURGERY (TABLE 6.3)

The group with improved quality of life were significantly different from the group who did not have improved quality of life in that they had:

1. Returned to work (p=0.001)
2. No angina (p=0.004)
3. Activity levels greater than pre-operative activity levels (p<0.001)

These three parameters were used to identify patients with improved quality of life.

In addition patients with improved quality of life had:

- no breathlessness (p=0.01)
- knowledge that smoking had an effect on the CVS (p<0.01)
- sexual performance better than before (p<0.01)
- spouses who considered them cured by the operation (p=0.01)
- spouses who considered their activity levels greater than pre-operatively (p=0.01)
- spouses with knowledge of the diet they should follow (p=0.04)

Patients with no improvement in their quality of life were significantly different in that they:

- were depressed (p=0.01)
- had persistent medical symptoms (p=0.02)

Return to work, no angina and increased activity (Improved quality of life)

All seventeen patients with improved quality had returned to work. Breathlessness is a symptom that is most strongly associated with a patient's ability to work and one year post-operatively a significantly higher proportion of non-workers (p=0.001) experience breathlessness (Caine et al, 1991). In this study the absence of breathlessness was also significantly associated with improved quality of life where one of the factors in determining improved quality of life was return to work.

Patients with improved quality of life evaluated their activity levels greater than before the operation (p<0.01). Spouses also evaluated patients' activity levels greater than before the operation in the improved quality of life group (p=0.012), confirms the patient's evaluation and supports the validity of the method used to identify improved quality of life.

Breathlessness

In a study by Caine et al (1991) 63% of the patients complained of breathlessness before the operation which is exactly the same percentage as recorded for this study (see appendix I, page 274). Twelve months after the operation 38% of subjects reported breathlessness compared to 33% in the study by Caine et al. In the CASS study (1983) breathlessness was regarded as a symptom of heart failure along with orthopnoea and ankle oedema. In this study patients were only questioned on their breathlessness and not on the other two issues. A decision was therefore made not to consider the absence of breathlessness as an ameliorated cardiac related symptom and thus not one of the markers to determine improved quality of life. The significant absence of breathlessness in the group of patients with improved quality of life ($p=0.01$) indicated that the method used to determine improved quality of life was sensitive and provided external validity for this study.

According to Caine et al (1991) breathlessness was the symptom most strongly associated with a patient's ability to work and one year post-operatively a significantly higher proportion of the non-workers ($p<0.01$) experienced breathlessness. In this study the absence of breathlessness was also significantly associated with improved quality of life where one of the factors in determining improved quality of life was return to work.

The effect of smoking on the cardiovascular system

The knowledge that smoking had an effect on the cardiovascular system was a significant factor in patients with an improved quality of life. Few patients in the current sample were aware of the effects of smoking and, at six months 54% percent and, at 12 months only 59% of the sample realised that smoking affected the cardiovascular system (appendix 1,pp 295 and 307). This knowledge was not tested on admission but one would have expected the patients to have assimilated this knowledge after the CABG surgery.

Sexual performance

At twelve months the sexual function of the group with an improved quality of life was better than before and thus this factor remained significantly different from the group with no improvement in quality of life ($p<0.01$). This could possibly be tied up with the reported depression of patients with no improvement in the quality of their lives. Improved sexual performance could be expected from patients who have returned to work, have no angina and are more active than before the operation.

Response of spouses with regard to

- operation being a cure
- activity levels post-operatively greater than pre-operative levels
- knowledge of the diet the patient should be following

This study represents mainly the subjective evaluation of the patient and his spouse or care-giver of the outcome of CABG surgery. The assessment of the patient's health as well as the effectiveness of the clinical intervention depends as much on the patient's perception as the clinician's view (Oldridge et al, 1995). The spouse's view is equally important as it reflects the impact of the disease and the intervention on the family and it substantiates in many instances the perceptions of the patient. This is not always the case and often the spouse will express a different opinion to that of the patient. In this study these contradictions were especially obvious in the assessment of depression and the report on whether or not the patient was still smoking.

Spouses of the patients with improved quality of life considered the operation a cure and had knowledge of the diet the patient had to follow. This was significantly different from the spouses in the group of patients whose quality of life had not improved ($p=0.01$; $p=0.04$). The group with improved quality of life were all males and married. Australian men who are married have a lower risk of coronary heart disease (Malcolm and Dobson, 1989). Marital status

and indices of social support are associated with mortality due to coronary heart disease and stroke (Gliksman et al, 1995). It has been reported that married patients have more emotional support than their unmarried counterparts (Coyne and DeLongis, 1986). Higher emotional support has been significantly linked to a better perception of quality of life, lower depression and compliance with prescribed behaviours (Kulik and Mahler, 1993) These findings support the findings in this sample of CABG surgery patients. A spouse is probably in a good position to encourage compliance with the recommended health behaviours, especially if they are optimistic about the outcome of the operation (consider the operation a cure) and they are knowledgeable about what the health behaviours should be (knows the diet the patient should follow).

The fact that spouses of patients with improved quality of life knew what diet they should follow, believed that they were cured regarded them more active than before the operation, indicates their concern and involvement with the long term treatment of the patient. Patients with improved quality of life had the support of an involved marriage partner.

Patients with no improved quality of life were significantly different from the group with improved quality of life in that they were:

- depressed (p=0.01)
- symptomatic post-operatively (p=0.02)

Depression

On day 4 to 6 post-operatively, 62% of this study reported that they were depressed, at six months 54% were depressed and at 12 months 50% were depressed (appendix 1, pages 296 and 309). Similar findings on the incidence of depression at twelve months (47%) were reported by McKhann et al (1997) but the incidence of depression reported by them prior to surgery was low (27%). This pre-operative value cannot be compared to the value of the patients in this study on day 4 to 6 post-operatively because a higher

level of depression is expected in the first few days after the operation. The spouses in this sample reported that the patients were depressed in 57% of cases at six months and 65% at 12 months. Spouses considered patients a lot more depressed at twelve months than patients reported themselves to be.

None of the patients with no improvement in quality of life attended a cardiac rehabilitation centre. The seven patients who attended a cardiac rehabilitation programme all had an improved quality of life. Shephard et al (1985) reported highly significant decreases in depression after one year of cardiac rehabilitation. Oldridge et al (1995) however felt that an improvement at 12 months was due to the natural process of recovery.

A cardiac rehabilitation programme would cater for an individual exercise prescription for participants. Reduction in depression has been noted with increased physical activity (Prosser et al, 1981). Exercise training and increased activity have been associated with improved psychological functioning and reduced cardiovascular reactivity to psychological stressors (Blumenthal and Emery, 1988). Improved physical fitness leads to improved self-confidence, self-image and emotional stability (Giese and Schomer, 1986). It certainly seems that patients in this study with no improved quality of life would have benefited greatly as far as depression was concerned should they have attended a cardiac rehabilitation programme.

The greater incidence of depression in the group of patients with no improved quality of life may also be due to the fact that some patients still had cardiac related symptoms and may have been on medication. It has been suggested that medication especially beta-blockers may cause depression as a side effect (Lindal E. 1990). Depression is associated with an increased risk of cardiac mortality after myocardial infarction (Frasure-Smith et al, 1995). The high rate of post-operative depression in this study is of concern. The presence of depression is a strong indicator that patients should be referred to a rehabilitation programme

The depression experienced by patients whose quality of life had not improved may have been related to spouses' state of anxiety because they may not have believe that the operation was a cure as did the spouses of patients with improved quality of life (Langeluddecke et al, 1989). When the husband or wife undergoes CABG surgery the spouse experiences considerable stress (Artininan and Duggan, 1993). The spouse takes over the patient's usual responsibilities and in so doing reduces the patient's stress (Coyne and DeLonghis, 1986) but increases her own. There is every indication that the spouse should be as well supported as the patient after CABG surgery and this would augment the number of patients with a successful outcome and lessen the incidence of depression post-operatively.

Other symptoms

The patients with improved quality of life also had a significant absence of post-operative symptoms (p= 0.02). The post-operative symptoms most frequently reported for this sample were: painful sternum (11%); swollen ankles and problems with leg wounds (16%); sleeplessness (7%). The patients in the study by Caine et al (1991) also reported pain in chest and leg as post-operative problems. A differentiation between angina and "chest pain" due to the surgical intervention was made in this study.

DISCUSSION OF THE RESULTS OF THE STEPWISE LOGISTIC REGRESSION

Logistic regression enters independent (predictor) variables in a stepwise manner and will also fit specified models and in this way can estimate the probability that the patient will have the symptom. In this case it was improved quality of life. The independent variables fitted in the specified model were:

- Better quality of sex-life
- Acceptance of self-responsibility

- Height of the patient
- Number of years the patient had stopped sporting activities

When estimating the probability that a patient would have an improved quality of life it was found that if patients were responsible, then whether their sex-life had improved or not, it did not affect the outcome and they would have an improved quality of life. The number of years that they had stopped with sporting activities before the operation affected the outcome adversely (no improved quality of life) only if the period was greater than the average for the group (24 years).

Their height (which they can do nothing about in any case) could influence the outcome and if they were really short (127 cms) they would not have an improved quality of life. However, **if patients were not responsible**, regardless of the independent variables fitted, **they would not have an improved quality of life.**

The important outcome of this analysis is that patients who are unlikely to have an improved quality of life after the operation can be identified pre-operatively. They would be patients that are very short and had stopped their sporting activities many years before they had the operation. After the operation these patients who are not responsible for their own health don't have an improved sex-life. The concept of responsibility for health which is obviously of great importance is discussed in detail in Chapter 7.

SUMMARY

This study revealed the following patient profiles for patients with an improved quality of life: Married males with an income >R50 000, had a normal sex-life before the operation, spent a mean of 11 hours per week at sport during their school years, had stopped with sporting activities on average of 16 years before the operation, were tall (mean height: 177 cms), and one year after the operation had an absence of breathlessness one year after the operation, knew that smoking had an effect on the cardiovascular system, reported their sexual performance as better than before the operation, had no other symptoms, were not depressed and had accepted the responsibility for their continued health. The spouse knew the diet the patient had to follow, considered the operation a cure and reported the patient to be more active than before the operation.

CONCLUSION

Self-Responsibility was identified as a significant factor in improved quality of life. Of the 17 patients with an improved quality of life all were also self-responsible (χ^2=8.931, p=0.003). Statistical analysis using logistic regression established the acceptance of self-responsibility as the most important factor in improved quality of life and patients who were not self-responsible would not have a successful outcome (improved quality of life) after their CABG surgery.

In the following chapter the results for self-responsibility and a discussion of these results will be presented.

CHAPTER VII

SELF - RESPONSIBILITY

This chapter deals with the concept of self-responsibility and a definition and brief summary of the acceptance of self-responsibility is given. The value of the acceptance of self-responsibility as a determinant of the successful outcome of an intervention is examined. The successful outcome of an intervention in patients with chronic disease, in this instance CABG surgery for CAD, is measured in terms of improved quality of life (see Chapter 6). The question is whether the acceptance of self-responsibility is a factor in the improved quality of life of these patients. The method to determine self-responsibility is outlined and is followed by a presentation of the results obtained from the research and a discussion of these results.

INTRODUCTION

From the review of the literature it is clear that the concept of self-responsibility for health has not been identified as an important factor in the rehabilitation of patients with chronic diseases. Some authors have however, suggested that it may be a valuable component of successful outcome in rehabilitation of chronic disease (Knowles, 1977; Fries, 1980; Oldridge, 1986; Rabbit, 1992). Concepts such as self-efficacy and self-care have been identified and researched. The concept of self-responsibility for health encompasses self-care and self-efficacy but extends beyond these concepts. "Responsibility" is defined as being morally accountable for actions. Therefore self-responsibility means that the individual can be held morally accountable for his or her actions regarding the self. This can be in a physical sense, a psychological (attitudinal) sense or an educational sense (The Concise Oxford Dictionary, 1992).

Self-responsibility can be defined as the moral duty of the patient to successfully execute the required health behaviour for improved health.

Persons with chronic disease are often more reliant on family members than on health professionals for care (Walston and Walston, 1982). In order to successfully become responsible the patient and the family members should be considered members of the medical team and be provided with information about the disease, the treatment of the disease and the rehabilitation process. The spouse's judgement of the patient's compliance to risk factor modification was considered to be of great importance in this project and was therefore included in this study. In addition the spouse's knowledge of the chronic nature of the disease and risk factors was also assessed.

The aim of this study was to establish if self-responsibility was an important factor in improved quality of life of patients after coronary artery bypass surgery. These patients were suffering from a chronic disease (CAD) and would have had an expensive intervention. The intervention was not necessarily life saving but would improve the functional capacity of patients and lead to amelioration of cardiac related symptoms.

SUMMARY OF METHODS (DISCUSSED IN DETAIL IN CHAPTER 4)

Patients were interviewed on entry into the study on days 4 to 6 after the operation. Patients and their spouses were interviewed telephonically six months and 12 months post-operatively.

Self-responsibility was assessed at 12 months after CABG surgery and the profiles of patients who were considered self-responsible at 12 months were established from the data collected on days 4 to 6 after the operation, at six months and 12 months post-operatively.

Patients were judged to be self-responsible if they met the criteria determined in pilot study 5 (page 96). These criteria were:

- Knowledge that the operation was not a complete cure (The patient and the spouse).
- Compliance to risk factor management (patient's report).
- Spouse's perception of the patient's acceptance of responsibility for risk factor modification.
- Presence of stress occasionally or not at all (the patient's response).

The patients' knowledge scores were also determined as described in the Chapter 3 (page,104) and Chapter 4 (page,122). Patients' knowledge scores totalled 35 and spouses' knowledge scores totalled 20.

The following was also determined

The extent to which:

- the socio-economic status of the patient influenced the patient's ability to accept responsibility for his own rehabilitation.
- the medical status of the patient had an influence on the patient's ability to become self-responsible
- the patient's attitude towards his disease influenced his acceptance of self- responsibility.
- the patient's knowledge of the chronic nature of his disease and modification of risk factors influenced the acceptance of self-responsibility.

RESULTS: IDENTIFYING PATIENTS WHO HAD ACCEPTED SELF-RESPONSIBILITY

Of the original 73 patients, 58 remained in the trial 12 months after the operation. These 58 patients were assessed for acceptance of self-responsibility and assigned to one of two groups. Patients in Group 1 had accepted self-responsibility and those in Group 2 had not accepted responsibility for their own health. In all 58 patients, the data to determine acceptance of self-responsibility, was complete.

Of the 41 patients who had accepted self-responsibility for their own health one year after the operation, 35 patients were males and 6 were females. Seventeen patients (13 males and four females) were shown to be not responsible for their health.

The acceptance of self-responsibility as a significant factor in the group of patients with improved quality of life, was examined.

The variables at days 4 to 6 post-operatively, at six months and at 12 months were then tested for statistically significant differences between the two groups. This was followed by a stepwise logistic regression to determine the predictive factors for acceptance of self-responsibility.

In Table 7.1 the incidence of self-responsible patients was determined in two groups of patients, those who had an improved quality of life and those whose quality of life had not improved, one year after the CABG. The Chi-square test was used for the statistical analysis and a p-value of 0.05 or less was regarded as statistically significant.

TABLE 7.1 (Repeat of table 6.7, page 171)

SELF-RESPONSIBILITY IN IMPROVED QUALITY OF LIFE ONE YEAR AFTER CABG SURGERY

Frequency	Self-responsible	Not self-responsible	Total
Improved quality of life	17	0	17
No improved quality of life	24	15	39
Total	41	15	56

$\chi^2 = 8.93$; $p = 0.003$.

Not one patient who did not accept responsibility for his health had an improved quality of life. However, patients who were self-responsible did not necessarily have an improved quality of life.

In Table 7.2 the variables, on admission, that were significantly different between the group who was responsible for their health (Group 1) and the group who was not responsible for their health (Group 2), are presented. A p-value of 0.05 or less is regarded as statistically significant. On statistical analysis only categorical data were significant. For the categorical data the degrees of freedom (df), Chi-square value (χ^2) and the p-value are given.

TABLE 7.2

ON ADMISSION

	Chi-square		
Group 1 (accepted self-responsibility, n=41) (categorical data)	df	χ^2-value	p-value
Married	1	7.74	0.005
Education > grade 12	1	6.37	0.01
Diabetes Mellitus	1	4.42	0.04
Income > R50 000,00	1	3.86	0.05

The significant differences between the patients in the two groups were that patients who had accepted self-responsibility were on admission into this study, married, educated beyond grade 12 and had incomes greater than R50 000 p.a. All 11 diabetic patients were in the self-responsible group. These patients had a history of chronic disease which was under control and the fact that they were all identified in the group who was responsible supports the method used to identify self-responsibility.

In Table 7.3 statistically significant differences between Group 1 and Group 2 is shown as they were identified six months after CABG surgery. The table is shown in three sections. In the first section the significant variables for patients accepting self-responsibility are given, followed by the significant variables as judged by the spouses of Group 1. The third section contains the significant variables for patients who did not accept responsibility for health (Group 2).

TABLE 7.3

SIX MONTHS AFTER CABG SURGERY

	Chi-square		
Group 1 (accepted self-responsibility) (categorical data)	df	χ^2-value	p-value
Knew to comply to stay well	1	6.90	<0.01
Knew to comply for ever	1	7.50	<0.01
Activity levels > pre-operative level	1	8.08	<0.01
Not depressed	1	4.08	0.04

Group 1 (spouses' judgement)				
Responsible for:	- following the correct diet	1	9.06	<0.01
	- not smoking	1	5.28	0.02
	- taking their medication	1	5.33	0.02
Not depressed		1	4.46	0.04

TABLE 7.3 (CONT.)

SIX MONTHS AFTER CABG SURGERY

Group 2 (not responsible n=17)	df	χ^2-value	p-value
No knowledge of exercise intensity	1	4.07	0.04
Presence of medical symptoms	1	4.80	0.03

Group 1 (accepted self-responsibility) n=41
Group 2 (not responsible) n=17

Six months after the operation the self-responsible patients were not depressed, were active and knew that they had to change their lifestyle permanently in order to stay wel . Their spouses also regarded them not depressed and responsible for following the correct diet, not smoking and taking their medication. Patients who were not responsible for their health one year after CABG surgery, already at six months after the operation, had no knowledge of the intensity of the exercise they should be doing and had medical symptoms such as painful sternums and legs.

Table 7.4 shows the significant differences between the self-responsible group and the group who did not accept responsibility one year after the CABG surgery. The table is presented in two sections. Firstly the significant variables are given for patients who had accepted self-responsibility (Group 1) and in the second section the significant variables for these patients, as judged by the spouse.

TABLE 7.4

TWELVE MONTHS AFTER CABG SURGERY

	Chi-square		
Group 1(accepted self-responsibility) (categorical data)	df	χ^2-value	p-value
Satisfied with outcome of operation	1	4.53	<0.01
Depressed	1	4.46	0.04
Knew effect of smoking on the CVS	1	5.55	0.02
Their spouses judged these patients to be:			
Cured by the operation	1	6.11	0.01
More active than before the operation	1	7.86	<0.01

Spouses of the patients who accepted self-responsibility thought they were cured by the operation. Self-responsible patients were satisfied with the outcome of the operation but had now become depressed.

In Table 7.5 the mean knowledge scores of patients and spouses in both groups, as established at six months after the CABG surgery, are presented. The Mann-Whitney U test was used to analyse these results which compare two different unmatched groups. This test can only be used with ordinal or interval/ratio data. A p-value of 0.05 or less is regarded as significant.

TABLE 7.5

KNOWLEDGE SCORES SIX MONTHS AFTER CABG SURGERY

Patients	Mean Score (Total = 35)	p-value associated with the Mann-Whitney U test
Group 1 (self-responsible)	20	0.03
Group 2 (not responsible)	16	

Spouses of:	Mean Score (Total = 20)	
Group 1 (self-responsible)	10	0.02
Group 2 (not responsibl)	7	

The patients in the group who had accepted self-responsibility had a significantly higher knowledge score than the patients in the group who were not responsible [(20/35 (57%) compared to 16/35 (46%)]. The spouses of the patients who had accepted self-responsibility had a lower percentage score than the patients i.e. 10/20 (50%). The spouses of the patients who were not responsible had the lowest knowledge score i.e. 7/20 (35%).

In Table 7.6 the mean knowledge scores of patients and spouses, one year after CABG surgery, for both groups are tabulated. The Mann-Whitney U test was used to determine statistically significant differences between the two groups.

TABLE 7.6

KNOWLEDGE SORES TWELVE MONTHS AFTER CABG SURGERY

Patients	Mean Score (Total = 35)	Mann Whitney U test (p-value)
Group 1 (self-responsible)	17.8 (51%)	0.02
Group 2 (not responsible)	14.5 (41%)	

Spouse of:	Mean Score (Total = 20)	
Group 1(self-responsible)	10.9 (55%)	0.003
Group 2 (not responsible)	6.4 (32%)	

The self-responsible group were significantly more knowledgeable than the group who did not accept responsibility for their own health. Over a period of six months (6 to 12 months after the operation) spouses of patients who had become self-responsible were the only group who had improved their knowledge scores. All other groups had less knowledge at 12 months than at six months. Spouses of patients who were not responsible for their health had the lowest knowledge scores (32%).

In Table 7.7 the medical and surgical information as obtained from the cardio-thoracic surgeons' files, is presented. The mean values are given.

TABLE 7.7

MEDICAL INFORMATION

			ANOVA	
	Group 1	Group 2	F-value	p-value
Pre-operative ventricular ejection fraction (%)	47	55	1.34	0.26
No of vessels bypassed	2.9	2.7	0.33	0.57
Bypass time (mins)	110	114	0.04	0.84
Aortic cross clamp time (mins)	58	56	0.07	0.80

There are no statistically significant differences between the two groups. The patients who had accepted self-responsibility had a lower ventricular ejection fraction on admission, a marginally shorter bypass time but a slightly longer aortic cross clamp time.

The severity of the disease, as assessed by the above factors, did not influence the acceptance of self-responsibility.

In Tables 7.8 and 7.9 the number of hospital admissions after CABG surgery as well the number of visits to medical doctors in connection with patients' cardiac conditions are reflected at six months and 12 months respectively.

TABLE 7.8

SIX MONTHS AFTER CABG SURGERY

			ANOVA	
	Group 1	Group 2	F-value	p-value
No of consultations (mean)	1.9	2.5	2.59	0.11
No of hospital admissions (mean)	0.2	0.8	10.04	0.003

Patients in Group 2 (not responsible) had by six months after CABG surgery, significantly more hospital admissions than those who were responsible.

TABLE 7.9

TWELVE MONTHS AFTER CABG SURGERY

	Group 1	Group 2	ANOVA	
	SR	NR	F-value	p-value
No. of consultations (mean)	4.4	4.2	0.005	0.94
No. of hospital admissions (mean)	0.9	0.5	0.82	0.37

SR (self-responsible), NR (not responsible)

There were no statistically significant differences in the number of medical consultations between the two groups but the self-responsible group now had slightly more hospital admissions than the group that were not responsible. This was not significant.

RESULTS OF STEPWISE LOGISTIC REGRESSION FOR SELF-RESPONSIBILITY

Stepwise logistic regression was used to estimate the probability that an individual would be self-responsible if a number of characteristics (variables) were considered.

Of the 58 patients who remained in the sample one year after the operation 41 were in Group 1 (responsible) and 17 were in Group 2 (not responsible). For the stepwise logistic regression analysis only those cases (56) with no missing variables were used. Of these 56 cases, 41 were self-responsible and 15 were not self-responsible.

THE IDENTIFIED PREDICTOR VARIABLES WERE THE FOLLOWING

- High knowledge score of the spouse
- Patient satisfied with the outcome of the operation.
- Education > grade 12
- Patient depressed at 12 months
- Patients were diabetics
- Patients were married
- Income > R50 000

Goodness of fit χ^2 =36.76; p= 0.92

Logistic regression will also fit specified models. A decision was taken to fit a specified model with the characteristics most frequently found in the South African population who are dealt with after CABG surgery and that could possibly be altered. The predictor variables fitted in the model were:

- Patient satisfied with the outcome of the operation (categorical yes, no)
- Knowledge score of spouse (continuous.....?/20)
- Education > Grade 12 (categorical yes, no)

The dependant variable was Acceptance of Self-responsibility

The outcome was yes or no (binary)

yes = 0

no = 1

Goodness of fit $\chi^2 = 25.16 : p = 0.69$

	coefficient
1. Patient satisfied with the outcome of the operation (x_1):	-1.6
2. Education >Grade 12 (x_2):	-2.0
3. Spouse's knowledge (x_3):	+ 0.21
4. Constant (b_0):	+1.013

EXAMPLES OF THE CALCULATIONS OF THE PROBABILITY THAT A PATIENT WILL BE SELF-RESPONSIBLE

Example 1

Calculating the probability of self-responsibility where the patient **is satisfied** with the outcome of the surgery and the value being changed is the level of education.

In a hypothetical case where the spouse has a knowledge score of 10, where the patient is satisfied with the outcome of the operation and has an education greater than grade 12 then the probability of a successful outcome will be calculated as follows:

$y = b_0 + b_1 x_1 + b_2 x_2 + \ldots + b_n x_n$

$= 1.013 + 2.1$

$= 3.11$

$p = e^{3.11}/1 + e^{3.11}$

$= 22.42/23.42$

$= 0.957$

At a point where the sensitivity is 92.68% and the specificity is 60% the cutpoint is 0.408 (see chapter 4, page 125). The case is predicted to be in the group self-responsible if the probability is greater than cutpoint. As the p-value in this case is 0.96 which is greater than 0.408, the patient would be regarded as self-responsible.

In the next calculation, if the knowledge score of the spouse remains 10, the patient is satisfied with the outcome but the educational level of the patient is less than grade 12, then the probability score would be 0.75. This is still greater than cutpoint (0.408) and the patient would be regarded as self-responsible. Thus the educational level alone does not affect the acceptance of self-responsibility

Example 2

Calculating the probability of responsibility where the patient is **not satisfied** and the value being manipulated is the educational level.

In the case where the patient is not satisfied, has an education ≥ grade 12 and the spouse has a knowledge score of 10, the probability score = 0.82 and the patient will be regarded as responsible.

In a case where the patient is not satisfied, has an education < grade 12 and the spouse has a knowledge score of 10, the probability of acceptance of self-responsibility would be 0.381. This is less than the cutpoint and the patient would be regarded as not responsible.

Only the patient who is not satisfied and not educated will not be responsible. Satisfaction with the outcome is thus very important in patients who have an education less than grade 12.

Example 3

Calculating the probability of responsibility where the patient is satisfied and the value being manipulated is the **knowledge score** of the spouse

If the knowledge score of the spouse changes to less than 10:

a) Knowledge score: 5

$y = b_0 + b_1 x_1 + b_2 x_2 + \ldots\ldots + b_n x_n$

$= 1.013 + 1.05$

$= 2.063$

$p = e^y / 1 + e^y$

$= 0.887$

The patient will be responsible.

b) Knowledge score: 1

$p = 0.77$

The patient will be responsible. A poor knowledge score of the spouse does not affect the outcome negatively

The satisfaction of the patient with the result of the operation together with the level of education (>grade12) is important when considering self-responsibility. The knowledge of the spouse regarding the risk factors does not affect the acceptance of self-responsibility.

DISCUSSION OF THE ACCEPTANCE OF SELF-RESPONSIBILITY

The most significant finding of this study was that self-responsibility was identified as a significant factor in patients who had an improved quality of life ($p<0.01$). Of the 58 patients and their spouses that were followed up 12 months after their CABG surgery, 41 patients were considered to have accepted responsibility for their rehabilitation. This number of patients who were responsible was greater than expected considering that only 17 patients had an improved quality of life. However, all the patients who were self-responsible did not have an improved quality of life. Assuming the responsibility for your health does not guarantee a successful outcome.

Of the patients who were self-responsible one year after the CABG surgery 85% (35) were males and only 15% (4) were females. The sample of patients who were not responsible for their health consisted out of 69% (13) males and 31% (6) females. It was unexpected that females would be less responsible for themselves especially when it came to modification of risk factors and looking after their own health. Of the patients in the self-responsible group (4 females only), 34 were married, two were single, three were divorced and two were widowed. It is clear that the males who had the support of a marriage partner were self-responsible.

Stepwise logistic regression established the probability that patients who were self-responsible would be: satisfied with the outcome of the operation, married with a spouse that is knowledgeable about the chronic nature of the disease and the modification of risk factors, educational level > grade 12, annual income >R50,000, diabetic and depressed one year after the operation (Goodness of fit χ^2 =36.76; p= 0.92). Logistic regression was also used to fit a specified model and the characteristics to be considered were: patient satisfaction with the outcome of the operation: knowledgeable spouse,

educational levels greater than grade 12 (Goodness of fit $\chi^2 = 25.16$: $p = 0.69$).

It was established from the logistic regression that the most important characteristics of patients who did not accept self-responsibility was a lack of education and dissatisfaction with the outcome of the CABG surgery. A poor knowledge score of the spouse (less than average) did not affect the outcome negatively.

When considering self-responsibility in patients who have educational levels < grade 12, their satisfaction with the outcome of the operation will determine whether they will accept responsibility for their own health. It is therefore important, especially in patients who have an educational level less than grade 12, that they are informed and guided to have a realistic appraisal of the outcome of the surgery. This may enhance their satisfaction with the outcome and in this way the acceptance of self-responsibility will be promoted. The best possible way to achieve this objective would be through encouraging their attendance at a cardiac rehabilitation programme.

This finding, that the outcome will not be successful unless a patient accepts self-responsibility, has enormous implications for the rehabilitation of patients after CABG surgery. A discussion on the implications of this finding will be presented after the description of the significant variables of self-responsible patients on admission into the trial, six months and 12 months later. This order will allow for a more logical presentation of the profile of self-responsible patients and thus the interventions required to achieve self-responsibility in order to promote a successful outcome.

ON ADMISSION INTO THE TRIAL (TABLE 7.2)

The significant variables for the self-responsible group on entry into the trial were:

- Married (p = 0.005)
- Educated > grade 12 (p = 0.01)
- Suffered from Diabetes Mellitus (p = 0.04)
- Income > R50,000

Patients who were self-responsible one year after the operation were married, had an education greater then grade 12, had an income greater than R50,000 per annum and suffered from diabetes mellitus

Coronary heart disease is the most common underlying cause of death in adults suffering from diabetes (Kleinmann et al, 1988). A multifactorial risk intervention programme is part of the treatment of diabetes. These programmes include increasing physical fitness, reducing obesity, smoking cessation and alterations in the diet (Goldberg, 1992).

All 11 diabetic patients in this study were included in the self-responsible group. On average the diabetic patients in this study had had diabetes for a period of 9.6 years and the fact that they were well enough to be operated on indicated that their diabetes was under control.

Diabetic patients would have learnt to cope with a chronic disease and to comply with a programme of risk factor management. It is therefore not surprising that these patients were in the self-responsible group. This observation also supports the method used to measure self-responsibility in this study and confers external validity to the study.

A significant number of patients who accepted the responsibility for their health outcome were married. The importance of social support and

cohesiveness has been reported in the literature and it has been suggested that it may be an important factor in the prevention of coronary heart disease (Bruhn, 1965). In a study by Berkman and Syme (1979) data was assessed to determine the influence of social connections, including marriage, on mortality. They found that patients who scored low on the social network index were twice as likely to die within the next nine years.

Similar results have been found by other researchers (House et al, 1988). Seventy five percent (n=55) of the patients in the study by House et al (1988) were married, 11% (n=8) were divorced and 10% (n=10) were widowed. In this study the patients who were responsible for themselves after bypass surgery, were those who had the support of a marriage partner (83% were married).

As most of the patients in the study were men (10 females only) and the patients who were self-responsible were married it meant that they were supported by their wives. It remains a paradox that when women suffer from coronary heart disease they are not responsible for themselves.

Socio-economic factors are also associated with health. In a study by Leren et al (1983) risk factors for coronary heart disease were higher among the lower socio-economic classes. It has been reported that adherence to instructions is especially poor among low-income groups and non-compliance has been reported to be as high as or even higher than 60% (Becker and Maman, 1975). In this study patients who had an improved quality of life and were thus self-responsible were in a higher socio-economic class, confirming the results of Becker and Maman.

Cardiac rehabilitation programmes should be targeting the patients who are not responsible. A lower socio-economic status seems to be associated with patients who are not responsible so that rehabilitation facilities and programmes should be designed around the needs of these patients. These

patients have to work and earn an income so programmes should be conducted at appropriate times so that patients can attend. The facilities should be located in the areas where the majority of patients live so that they would have easy and inexpensive access to them.

SIX MONTHS AFTER CABG SURGERY (TABLE 7.3)

The significant variables for self-responsible patients, six months after the operation were the following:

- Patients knew that they had to comply with the medical management and the modification of risk factors ($p<0.01$)
- Patients realised that they would have to do this for ever i.e. that they would have to change their lifestyle permanently ($p<0.01$)
- Their activity levels were greater than pre-operatively ($p<0.01$)
- They were not depressed ($p = 0.04$)

According to the spouses there were also significant differences at six months .The group who were self-responsible were:

- taking their medication ($p=0.02$)
- not smoking ($p=0.02$)
- following the correct diet ($p=<0.01$)
- Not depressed ($p=0.04$)

Patients who were not responsible for their health had:

- no knowledge of how much exercise they should be doing ($p = 0.04$)
- persistent medical symptoms ($p = 0.03$)

At six months the group who had accepted responsibility for their own rehabilitation was significantly different in the following aspects from the group who had not accepted self-responsibility: they knew that they had to change their lifestyle permanently, they were more active than pre-operatively, and were also not depressed. Their spouses (self-responsible group) were satisfied with the outcome of the surgery and confirmed that they were taking their medication, not smoking, following the correct diet and that they were not depressed. Patients who were not responsible for their health had no knowledge of how much exercise they should be doing and reported persistent medical symptoms.

Six months after CABG surgery, patients who were judged to be self-responsible knew that they had to comply with health recommendations in order to stay well and that they would have to continue complying indefinitely. According to their spouses they were actually following the prescribed diet, were not smoking and were taking their medication. They were also not depressed. Moser and Dracup (1995) suggest that patients can control the course of their disease by choices they make regarding positive lifestyle changes. It appears that six months after the bypass those patients that had accepted self-responsibility were already starting to take control of their lives. Most outcomes flow from actions (Bandura, 1986) and an improved health outcome is as a result of the action taken by the patient. If patients follow the recommendations of health care practitioners and assume the responsibility for the actions taken, they may perceive themselves as being in control. Feelings of perceived control are important for psychosocial recovery after cardiac events (Mahler and Kulik, 1990). Perceiving greater control over one's medical care and treatment is associated with positive mood states (Affleck et al, 1987). The patients in this study were not depressed at six months and the fact that they were taking some control of their lives may well account for the fact that they were not depressed.

Patients who were not responsible had significantly less knowledge about an exercise programme (p=0.04) and had significantly more medical symptoms than the self-responsible group (p=0.03). It is possible that, because these patients still had symptoms, they were concerned about the outcome of the bypass surgery and not at all interested in any form of exercise. Mahler and Kulik (1990) stated that chronic diseases place greater responsibilities on patients. According to them patients who are not very involved in their treatment (do not accept responsibility) had more problems with ambulation one month after CABG surgery than those patients who were involved with their treatment. It may be that these patients with low behavioural involvement (not responsible) continue to experience greater ambulation dysfunction and thus have no interest in exercise. The findings of Mahler and Kulik (1990) may also explain why patients who took responsibility for their own well being (high behavioural involvement) were more active.

SELF-RESPONSIBILITY TWELVE MONTHS AFTER CABG SURGERY (TABLE 7.4)

The significant variables for self-responsible patients 12 months after CABG surgery were:

- satisfied with the outcome of the operation (p<0.01)
- depressed (p = 0.04)
- knowledge of the effect of smoking on the CVS (p = 0.02)

Their spouses considered:

- the operation as a complete cure (p=0.01)
- the patients more active than before the operation (p<0.01)

When judging self-responsibility one year after CABG surgery the group of patients who was self-responsible was significantly more satisfied with the outcome of the surgery and more depressed than the group who were not responsible for their rehabilitation. Their spouses regarded the operation as

a complete cure and felt that their partners were more active than before the operation.

Probably the most significant finding at twelve months after CABG surgery was that the patients who were self-responsible were satisfied with the outcome of the operation. The question "Are you satisfied with the outcome of the operation?" was directed to the patient and the spouse. It is meaningful to assess the outcome of an intervention in terms of the patient's perception of changes in their health state (Caine et al, 1991). In 1960, Rosenstock made the statement that beliefs held by an individual form the basis for that person's decisions regarding health care. If a patient is satisfied with the outcome of an intervention it is more likely that they will comply with recommendations for life-style change than if they were not satisfied. This again emphasises the importance of realistic expectations after an intervention.

Self-responsible patients expressed satisfaction with the outcome of the operation but it did not mean that they were totally free of symptoms. King et al (1992) found that the majority of subjects believed that having surgery was worthwhile and that it was related to a decrease in angina and a return to work. This is not totally in agreement with the findings of this study. The group of patients in this study with improved quality of life (no angina and return to work) did not differ significantly from the group who did not have an improved quality of life as far as satisfaction with the outcome of the operation was concerned. However, significantly more of the patients who were self-responsible were satisfied with the outcome of the operation than those who were not responsible ($p<0.01$). In conclusion it could be said that, if a patient is satisfied with the outcome of the operation (believes it is good) and has knowledge of risk factor management, then such a patient will use that knowledge as a basis for decisions regarding health care as suggested by Rosenstock (1990) and become self-responsible.

According to Palmore and Luikart (1972) there is a strong relationship between life satisfaction and health, activity, socio-economic status and to some extent, age. They go on to say that " the more satisfied tend to be healthier, more socially active, tend to have more income and education and tend to be younger". They conducted a research project to determine the relevant importance of the above variables. From their results it was concluded that self-rated health was the strongest variable associated with life satisfaction. Furthermore the patient's own perception of his health was more important than the physician's rating of his health. This implies that a patient with poor objective health may still have a high life satisfaction if he believes that his health is relatively good. Similarly a patient who does not believe that his health is good, will have low life satisfaction even though he may be considered from a medical point of view to be in good health (Maddox, 1964; Palmore and Luikart 1972).

Subjects who believe they can control their lives have greater satisfaction than those who believe that their lives tend to be controlled by luck or fate (Palmore and Lui' art 1972). Similar findings have been reported by Hickson et al (1988) wh eported a relationship between sense of control and life satisfaction in elderly men. Subjects who are knowledgeable about their disease and the action they should take to remain healthy are more likely to believe that they control their lives. So, education of a patient may lead to a belief that they control their lives and in this way satisfaction with the outcome can be achieved.

Having a confidante in whom one can confide and talk to increases satisfaction in men but not in women (Palmore and Luikart, 1972). As the majority of this sample were married men that were satisfied with the outcome of the surgery the findings of Palmore and Luikart (1972) certainly support the profile of a self-responsible patient as determined in this study. In this study 83% of the patients were satisfied with the outcome of the surgery and 66% believed the operation had cured them completely.

Depression has frequently been quoted as one of the persistent negative psychological outcomes of bypass surgery (Heller and Kor ..ld, 1974; Gold, 1996; McKhann et al, 1997). One year after the operation, patients who had accepted self-responsibility were significantly more ..ssed than patients who were not responsible. Patients may have been depressed because they were aware of the fact that the operation was not a complete cure and that they had a chronic disease (knowledge of the chronic nature of the disease was part of the definition to determine self-responsibility). They also realised that they would have to change their lifestyle permanently and this in itself could have caused their depression. According to Kar..an et al (1987) the stress associated with chronic health situations is thou.. to be an important factor in the events leading to depression.

Depression is often identified in patients prior to CHD and frequently accompanies recovery (Allan and Scheidt, 1996). In a meta-analysis by Booth-Kewley and Friedman (1987) it was found that depression, more than any other psychological attribute, had the strongest association with the outcome of CHD.

Some researchers have found that depressed patients comply poorly to life-style changes (Fernandez, 1993; Williams and Littman, 1996). This finding is directly the opposite to the findings of the self-responsibility study. The group of patients who were identified as responsible, were significantly more depressed than the group who were not responsible. They were also more knowledgeable than the group who were not responsible and could have been depressed because they realised that they had a chronic condition and would have to change their lifestyles. In addition it has to be considered that although patients were identified as self-responsible it did not imply that they had an improved quality of life. Those patients without an improved quality of life but responsible may still have had symptoms and impaired functional capacities and this would account for their depressio..

Although the studies discussed above refer to the effects of depression on patients with CHD there are some studies that have been done to study the effects of depression on patients after bypass surgery (Lindal, 1990; Gold, 1996). These studies also report depression after CABG surgery but it seems not to affect the outcome. Gold (1996) states that post-operative depression is a real entity following CABG surgery. Furthermore, the presence or absence of post-operative depression does not relate to passing cognitive or neuropsychological difficulties and it does not prevent patients from obtaining the same substantial improvement in overall functional status as those patients who are not depressed (Gold 1997; McKhann et al, 1997). Lindal (1990) also reported a high percentage of depressed patients (54%) after CABG surgery with no apparent effect on the functional status of the patient or the patient's ability to return to work.

Cardiac rehabilitation programmes are known to have a positive effect on depression. Since the establishment of cardiac rehabilitation programmes, patients have become physically far more active and with this increased physical activity their levels of depression have also markedly improved (Kos-Munson et al, 1988; NIH Consensus Conference, 1996).

Seventy five (75%) patients in this sample had smoked before the operation and one year after the operation eight (16.7%) of the patients were still smoking. Similar results were obtained by Miller et al (1983) with 83% of the CABG surgery smoking preoperatively and 19% postoperatively. It does seem that CABG surgery patients are more adherent to smoking restrictions than patients with myocardial infarcts (Miller et al, 1983). The reason for the compliance of the CABG surgery patients may be that they were aware of the effects of smoking on the cardiovascular system. This statement is supported by the fact that a significant number of self-responsible patients (patients with knowledge and compliance) knew that smoking had an effect on the cardiovascular system ($p=0.02$). It is also interesting to note that when asked the cause of their disease smoking was rated the highest.

Twenty nine percent (29%) of patients in the study attributed the cause of their disease to smoking.

KNOWLEDGE SCORES (TABLES 7.5; 7.6)

The knowledge scores included knowledge of the disease, the operation, risk factors and the knowledge that the disease was chronic. Patients were scored out of 35 possible marks and spouses out of 20. Knowledge of the disease (other than that the disease was chronic) and of the operation was not tested for spouses because the procedure was frequently explained in detail to the patient after hospitalisation and it was unlikely that the spouse would have had the same access to information as the patient. An evaluation of the knowledge scores at six months and 12 months after CABG surgery revealed that patients who had accepted responsibility for their rehabilitation were significantly more knowledgeable than the patients who were not responsible ($p=0.03$; $p=0.02$). Spouses of the self-responsible group were also more knowledgeable than spouses of the group who were not responsible ($p=0.02$; $p<0.01$). Although there was a significant difference between the groups, the knowledge of both groups was poor (mean knowledge score: at six months: Self-responsible 20/35; not responsible 16/35).

By improving the patient's knowledge of the disease and the risk factor management the compliance of the patient may be improved and in this way a perception that they are in control of their lives may be gained. This may enhance the satisfaction of the outcome. The knowledge that a patient has of a specific aspect of a programme also relates significantly to the patient's compliance with that aspect. It is important to note that compliance is frequently not transferable especially from the "in-hospital" set-up to life outside of the hospital. On leaving the hospital the patient may be influenced by many other factors outside the hospital setting that may influence compliance (Tirrel and Hart, 1980). In such situations the

knowledge of the spouse may serve to influence and to reinforce the patient's compliance. This underlines the importance for patients as well as spouses to attend a rehabilitation programme.

Patients were knowledgeable about the operative procedures at the time of the surgery. Surgical procedures in this study were explained in detail to the patients. It may be that as these procedures were explained immediately prior to the operation and therefore were more meaningful to patients and could be remembered. Their knowledge about their medical condition however, was poor. Sixty four percent of patients knew that there was an occlusion or narrowing of the arteries of the heart, 45% were aware that the disease had been present for some time and only 22% knew that other arteries than the arteries of the heart were involved. It could be that this information is not particularly meaningful to the layman.

Patients are generally not well informed about their illnesses while they are in hospital. This is partly due to the fact that the methods used to impart information are not effective (Gariballa et al, 1996). Poor information and lack of information may have far-reaching implications on the outcome of the management of the disease. Patients are less likely to comply to recommendations for lifestyle change if they do not understand the underlying principles for risk reduction (Gariballa et al, 1996).

It has been identified that the most important learning needs of patients at hospitalisation and follow-up are on aspects concerned with survival (Czar and Engler, 1997). Barnason and Zimmerman (1995) compared the teaching outcomes of three different methods (in-patient teaching programme; post-discharge telephone follow-up programme; post-discharge group teaching programme) and found that their was no difference between the teaching outcomes, regardless of the method used. However their results did support the effectiveness of an inpatient teaching protocol which focused on "survival" skills. If patients are mainly concerned to learn about

"survival skills" while they are in hospital, a structured programme with emphasis on lifestyle modifications for chronic disease is essential after leaving the hospital. This emphasises again the importance of attendance at a cardiac rehabilitation programme.

One year after the CABG surgery patients' knowledge scores of the patients who were self-responsible had become less and not greater (56%-52%) as had been expected. Decreased compliance, over a period of time, with behaviour changes in patients with coronary artery disease, has been demonstrated in follow-up studies (Mills et al, 1985; Miller et al, 1989). These findings support the fact that lower levels of knowledge were detected in our sample one year after surgery. Lower knowledge scores may simply be due to the fact that they had forgotten some of the information imparted to them during the period of hospitalisation. What is important is that they were not concerned enough about their condition to acquire more knowledge about it. Twelve months after the operation the knowledge of spouses of patients who were self-responsible was slightly higher than their spouses (51%-55%) and higher than it was at six months post-operatively (52% -55%). Interestingly and probably as could be expected, spouses of patients who were not responsible had the lowest knowledge scores of all (32%). Again it is obvious that patients who are not responsible as well as their spouses should attend a cardiac rehabilitation programme.

CARDIAC REHABILITATION

Only seven (12%) of the sample attended a rehabilitation programme at one year post-operatively (see appendix 1; questionnaire 5, 7). Six months after the operation, the five patients that were attending a cardiac rehabilitation programme were in the self-responsible group as well as the improved quality of life group. The seven patients attending at 12 months were also in both groups. It can be argued that it is to be expected that patients who are

responsible will attend a cardiac rehabilitation programme especially as these patients also had improved quality of life.

The percentage of patients that enrol in cardiac rehabilitation programmes is notoriously low. International figures for enrolment vary from 14%-34% (Harlan et al, 1995). They reported that there were no significant differences between the participating and non-participating groups' clinical factors (p=0.32), non-participants were more likely to be women (p=0.02),and participants were more likely to be employed and had higher education and income. When evaluated on the Duke Activity Status Index participants who had moderate impairment were less likely to participate than those with mild impairment (p = 0.001) [Harlan et al, 1995]. The results from this study were similar. The patients in our study also had a higher education (> grade 12), higher incomes (> R 50,000) and there were no female participants.

Surgeons do not necessarily follow-up patients for an extended period of time after coronary artery bypass surgery. They are nevertheless in an excellent position to introduce, and strongly recommend, risk factor management to patients and their spouses. Patients may be more susceptible to changing when there is a temporary disruption of their lifestyles rather than at a later stage when they are feeling much better and have returned to the same environmental and social circumstances that may have contributed to their atherosclerotic disease (Hiratzka, 1995).

In 1992, Ades et al reported that markers of the severity of cardiac disease such as left ventricular ejection fraction, were not predictive of participation in a rehabilitation programme but that psychological factors such as prior depression, denial of illness severity and limited education served to block access to cardiac rehabilitation. They also reported on the power of the primary physician's recommendation for cardiac rehabilitation participation (Ades et al, 1992). The reason for the poor attendance is that the patients in this sample were not referred to the rehabilitation programme by their

surgeons or physicians. Two of the patients attending the programme said they were referred by the doctor, two by physiotherapists, three by friends and one by a fellow patient. Since the completion of this study an inpatient rehabilitation service has been started at the public hospital involved in this study. There is an intensive educational programme presented to patients during the hospitalisation phase and presumably the numbers of patients from this hospital attending a cardiac rehabilitation programme will increase.

A very interesting observation made by Allan and Scheidt (1996) was that the extraordinary reductions in CHD in the United States was rather due to lifestyle changes made by the people themselves than the result of high-tech medical interventions. The problem is that many cardiologists and particularly cardio-thoracic surgeons, are not particularly interested in the day to day support of their patients that is necessary to help them maintain a healthy lifestyle to prevent and reduce the risk of cardiac events. Perhaps it is true that in an action-oriented society, the modest effects of flamboyant interventions provided in the surgical theatre or coronary care unit, command more attention than the effectiveness of modest interventions such as patient and family education following hospitalisation (Mumford et al, 1982).

MEDICAL AND SURGICAL FACTORS (TABLES 7.7; 7.8; 7.9)

The severity of the disease, when measured in terms of pre-operative left ventricular ejection fraction and intra-operative measures such as the number of vessels bypassed, bypass time and aortic cross clamp time, was not significantly different between the two groups. In 1995, Louagie and co-workers found that the aortic cross-clamp time was the main determining factor of post-operative hospital outcome. The longer the cross-clamp time the greater the likelihood of a major adverse outcome and they suggested

that there was a need for improved myocardial protection techniques (Louagie et al, 1995).

The numbers of consultations with a doctor and the number of hospital admissions were also not significant factors for the acceptance of self-responsibility.

THE OBJECTIVES OF THIS STUDY INCLUDED THE ANSWERS TO THE FOLLOWING QUESTIONS

1)To what extent the socio-economic status of the patient influenced the patient's ability to accept the responsibility for his own rehabilitation?

Married patients with an income > R50,000 and an educational level >Grade 12, would accept self-responsibility.

2) To what extent the medical status of the patient had an influence on the patient's ability to become self-responsible?

The medical status as determined by the pre-operative left ventricular ejection fraction, the number of vessels bypassed, the bypass time and the aortic cross clamp time had no effect on the acceptance of self-responsibility. The total number of times that patients consulted a doctor in connection with their cardiac condition and the total number of hospital admissions in the year after the operation also had no effect on the acceptance of self-responsibility.

3) To what extent the patient's attitude towards his disease influenced his acceptance of self- responsibility?

Patients' satisfaction with the outcome of the operation influenced the acceptance of self-responsibility positively

4) Whether the patient's knowledge of the chronic nature of his disease and modification of risk factors had any effect on the acceptance of self-responsibility?

These two domains, knowledge of the chronic nature of the disease and knowledge of the modification of risk factors, were identified as significant aspects of self-responsibility.

5) The comparison of the knowledge of the patient with that of the spouse or care-giver.

Both patients and spouses in the group that had accepted self-responsibility had higher knowledge scores. At six months the mean score for patients was 56% and for spouses was 52%. The mean score of patients was 51% and of spouses was 55% at twelve months. The knowledge of patients had become slightly less and the knowledge of spouses had become slightly more. Depression was identified at twelve months after the operation but the patients were not depressed at six months and this was confirmed by their spouses.

IMPLICATIONS OF SELF-RESPONSIBILITY AS A SIGNIFICANT FACTOR IN THE SUCCESSFUL OUTCOME AFTER CABG SURGERY

This research has shown that patients who are not responsible for their health will not have improved quality of life following CABG surgery. The concern therefore lies with these patients and their spouses and attention should be focused on them post-operatively. They and their spouses should have knowledge about the chronic nature of the disease, both should know about risk factor modification and the patient should be assisted in the modification of his health behaviour. Patients should have realistic

expectations of the outcome of the operation and be aware that the intervention will in most cases remove the symptoms and increase the functional capacity of the patient. However they have to realise that the operation is not a cure, that they suffer from a chronic disease and that they have to take the responsibility for changing their lifestyle in order to maintain optimal health. All this can be achieved by encouraging patients to participate in a cardiac rehabilitation programme.

SUMMARY

When summarising this section on the results and discussion of self-responsibility there needs to be some reflection on the method used to identify self-responsibility. The method seems to have been sensitive and accurate because all the diabetic patients were included in this group. Diabetic patients who have had diabetes on average for a period of 9.6 years and still qualified for surgical revascularization, must have been responsible for managing their chronic disease. It could have been expected that the knowledge scores of the self-responsible group would be higher than the scores of the patients who were not responsible. The significant differences found in knowledge scores in this study supports the method used to measure acceptance of self-responsibility.

The profile of patients 12 months after CABG surgery who had accepted self-responsibility, was as follows: Married, income > R50 000, education > Grade 12, Diabetics, satisfied with the outcome of the operation, depressed, higher knowledge scores than the group that was not responsible and aware of the effect of smoking on the cardiovascular system.

The profile of the spouses of self-responsible patients were: More knowledgeable than the group who were not responsible, thought patients to

be cured by the operation and judged the patients to be more active after the operation than before.

With stepwise logistic regression the probability was established that patients who were satisfied with the outcome of the operation and had an educational level greater than grade 12 were lik ` to be self-responsible irrespective of the spouses knowledge. The most important finding however, is that if patients do not have educational levels greater than grade 12 and are not satisfied with the outcome of the operation they will not be responsible and if they are not responsible they will not have an improved quality of life.

CONCLUSION

In concluding this section on the acceptance of self-responsibility it must be emphasised that patients with a chronic disease such as CAD will not have an improved quality of life unless they become responsible for their continued health. Improving patients' satisfaction with the outcome of the surgery and increasing their knowledge of the disease and risk factor modification is of great importance to achieve self-responsibility. The spouse should also be supported and educated as this person plays a significant role in the lifestyle modification of the patient and their acceptance of self-responsibility.

CHAPTER VIII

CONCLUSIONS

The aim of this study was to determine whether self-responsibility is an important factor in the successful outcome of CABG surgery. Information was also sought on whether the following factors influenced the acceptance of self-responsibility: socio-economic status, medical status, attitude towards the disease, knowledge of the chronic nature of the disease and risk factor modification, the knowledge of the spouse concerning the chronic nature of the disease and the importance of risk factor modification. This research was based mainly on patients' subjective views on the outcome of the CABG surgery. The spouse was included in this research as the information they provided was considered to be essential in the evaluation of self-responsibility.

The most significant finding of this research was that **self-responsibility was established as a significant factor in determining the improved quality of life** of patients 12 months after CABG surgery. Improved quality of life was used to determine the successful outcome of CABG surgery. Furthermore, it was established that the acceptance of self-responsibility was the strongest predictive factor for an improved quality of life after CABG surgery. Other factors that were strong predictors of improved quality of life were more recent participation in physical activities prior to CABG surgery; height; and an improved sex-life after CABG surgery.

The strongest predictors of self-responsibility were satisfaction with the surgical outcome of the surgery, education level beyond grade 12, and a spouse with knowledge of the disease and therefore knowledge of risk factor modification.

Accordingly I conclude that unless a patient with chronic heart disease accepts responsibility for his rehabilitation after the surgical intervention, the

outcome will not be successful regardless of the adequacy of the surgical procedure. Patients who are educated and satisfied with the outcome because they have realistic expectations, will be self-responsible. Satisfaction with the outcome can be influenced by knowledge of lifestyle modifications which will in turn lead to a sense of control. There is evidence in the literature that a sense of control is associated with life satisfaction. Knowledge is a modifiable characteristic so that it may be possible to improve patients' satisfaction with the outcome, if their knowledge of the disease, the intervention and the expected outcome is increased.

The patients in this study had many risk factors for CHD and are representative of the South African population. The sociodemographic profiles of patients in this study were similar to that of other international studies with the exception that the mean age of this population was younger and that fewer females underwent CABG surgery. I therefore consider the results of this study to be transferable to other populations.

There was a close correlation between levels of education and levels of income. Thus patients earning less than R50 000 were likely to have a level of education of grade 12 or less. I conclude that these patients should be identified as an extremely high risk group on social grounds at the time of CABG surgery and every effort should be made to support them and their spouses post-operatively. Only seven patients in this study attended a cardiac rehabilitation programme. It would seem that a great deal of expense was incurred to correct the surgical problem, but minimal effort was made to ensure a successful outcome by providing additional support to these patients. This being the case causes concern, especially when considering that it is not the surgical procedure but the acceptance of self-responsibility that is the strongest predictive factor for successful outcome.

Another important finding of this research was that certain parameters such as left ventricular ejection fraction, the number of vessels bypassed, bypass time and aortic cross clamp time, and the number of days patients spent in ICU post-operatively, were of no significance in predicting improved quality of life of patients 12 months after CABG surgery. These factors also were not predictive of the acceptance of self-responsibility.

The cost effectiveness of the intervention should therefore be an important consideration because for many patients the cost implication was considerable. Their medical aid support was frequently depleted after the surgery and their financial status was further compromised as many patients did not return to work. If patients do undergo CABG surgery a determined attempt should be made to achieve a successful outcome in terms of an improved quality of life. Every effort should also be made to assist patients in accepting the responsibility for their own continued recovery after CABG surgery. Rehabilitation programmes should be designed in such a way that they ensure that patients are satisfied with the outcome of the surgical procedure. Spouses should receive support and be educated on aspects of the disease and risk factor modification as this person is very important for the patient's successful lifestyle change.

The barriers to becoming responsible for one's health have been described by Knowles (1977) as insufficient knowledge of the disease, insufficient knowledge of what is preventable and insufficient interest. This research confirmed these observations. At the completion of this project the concern was directed towards those patients who did not accept responsibility for themselves and therefore did not have an improved quality of life. The need for support of patients and spouses in this group of patients was highlighted.

The importance of knowledge about the disease and satisfaction with the outcome of the disease emphasises the importance of rehabilitation and

educational programmes for patients. The value of the spouse in the acceptance of responsibility of the patient with a chronic disease was demonstrated in this study and makes it essential that more time and effort be given to the support of the spouse. The responsibility of recovering from an illness need not rest solely on the doctor, the health care worker or the patient. A partnership can be struck in which responsibility is jointly held and shared (Wallston and Wallston, 1982). In order for patients to become self-responsible they should have access to information, have accessible health services of good quality and have minimal financial barriers to health services.

In a society where decisions for funding for medical services are constantly under pressure, patients with chronic diseases of lifestyle should accept the moral obligation to preserve their own health. It must be their responsibility to maintain as healthy a life as is possible within the confines of their chronic disease. Patients should be encouraged to become self-responsible.

I conclude that a human life of quality is lived according to a human plan. When chronic illness occurs life can no longer be lived according to the original plan. The role of the health care worker is to assist and support the patient to live a life of quality again by taking control of an altered life plan. Unless individuals become active participants in their rehabilitation, realise that they have a chronic disease and take the responsibility to modify their life style, they will not have an improved quality of life and therefore will fail to have a successful outcome following CABG surgery.

These sentiments were poignantly expressed by a patient suffering from a serious chronic cardiac disease, in the following statement: "Through the little deaths of illness we learn and grow..... Finally you discover that you are responsible for your own self alone....."(Pettit, 1988).

CHAPTER IX

RECOMMENDATIONS

On completion of this research the following recommendations for further research on the acceptance of self-responsibility are made:

1. That the concept of the acceptance of self-responsibility should be investigated in patients suffering from chronic diseases other than CAD.

2. That the concept of the acceptance of self-responsibility be investigated in patients who have not undergone a significant invasive procedure such as CABG surgery.

3. That the possible connection between patients who exhibit "behaviour involvement" characteristics as described in chapter 2, and those who accept self-responsibility be investigated.

4. That the connection between the perception of control and knowledge be further investigated, as well as the extent to which patients' belief of their control over a situation influences their satisfaction with the outcome of an intervention.

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As the contents of the appendices were so extensive a decision was made to place them after the Reference List.

APPENDIX I

SIX QUESTIONNAIRES

This appendix includes the questionnaires with patients' responses.

Questionnaires presented to patients on days four to six post-operatively (1, 2 and 3).

Questionnaires presented to patients and spouses/care-givers six months and one year post-operatively (4 and 5).

Questionnaire on medical and surgical information (6).

QUESTIONNAIRE 1: FOUR TO SIX DAYS POST-OPERATIVELY

QUESTIONNAIRE ON SOCIO-ECONOMIC STATUS

Patient information

1.	Case number	**Patients interviewed n = 73**		□□	1 - 2
2.	Card number			□□	3 - 4
3.	Tel number				
4.	Date of interview			□□□□□□	10
5.	Age in years	***Mean:***	***56.54***	□□	11 - 12
		Range:	***31 - 78***		
6.	Sex:				
	Male = 1	***63***			
	Female = 2	***10***		□	13
7.	Population distribution:				
	White = 1	***60***			
	Black = 2	***4***			
	Asian = 3	***8***			
	Coloured = 4	***1***		□	14
8.	Home language				
	Afrikaans = 1	***34***			
	English = 2	***29***			
	African = 3	***4***			
	Other = 4	***6***		□	15
9.	Marital Status:				
	Married = 1	***55***			
	Single = 2	***3***			
	Divorced = 3	***8***			
	Widowed = 4	***7***		□	16

10. Number of children (Specify) ☐☐ 17 - 18
Mean : ***2.64***
Range: ***0-9***

11. Total family income: (*n* = *71*)

Less than R15 000	= 1	***6***		
R15 000 or more but less than R20 000	= 2	***11***		
R20 000 or more but less than R30 000	= 3	***9***		
R30 000 or more but less than R50 000	= 4	***19***		
R50 000 or more but less than R80 000	= 5	***8***		
R80 000 or more but less than R120 000	= 6	***6***		
R120 000 or more	= 7	***12***	☐	19

12. Referral centre:

Provincial Hospital	= 1	***12***		
Private doctor	= 2	***57***		
Other (specify)	= 3	***4***	☐	20

13. Occupation: Specify ☐ 21

Prestige rating ☐☐☐ 22 - 24

In what capacity have you been employed in the past year

Full-time	= 1	***44***		
Part-time	= 2	***7***	***51 employed***	
Unemployed	= 4	***6***		
Disability pension	= 5	***3***	***22 unemployed***	
Pensioner	= 6	***13***	☐☐	25 - 26

If not 1, was this due to your medical condition?

Yes	= 1	***14***	} ***29***	
No	= 2	***15***	☐	27

14. Educational level:

What educational level have you achieved

Up to st. 5 (grade 7)	= 1	***5***		
Up to st. 9 (grade 11)	= 2	***27***		
Matric or equivalent (grade 12)	= 3	***22***		
Matric + 3 or more yrs	= 4	***10***		
University degree	= 5	***11***	☐	25

15. Is religion an important aspect of your life?

Yes	= 1	***51***		
No	= 2	***24***	☐	29

QUESTIONNAIRE 2: FOUR TO SIX DAYS POST-OPERATIVELY RISK FACTORS

Name of patient

Address of patient

Tel. no.

Do you suffer from any one or more of the following:

1. **HYPERCHOLESTEROLAEMIA:**

Yes = 1	***34 (46.6%)***		
No = 2	**39**	☐	30
What is your cholesterol level:		☐☐☐	31 - 33
20 patients knew values			
mean :	***6.29 mmol/l***		
range:	***5 mmol/l - 11.2 mmol/l***		
From medical record:	***not available***	☐☐☐	34 - 36
How long since it has been diagnosed			
Years		☐☐☐	37 - 38
Months		☐☐☐	39 - 40
Days		☐☐☐	41 - 42
mean: 5.3 years			

2. **HYPERTENSION:**

Yes = 1	***30 (41.1%)***		
No = 2	***43***	☐	43
What is your blood pressure:	Systolic	☐☐☐	44 - 46
	Diastolic	☐☐☐	47 - 49
19 patients knew values			
Systolic :	***mean 142.6***		
Diastolic :	***mean 91.3***		

From medical record — Systolic ☐☐☐ 50 - 52
Diastolic ☐☐☐ 53 - 55

11 values
Systolic : mean 129.6
Diastolic : mean 77.

How long since it has been diagnosed

Years ☐☐ 56 - 57
Months ***mean 12.4 years*** ☐☐ 58 - 59
Days ☐☐ 60 - 61

CARD 2

3. **SMOKING:**

Ever = 1 ***55 (75%)***
Never = 2 ***18*** ☐ 5

If ever:

At present = 1 ***1***
Not at present = 2 ***54*** ☐ 6

Cigarettes = 1 ***53***
Cigars = 2 ***8***
Pipe = 3 ***8*** ☐☐☐ 7 - 9

How many years did you smoke? ☐☐ 10 - 11
mean 27.2(range 3 - 60; SD±12.2)

If ever, but not at present, how long since you've given up ?

Years ☐☐ 12 - 13
Months ☐☐ 14 - 15
Days ☐☐ 16 - 17
7.2 years(range 0 - 60; SD±13.5)

If cigarettes:
How many cigarettes a day? ☐☐☐ 18 - 20
27 cigarettes(range 10 - 75; SD±14.4)

Pack years:

no of cigarettes per days x years smoked / 20	☐☐☐	21 - 23
mean 40.4(range 2 - 150; SD±30.1)		

4. **PHYSICAL ACTIVITY**

Did you ever participate in sport:

Yes = 1	***66 (91.7%)***		
No = 2	***6***	☐	24
At school :	***62 (85%)***	☐	25
After school :	***50 (68%)***	☐	26

What sport did you play (specify)

At school :	***rugby***	☐☐ ☐☐	24- -36
	cricket	☐☐	31- -32
	soccer		
After school :	***rugby***	☐☐ ☐☐	33 - 36
	soccer	☐☐ ☐☐	37 - 38
	tennis		

'See appendix III)

How many hours a week did you play sport?	☐☐	
At school:		
Hours/week ***mean 7.9 hrs(range 0 - 30; SD±5.4)***	☐☐	39 - 40
After school		
Hours/week ***mean 5.9 hours(range 0 - 40; SD±6.1)***	☐☐	41 - 42
How many years ago did you stop? ***mean 24.5 years(range 0 - 63; SD±14.1)***	☐☐	43 - 44

Are you doing any physical activity now?

Yes = 1	***21***			
No = 2	***48***		☐	45

If yes,
what type of activity (specify) ☐☐ ☐☐ ☐☐ 46 - 51
golf, walking, cycling, bowls

If yes: For leisure	= 1	***17***		
For training effect	= 2	***4***	☐	52

If for training effect:

What sort of training (specify) ☐☐ 53 - 54
jogging, gym, cardiac rehabilitation exercise

Frequency:	1 x wk = 1			
	3 x wk = 2	***2***		
	Daily	= 3 ***2***	☐	55

What is the time spent on your
physical activities per session (mins) ☐ 56 - 57
55(range 10 - 99; SD±42.5)

5. **FAMILY HISTORY**

Is there any family history of heart disease:

Yes = 1	***42 (57.5%)***			
No = 2	***31***		☐	58

Who was involved:

Grandparents	=	***8***	***(19%)***	☐	59
Parents	=	***32***	***(76%)***	☐	60
Siblings	=	***19***	***(50%)***	☐	61

Age of death:

Before 55	= 1	***10***	☐	62
Between 55 - 65	= 2	***16***	☐	63
After 65	= 3	***14***	☐	64
Unsure	= 4	***2***	☐	65

What was the cause of death (specify) ☐☐ 66 - 67
Myocardial infarction 66.7%

6. **STRESS**

Do you consider your life stressful at the present time?

Yes = 1 ***52 (71.2%)***
No = 2 ***21*** ☐ 68

Is your life constantly stressful

Yes = 1 ***33 (45%)***
No = 2 ***40*** ☐ 69

Why is your life stressful (specify) ☐☐ 70 - 71
Work related 65.4%
Family matters 30%

CARD 3

7. **DIABETES MELLITUS**

Do you suffer from diabetes

Yes = 1 ***11 (15.07%)***
No = 2 ***62*** ☐ 5

If yes, what type of diabetes

IDDM = 1 ***1 (1.4%)***
Non-IDDM = 2 ***10 (13.7%)*** ☐ 6

Is your diabetes under control

Yes = 1 ***11***
No = 2 ***0*** ☐ 7

How long have you suffered from diabetes.

Years		☐☐	8 - 9
Months	_ ***9.6 years(range 0 - 30; SD±9.02)***	☐☐	10 - 11
Days		☐☐	12 - 13

8. **OBESITY** ***n = 73***

i) What did you weigh when you left school? (kg) ☐☐☐ 14 - 16
68kg(range 39 - 130kg; SD±15.3)

ii) What is your weight now? (kg) ☐☐☐ 17 - 19
82.4(range 45 - 120kg; SD±15.0)

iii) What is your height now? (cms) ☐☐☐ 20 - 22
171.9cms(range 127 - 188cms; SD±11.2)

iv) Body Mass Index (BMI)

$$\frac{\text{wt in kg}}{\text{height m}^2}$$ ☐☐☐ 23 - 25

27.8(range 20 - 37; SD±4.3)

1.	<24	=	***11 = 15.3%***	☐ 26
2.	24 - 30	=	***43 = 59.7%***	☐
3.	>30	=	***18 = 18.25%***	☐

v) Waist/hip ratio ***Not done***

9. **ALCOHOL**

Do you take alcohol regularly?

Yes	= 1	***35 (47.9%)***		
No	= 2	***38***	☐	27

No. of drinks per day: ***3(range 1 - 10; SD±2.6)***	☐☐	28 - 29
No. of drinks per week: ***23(range 2 - 70; SD±17.7)***	☐☐	30 - 32

QUESTIONNAIRE 3: FOUR TO SIX DAYS POST-OPERATIVELY MEDICAL HISTORY AND CURRENT MEDICAL STATUS

Name of patient

Tel. No.

Date of interview: ☐☐☐☐☐☐

1. What symptoms brought you to the Dr?

a) Angina

Yes	= 1	***61***	***83.6%***		
No	= 2	***12***	***16.4%***	☐	33

If yes:

Light, barely notice able	= 1	***6 (9.8%)***		
moderate bothersome	= 2	***17 (27.9%)***		
Severe, very uncomfortable	= 3	***23 (37.7%)***		
Most severe pain ever experienced in the past	= 4	***15 (37.7%)***	☐	34

b) Fatigue (tiredness)

Have you experienced any tiredness in the past few months?

1.	never	= ***18 (24.7%)***		
2.	slightly, occasionally	= ***11 (15.1%)***		
3.	tired	= ***9 (12.3%)***		
4.	very tired, often	= ***22 (30.1%)***		
5.	worst tiredness one could expect to have	= ***13 (17.8%)***	☐	35

c) Breathlessness

Have you experienced any breathlessness in the past few months?

Yes	= 1	***46 (63%)***		
No	= 2	***27 (37%)***	☐	36

d) Other symptoms?

Yes = 1	***26 (38.2%)***			
No = 2	***48 (61.8%)***		☐	37
Specify	***CA prostate***	***= 2 (2.8%)***	☐☐ ☐☐	38––
	CVA	***= 2 (2.8%)***	☐☐	-43

2. MEDICAL HISTORY

Have you any previous history of:-

a) Angina:

Yes = 1	***37 (50.7%)***		
No = 2		☐	44

At rest:

Yes = 1	***14 (20.0%)***		
No = 2		☐	45

Effort induced:

Yes = 1	***35 (48%)***		
No = 2		☐	46

b) Myocardial Infarction:

Yes = 1	***41 (56.2%)***		
No = 2		☐	47
If yes, how many: ***mean 1.5(range 1 - 7; SD±1.13)***		☐	48

Time since last MI

Years		☐☐	49 - 50
Months	***mean 4.7 years(range 0 - 25 years)***	☐☐	51 - 52
Days		☐☐	53 - 54
Site of infarction (specify)		☐ ☐	55 - 56

c) Percutaneous transluminal coronary angioplasty. ***(n = 70)***

Yes = 1 ***23 (32.9%)***
No = 2 ***47 (67.1%)*** ☐ 57

If yes, when was the last one done?
Give date ☐☐☐☐☐☐ 58 - 63

d) C.A.B.G

Yes = 1 ***5 (6.9%)***
No = 2 ☐ 64

If yes, how many? ***mean = 1.2*** ☐ 65

No of vessels bypassed ***mean = 3*** ☐ 66

When was the last operation done: 67-

Years ago ***mean = 4.9 years*** ☐☐ - -
range = 0 - 12 years ☐☐ - 72
☐☐