CHAPTER II

REVIEW OF LITERATURE

The cardiovascular diseases are among one of the main cause of death in the developed countries. They have been increasing epidemically in the developing countries. In spite of several alternatives for the treatment of the coronary artery disease, surgery of the myocardial revascularization is an option for the management of cardiovascular disease. It provides the remission of the angina symptoms contributing to the increase of the expectation and improvement of the quality of life.

Most of the patients undergoing myocardial revascularization surgery develop postoperative lung dysfunction with reduction of the lung volumes, damages in the respiratory mechanism, decrease in the lung capacity and increase of the respiratory work. The reduction of volume and lung capacities can contribute to alterations in the gas exchanges, resulting in hypoxemia and decrease in the diffusion capacity. Taking this into account, the Physiotherapy has been requested more and more to perform in the pre as well as in the postoperative period of this surgery. Pulmonary rehabilitation can enhance one’s confidence to undertake the various activities of daily life. Therefore Pulmonary rehabilitation could influence one’s view of the quality of his/her life. Although the HRQL (Health Related Quality of Life) is not a medical evaluation and is based strictly on self-reporting, the HRQL is important in assessing the medical outcomes
of CABG. The HRQL has become an accepted measure of how medical intervention affects the patient mentally and physically.

The present study is aimed at determining the effect of pulmonary rehabilitation on physiological parameter, psychological parameters and quality of life. This chapter attempts to present a broad overview of the research and non-research literature reviewed under the following major heading

1) Pulmonary Rehabilitation After CABG Surgery
2) Effect of education on CABG patients
3) Effect of Anxiety after cardiac surgery
4) Effect of Pain
5) Quality of life After CABG Surgery

PULMONARY REHABILITATION AFTER CABG SURGERY

Matheus\textsuperscript{37} conducted a study to evaluate lung function and respiratory muscle strength in the postoperative period and investigate the effect of inspiratory muscle training on measures of respiratory muscle performance in patients undergoing coronary artery bypass grafting. A randomized study was done with 47 patients undergoing CABG with cardiopulmonary bypass. They were divided into Study Group (SG) 23 patients and Control Group (CG) 24 patients. The Study Group underwent physical therapy and inspiratory muscle training and CG underwent conventional physiotherapy. The study compared the maximal respiratory pressures, tidal volume (TV), vital capacity (VC) and
peak expiratory flow (peak flow) preoperatively (Pre-OP), 1st (PO1) and 3rd (PO3) postoperative day.

There was a significant reduction in all variables measured on PO1 compared to preoperative values in both groups, TV in SG and CG and VC in SG and CG and peak flow. At PO3, SG presented higher value of VC, and TV. Thus concluded patients undergoing cardiac surgery experience reduced ventilatory capacity and respiratory muscle strength after surgery. Muscle training was performed to retrieve TV and VC in the PO3, in the trained group.

Cavenaghi\textsuperscript{38} aimed at updating the knowledge regarding the respiratory physiotherapy performance in the pre and postoperative period of the myocardial revascularization surgery for the prevention of lung complications. The Physiotherapy uses several techniques in the preoperative period such as: the incentive spirometry, exercises of deep breathing, cough, inspiratory muscle training, earlier ambulation and physiotherapeutic orientations. Therefore in the postoperative period, the objective was to prevent the lung complications, performed by means of physiotherapeutic manoeuvres and non-invasive respiratory exercises, which aimed at improving the respiratory mechanism, the lung re-expansion and the bronchial hygiene. Respiratory physiotherapy is an integral part in the care management of the patient with cardiac problem, either in the pre or in the postoperative period, since it contributes significantly to a better prognosis of these patients with the use of specific techniques.
Moreno\textsuperscript{39} assessed the pulmonary function in postoperative CABG patients treated with a physiotherapy protocol. 42 volunteers with an average age of 63 ± 2 years were included and separated into three groups: healthy volunteers (n = 09), patients with CAD (n = 9) and patients who underwent CABG (n = 20). Patients from the CABG group received pre-operative and post-operative evaluations on days 3, 6, 15 and 30. Patients from the CAD group had evaluations on days 1 and 30 of the study, and the healthy volunteers were evaluated on day 1. Pulmonary function was evaluated by measuring forced vital capacity (FVC), maximum expiratory pressure (MEP) and Maximum inspiratory pressure (MIP).

After CABG, there was a significant decrease in pulmonary function, which was the worst on postoperative day 3 and returned to the preoperative baseline on postoperative day 30.

Savci\textsuperscript{40} investigated the efficiency of inspiratory muscle training (IMT) on postoperative respiratory muscle strength, functional capacity, quality of life, and psychosocial status in patients with coronary artery bypass graft (CABG) surgery. 43 patients undergoing CABG surgery were randomly assigned to one of the two groups. All subjects received usual care. In addition, subjects in the intervention group received IMT training pre- and postoperatively. Pulmonary function testing, six minute walk test (6MWT), quality of life and psychosocial parameters were assessed preoperatively and the fifth day after the surgery.

The mean inspiratory muscle strength increased from 82.64 cmH\textsubscript{2}O at baseline to 95.45 cmH\textsubscript{2}O five days postoperatively in the intervention group. The intervention group
covered further distance during the 6MWT than usual care. The improvement in quality of life was greater in the intervention group for the dimension of sleep. The anxiety scores were significantly lower in the intervention group than the usual care group. The length of intensive care unit stay was significantly shorter in the intervention group than the usual care group. IMT results in faster recovery of inspiratory muscle strength, functional capacity, intensive care unit stay, quality of life and psychosocial status after CABG.

Barros\textsuperscript{41} demonstrated that the impaired ventilatory capacity during the post operative period, in patients undergone Coronary arterial bypass graft surgery (CABG) and to test the respiratory muscle training (RMT), performed after the surgery, may increase the ventilatory capacity. 38 patients, those underwent CABG with extra-corporeal circulation were randomized in two groups: 23 patients in the RMT group and 15 in the Control Group (CG). RMT group received conventional physiotherapy plus RMT. The CG group received the conventional physiotherapy. Evaluated parameters: maximum inspiratory and expiratory pressures (MIP) (MEP), dyspnea (Borg), peak expiratory flow (PEF), pain, tidal volume and hospitalization days. Measures were performed at pre, first post operative day and also at the patients discharge from the hospital.

MIP and MEP in the RMT group were higher when compared with CO at the patients discharge. The PEF was higher after hospitalization in the RMT group. Tidal volume was also higher in the RMT group at discharge. No differences were observed among the groups in the aspects: admission days, dyspnea and pain. Patient’s undergone CABG surgery presents an impaired respiratory muscle strength in their post operative
phase. RMT performed in this phase was effective to restore the ventilatory capacity in the following parameters: MIP, MEP, PEF and tidal volume, in this group of patients.

Ferreira\textsuperscript{42} conducted a study to assess patients undergoing coronary artery bypass graft (CABG) surgery have higher risk to develop pulmonary complications (PCs) such as atelectasis, pneumonia and pleural effusion. These complications could increase the length of hospital stay, resources utilization and also are associated with reduced quality of life and functional capacity. The study was aimed to test if the use of incentive spirometry (IS) associated with Expiratory Positive Airway Pressure (EPAP), after CABG surgery improves dyspnea, effort perceived and quality of life 18 months after CABG. 16 patients submitted to a CABG, were randomized to a control group (n=8) and IS+EPAP group (n=8). The protocol of IS+EPAP was applied in the immediate postoperative period and following 4 weeks in the patient's home. 18 months after CABG, the strength of the respiratory muscle, the functional capacity, the lung function, the quality of life and the level of physical activity were evaluated.

After six minute walk test (6-MWT), the score of the dyspnea (1.6+/-.0.6 vs 0.6+/-.0.3,) and the perceived effort (13.4+/-.1.2 vs 9.1+/-.0.7,) were higher in the control group, when compared with the IS+EPAP group. In quality of life evaluation, the domain related to the physical aspects limitations was better in IS+EPAP group (93.7+/-.4.1 vs 50+/-.17,). Therefore patients that were submitted to IS+EPAP present reduction of dyspnea and lower effort sensation after the 6-MWT, and also a better quality of life 18 months after CABG.
Dehadri\textsuperscript{43} evaluated the effect of progressive muscular relaxation (PMR) training in decreasing anxiety and improving quality of life among anxious patients after coronary artery bypass graft surgery (CABG). The study was conducted on 110 patients who underwent coronary artery bypass graft (CABG). Patients were allocated to receive both exercise training and lifestyle education plus relaxation therapy (relaxation group; n=55) and only exercise training beside lifestyle education (control group or the recipient of usual care group; n=55). Duration of the relaxation therapy was 6 weeks and in the case of usual care was 8 weeks. Both the groups were followed up one month after completion of intervention. Anxiety and quality of life in the two treatment groups were compared. There were no significant differences in overall QOL, state anxiety and trait anxiety scores between the two groups before intervention. Significant reductions in state anxiety and trait anxiety levels were observed in relaxation group after intervention compared to control group. The study concluded that progressive muscular relaxation training may be an effective therapy for improving psychological health and quality of life in anxious heart patients.

Stein\textsuperscript{44} evaluated the effects of a 6-day postoperative in-hospital cardiopulmonary rehabilitation program on inspiratory muscle strength and its potential association with improved functional capacity after coronary artery bypass graft (CABG) surgery. 10 subjects underwent a 6-day postoperative in-hospital program, which included the use of expiratory positive airway pressure mask and bronchial hygiene techniques, coupled with progressive distance walking and cardiopulmonary training. 10 subjects in the control group were followed by their own physicians and received
routine nursing assistance but were not exposed to any specific respiratory or motor physical intervention.

Maximal inspiratory and expiratory pressure were measured by a pressure transducer, and the highest pressure obtained in 6 measurements was used for analysis (before surgery, and 7 and 30d after surgery). The six-minute walk test (6MWT) was performed 7 days after surgery, and maximal cardiopulmonary exercise testing was performed 30 days after CABG.

Rehabilitation resulted in maintenance of maximal inspiratory pressure measured at 7 and 30 days postoperatively, while it was significantly reduced in the control group. 6MWT distance was longer 7 days after CABG in rehabilitation subjects (416+/−78m) than controls (323+/−67m). Peak oxygen intake at day 30 was also higher in the rehabilitation group.

Yánez-Brage⁴⁵ conducted a study to determine whether pre-surgery respiratory physiotherapy reduces the incidence of post-surgery pulmonary complications. Observational study of 263 patients submitted to off-pump coronary artery bypass grafting (CABG) surgery at the ACoruña University Hospital (Spain) was conducted. 159 patients received preoperative physiotherapy. A physiotherapist provided a daily session involving incentive spirometry, deep breathing exercises, coughing and early ambulation. Both groups of patients (those that received physiotherapy and those that did not) were similar in age, sex, body mass index, creatinine, ejection fraction, number of affected
vessels, O2 basal saturation, prevalence of diabetes, dyslipidemia, exposure to tobacco, age at smoking initiation, number of cigarettes/day and number of years as a smoker.

The most frequent postoperative complications were hypoventilation (90.7%), pleural effusion (47.5%) and atelectasis (24.7%). In the univariate analysis, prophylactic physiotherapy was associated with a lower incidence of atelectasis (17% compared to 36%). After taking into account age, sex, ejection fraction and whether the patients received physiotherapy or not, we observed that receiving physiotherapy is the variable with an independent effect on predicting atelectasis. Therefore conclude that preoperative respiratory physiotherapy is related to a lower incidence of atelectasis.

Hulzebos aimed to evaluate the prophylactic efficacy of preoperative physiotherapy, including inspiratory muscle training (IMT), on the incidence of postoperative pulmonary complications (PPCs) in high-risk patients scheduled for elective coronary artery bypass grafting (CABG). Of 655 patients referred to a university medical centre in The Netherlands for elective CABG, 299 met the criteria for being at high risk of developing PPCs. A total of 279 were enrolled and monitored up to discharge from hospital. Patients were randomly assigned to receive either preoperative IMT (n=140) or usual care (n=139).

Both groups were comparable at baseline. Before CABG, 2 control group patients and 1 IMT group patient died. After CABG surgery, PPCs were present in 25 of 139 patients in the IMT group and 48 of 137 patients in the control group. Pneumonia occurred in 9 of 139 patients in the IMT group and in 22 of 137 patients in the usual care group. Mean duration of postoperative hospitalization was 7 (range 5-41) days in the IMT group.
versus 8 (range 6-70) days in the usual care group. Preoperative physiotherapy, including IMT, statistically significantly reduced the incidence of PPCs and the duration of postoperative hospitalization in patients at high risk of developing a pulmonary complication on undergoing CABG.

*Jensen*[^47] found that despite numerous advances in anaesthesia, surgical techniques, and postoperative care for coronary artery bypass graft (CABG) surgery, postoperative pulmonary complications (PPCs) still accounted for postoperative morbidity. To determine current risk factors for PPCs in CABG surgery patients a retrospective cohort design was used. Health records were reviewed for patients (n=315) who had CABG surgery at a large quaternary healthcare centre over a 4 month period. Pre-, peri-, and postoperative risk factors for PPCs were recorded as binary variables. Data were further assessed according to PPCs and non-PPCs using logistic regression models.

PPCs occurred in 99.4% of this CABG surgical cohort. Atelectasis, pleural effusion, atelectasis with pleural effusion, and pneumonia were the most frequent PPCs post CABG surgery. Age >65 years & diabetes were found to be related to the presence of atelectasis. No significant risk factors were related to the development of pleural effusion or atelectasis with pleural effusion. Postoperative pneumonia was associated with previous myocardial infarction and hospital stay >5 days. History of bronchitis and COPD were related to postoperative pneumothorax; history of heart failure, COPD, and other lung diseases were related to postoperative pulmonary edema. These findings

[^47]: Jensen
contribute to the understanding of PPCs in post-CABG surgery patients and assist in identification of patients at risk for developing PPCs.

Romanini\textsuperscript{48} evaluated the physiotherapeutic effect of intermittent positive pressure breathing (IPPB) and incentive spirometry (IS) in patients submitted to myocardial revascularization surgery. 40 patients were divided in two groups: one was submitted to IPPB (n=20) and the other to IS (n=20). The patients were evaluated at the preoperative period and 24, 48 and 72 hours postoperatively, with the resources being applied in the postoperative period. The following parameters were analyzed: Oxygen Saturation (SpO2), Respiratory Frequency (RF), Minute Volume (MV), Current Volume (CV), Maximum Inspiratory Pressure (Ip max) and Maximum Expiratory Pressure (Ep max).

The groups were considered homogeneous regarding the demographic and clinical variables. In the group submitted to IPPB, an increase in SpO2 was observed 48 and 72 h after surgery, when compared to the IS group. As for the RF, MV and CV variables, there were no statistically significant differences between the groups. The group submitted to IS showed a significant increase in the Epmax 24 and 48 h after surgery. Therefore aiming at reversing hypoxemia earlier, IPPB showed to be more efficient when compared to IS; however, IS was more effective in improving respiratory muscle strength.

Weiner\textsuperscript{49} founded out that Pulmonary complications after cardiac surgery are a leading cause of postoperative morbidity and mortality. Respiratory muscle weakness may contribute to the postoperative pulmonary abnormalities. It was hypothesized that: (1)
there is a decrease in inspiratory muscle strength (PI max at residual volume) and endurance (Pm peak / PI max) following coronary artery bypass graft (CABG); (2) this weakness is associated with reduced Pulmonary Function Tests (PFTs), impaired gas exchange, and a higher rate of pulmonary complications; and (3) prophylactic Inspiratory Muscle Training (IMT) can prevent those changes. 84 candidates for CABG, with ages ranging from 33 to 82 years, were evaluated prior to operation and randomized into two groups: 42 patients underwent IMT (Inspiratory Muscle Training) using a threshold trainer for 30 min/day for 2 weeks, 1 month before operation (group A); 42 patients served as a control group (group B). There was a significant decrease in respiratory muscle function, PFTs, and gas exchange in the control group following CABG, whereas these parameters remained similar to those before entering the study in the training group. The differences between the groups were statistically significant. In addition 11 (26%) patients in the control group but only 2 (5%) in the training group needed postsurgical mechanical ventilation longer than 24 hours, CABGs have a significant deteriorating effect on inspiratory muscle function, PFTs, and arterial blood gases. The decrease in these parameters can be prevented by prophylactic inspiratory muscle training, which may also prevent postsurgical pulmonary complications.

Crowe\textsuperscript{50} conducted a study to determine whether the addition of Incentive Spirometry (IS) to post-operative pulmonary physical therapy is more effective than physical therapy alone in reducing postoperative pulmonary complications in high-risk patients after Coronary Artery Bypass Grafting (CABG). Patients were given the spirometer and
instructed in its use, as often occurs in clinical settings. 185 Subjects were randomly assigned to receive either postoperative pulmonary physical therapy (breathing exercises, secretion removal, mobility) or physical therapy combined with IS.

No difference was found between the two groups in atelectasis, spirometry, oxygen saturation, pulmonary infection, or hospital stay. Incentive spirometry combined with physical therapy is no more effective than postoperative physical therapy alone in reducing atelectasis for this population.

Stiller\textsuperscript{51} conducted a randomized controlled study on 120 patients undergoing coronary artery surgery to investigate whether prophylactic chest physiotherapy affected the incidence of postoperative pulmonary complications. Group 1 patients received no preoperative or postoperative chest physiotherapy. Group 2 patients received preoperative education and instruction in breathing and coughing exercises and postoperative supervision and assistance in performing the same. These exercises were supervised by a physiotherapist twice per day on the first 2 postoperative days and once per day on the 3rd and 4th postoperative days. Physiotherapy for group 3 patients was the same as for group 2 patients except that patients were seen by a physiotherapist 4 times per day on the first 2 postoperative days and twice per day on the 3rd and 4th postoperative days. Group 2 and 3 patients were instructed to practice breathing and coughing exercises every hour. Overall, an incidence of clinically significant postoperative pulmonary complications of 7.5 percent was demonstrated. In general, these patients demonstrated lower levels of preoperative pulmonary function and very low early postoperative oxygenation compared with those who did not
develop pulmonary complications. There was no indication that the incidence or severity of fever, hypoxemia, chest X-ray abnormalities or clinically significant post operative pulmonary complications was different between groups. These results suggest that the necessity for prophylactic chest physiotherapy after routine coronary artery surgery should be reviewed.

Pratibha\textsuperscript{52} conducted a study to find the effect of cardiac rehabilitation and home exercises on blood pressure, Heart rate, Respiratory Rate and Rating of Perceived Exertion (RPE) and compare the effects of cardiac rehabilitation and home exercises. Thirty eligible patients undergone Coronary artery bypass grafting (CABG) had participated in this study. After completion of baseline exercise stress test at discharge or within first week after discharge were randomly assigned to group A (Hospital based Cardiac rehabilitation) and group B (Home based cardiac rehabilitation) for 6 weeks. There were significant improvements in hemodynamics both with hospital based cardiac rehabilitation and home based exercises but there were no significant differences between hospital cardiac rehabilitation and home based exercises. Therefore it is concluded that both hospital based cardiac rehabilitation and home based exercises are effective in improving acute hemodynamics.

Shabani\textsuperscript{53} conducted a study to determine the effects of cardiac rehabilitation program (CRP) on exercise capacity and rate pressure product (RPP) in Iranian female patients undergoing coronary artery bypass grafting (CABG) in Hamadan, Iran. 60 patients
after CABG were assigned into an exercise group (n = 30, mean age 58.5 ± 10.8 years), who performed physical training for 12 weeks, or a control group (n = 30, mean age 59.3 ± 8.6 years) who received usual care. Functional capacity and RPP were evaluated by six minute walking test (6MWT) and exercise test.

In comparison to before training, significant increases of estimated exercise capacity as well as 6MWT were observed in exercise group after 12 weeks training. Women increased their exercise duration time by 49.2% and RPP by 10.3% after training. However, no significant differences were found before and after CRP in the control group. Therefore it is conclude that after CRP, women demonstrated significant improvements in exercise duration time, 6MWT, RPP and supply of oxygen to cardiac muscles. CRP can play an important role in improving functional independence in women.

Hulzebos\textsuperscript{54} evaluated the prophylactic efficacy of preoperative Inspiratory Muscle Training (IMT) on the incidence of Postoperative Pulmonary Complications (PPC) in high-risk patients scheduled for elective CABG surgery. 280 Patients were randomly assigned to receive either preoperative IMT (n = 140) or usual care (n = 139). Both groups received the same postoperative physical therapy. The results showed that both groups were comparable at baseline. After CABG surgery, PPCs were present in 25 (18.0%) of 139 patients in the IMT group and 48 (35.0%) of 137 patients in the usual care group. Pneumonia occurred in 9 (6.5%) of 139 patients in the IMT group and in 22 (16.1%) of 137 patients in the usual care group. Median duration of postoperative hospitalization was 7 days (range, 5-41 days) in the IMT group vs 8 days (range, 6-70
days) in the usual care group by Mann-Whitney U statistic. They concluded that Preoperative IMT reduced the incidence of PPCs and duration of postoperative hospitalization in patients at high risk of developing a pulmonary complication undergoing CABG surgery.

Hedbäck\textsuperscript{55} conducted a study on patients undergoing coronary artery bypass grafting (CABG) to determine the effect of cardiac rehabilitation program. 49 patients followed a cardiac rehabilitation program that included medical follow-up and physical training, both in outpatient groups and on an individual basis at home. The effect of the program on exercise test variables, coronary risk factors, and medication one year after surgery was compared to a non-exercised control group (n = 98). The study group showed less increase in the rate-pressure product, indicating a favourable effect on myocardial oxygen consumption; a lower frequency of angina at exercise testing; a reduction in resting systolic and diastolic blood pressure; fewer smokers; and fewer patients taking long-acting nitrates. It is suggested, therefore, that an organized cardiac rehabilitation program may be advantageous after CABG.

**EFFECT OF EDUCATION ON CABG PATIENTS**

Hoseini\textsuperscript{56} investigated the use of educational audiotape programme on anxiety and depression in patients undergoing Coronary Artery Bypass Graft (CABG). The study was conducted in Iran, 70 patients undergoing CABG were included and divided into two
equal groups, the control group and intervention group. They were followed up for six weeks. An audiotape educational programme was given to the intervention group after surgery in addition to the routine training. But patients in the control group received only routine training. Anxiety and depression were assessed by Hospital Anxiety and Depression Scale through a standardised questionnaire for anxiety and depression. Data were collected before and six weeks after the intervention.

The mean scores obtained in both anxiety and depression dimensions were significantly different between the intervention and control groups. Audiotape educational programme used by patients undergoing CABG decreases the level of their anxiety and depression after cardiac surgery.

Zhang\(^{57}\) evaluated the effect of nurse-initiated preoperative education and counselling on postoperative complications and anxiety symptoms following CABG. 40 patients were divided into the study and control groups. All patients received standard preoperative and postoperative care, but the study group patients also completed a structured education and counselling course supervised by designated nurses 3 days before the surgery. Anxiety symptoms were assessed by Zung's self-rating anxiety scale (SAS) on the day of admission and at 3 days after the surgery.

Result showed there was no statistically significant difference in the baseline characteristics or operational data between the 2 groups. Following the surgery, the rate of complications such as lower extremity edema, urinary retention, constipation, respiratory infection, and deep venous thrombosis in the study group was lower than in the control group. The mean postoperative SAS scores in the study group was lower than
in the control group, and the proportion of patients with a SAS score greater than 40 in the study group was also lower than in the control group (15% vs 45%). Therefore concluded that Nurse-initiated preoperational education and counselling were associated with a reduced rate of post operative complications and a reduced level of anxiety following CABG.

Utriyaprasit\textsuperscript{58} conducted a study to test the effect of an audiotape giving concrete objective information and strategies to reduce symptoms, psychological distress and enhance physical functioning in patients having coronary artery bypass grafts. A randomized controlled trial was conducted during 2004-2005. A sample of 120 Thai patients having coronary artery bypass grafts was randomly assigned to an intervention group or a control group. The intervention group was given an information audiotape the day prior to hospital discharge, and encouraged to listen to it as many times as necessary. Participants were interviewed using validated instruments pre-discharge and at 2 weeks and 4 weeks after discharge.

Participants in the intervention group had statistically significantly fewer symptoms of shoulder, back or neck pain and lack of appetite, and increased physical activity after discharge, compared to the control group. However, no statistically significant difference in psychological distress was observed. Therefore concluded that Nurses can use an audiotape containing preparatory information to improve outcomes for patients having coronary artery bypass grafts during the few weeks after discharge from hospital.
Fredericks\textsuperscript{59} found that patient education is an essential component of nursing care aimed at assisting patients in caring for themselves at home, following discharge from hospital. Studies were included in the systematic review on the educational intervention involving the provision of self-care information following surgery but before discharge from hospital and the outcome assessed related to self-care behaviour. A descriptive synthesis was used to code and extract data on publication information, study design, sample size, and quality of study, as well as postoperative CABG teaching, self-care behaviour performance, and demographic characteristics of the patients who participated in the studies. A quantitative synthesis consisted of a statistical approach, which was used to calculate the magnitude of the treatment effects on self-care behaviour. Results indicated larger effect on CABG patient on education in which the content was individualized, and given in a combination of media on an individual basis, and in more than one session.

Herdy\textsuperscript{60} conducted a clinical trial to evaluate the effects of an in-hospital cardiopulmonary rehabilitation program performed before and after CABG on postoperative outcomes. 56 patients who had to wait for CABG in-hospital were randomly assigned to a cardiopulmonary rehabilitation (Rehab; n = 29) or to usual care (Control; n = 27). In the Rehab group, intervention lasted for at least 5 days preoperatively until discharge. The program consisted of cardiac rehabilitation associated with respiratory physical therapy.

By hospital discharge, Rehab patients presented a shorter time to endotracheal extubation a reduction in the incidence of pleural effusion, atelectasis, pneumonia, and atrial
fibrillation or flutter. Length of in-hospital stay after surgery was also reduced in the Rehab group (5.9 vs. 4.6 days). Therefore it is concluded that Pre- and postoperative cardiopulmonary rehabilitation in patients who await CABG in the hospital is superior to standard care and leads to a reduced rate of postoperative complications and shorter hospital stay.

Deyirmenjian\(^61\) conducted a study to assess the impact of preoperative patient education on anxiety and recovery of the Lebanese patients undergoing open-heart surgery. The quasi-experimental study was conducted at a large hospital in Beirut. All patients who were admitted to the cardiac surgery unit and who met the inclusion criteria were randomly assigned to as experimental or a control group. The patients in the experimental group (n = 57) received a special educational session on their admission day and had a tour of the cardiac surgery unit. The control group (n = 53) followed the routine hospital protocol, which encompassed almost no preoperative education or a tour. Anxiety was assessed using the Beck Anxiety Inventory while recovery was measured by physiological outcomes, days of hospital stay, and presence of complications. Borderline statistical significance was noted for the experimental group in terms of preoperative and postoperative anxiety. The experimental group had a shorter time from awakening to extubation.

Watson\(^62\) conducted a study to evaluate a preadmission education intervention to reduce pain and related activity interference after CABG surgery. Patients (N=406) were randomly assigned to (a) standard care or (b) standard care + pain booklet group. Data were examined at the preadmission clinic and across days 1-5 after surgery. Outcomes
were pain-related interference (BPI-I), pain (MPQ-SF), analgesics (chart), concerns about
taking analgesics (BQ-SF), and satisfaction (American Pain Society-POQ). The impact of
sex was explored related to primary and secondary outcomes. The intervention group did
not have better overall pain management although they had some reduction in pain-
related interference in activities and fewer concerns about taking analgesics on day 5.
Despite moderate 24-h pain intensity across 5 days, patients in both groups received
inadequate analgesics. Women reported more pain and pain-related interference in
activities than men. The booklet was rated as helpful, particularly by women. In
conclusion, the intervention did not result in a clinically significant improvement in pain
management outcomes. In future, an intervention that considers sex-specific needs and
also involves educating the health professionals caring for these patients may influence
these results.

Shuldham\textsuperscript{63} studied the consequences of pre-operative education, given before
admission, on postoperative pain, anxiety, depression and well-being in the 6 months
following a first episode of coronary artery surgery. 356 people were randomized into the
study, with 188 in the experimental and 168 in the control. Patients in the experimental
group received the intervention, a day of education by members of the multidisciplinary
team, prior to admission for surgery. Experimental and control subjects had the usual
care, which involved education on admission and throughout their stay in hospital.
Measurement was conducted on entry to the study, before randomization, and at 3 days, 6
weeks, 3 months and 6 months following operation. The study shows there was no
significant differences between groups in the primary outcomes in anxiety and pain or in
depression and wellbeing 6 months after operation. This was also the case 3 days after coronary artery surgery. There was a significant difference in length of hospital stay with the experimental group having the longer stay.

**Moore**\(^6^4\) conducted a randomized clinical trial to test the effects of an early home recovery information intervention on physical functioning, psychological distress, and symptom frequency 1 month following Coronary Artery Bypass Graft Surgery (CABG). Recovery outcomes were compared between two groups: those receiving an audiotape of information on expected physical sensations and their management (Cardiac Home Information Program [CHIP]) in addition to the usual care, and those receiving the usual cardiac discharge information protocol. A non-probability sample of 180 patients (84 women and 96 men; mean age = 62 years) was equally distributed between the two study groups. When controlling for age, co-morbidity, and cardiac functional status, the results showed positive effects on physical functioning in women and psychological distress, vigour and fatigue in men. Consistent with other studies, women had worse physical functioning and more symptom frequency than men. These findings indicate that the CHIP intervention is an effective method to prepare CABG patients for home recovery.

**Arthur**\(^6^5\) conducted a study to examine the effect of a multidimensional preoperative intervention on pre-surgery and post-surgery outcomes in low-risk patients awaiting elective CABG. 249 patients on a waiting list for elective CABG whose surgeries were scheduled for a minimum of 10 weeks from the time of study recruitment were selected.
During the waiting period, the treatment group received exercise training twice per week, education and reinforcement, and monthly nurse-initiated telephone calls. After surgery, participation in a cardiac rehabilitation program was offered to all patients.

Postoperative length of stay was the primary outcome. Secondary outcomes were exercise performance, general health-related quality of life, social support, anxiety, and utilization of health care services. Length of stay differed significantly between groups. Patients who received the preoperative intervention spent 1 less day in the hospital overall and less time in the intensive care unit. During the waiting period, patients in the intervention group had a better quality of life than control group. Improved quality of life continued up to 6 months after surgery.

Barnason found that shortened hospitalizations following cardiac surgery necessitate re-evaluation of how pertinent information for self-care management and reduction of coronary artery disease risk factors can be incorporated into an effective in-patient cardiac teaching program. This study investigated the effect of three different teaching approaches (i.e., an inpatient teaching program, a post-discharge telephone follow-up program, and a post-discharge group teaching program) among 90 patients who had undergone coronary artery bypass graft surgery. Teaching outcomes were evaluated in this study by use of the Heart Disease Management Questionnaire and Cardiac Surgical Patient Teaching Satisfaction Inventory. Analyses of the data revealed similar patient teaching outcomes regardless of the type of teaching intervention the participant received. Findings supported the effectiveness of the inpatient teaching protocol which focused on "survival skills" for self-care management post-discharge. The findings are important in
the redesign of teaching programs which are efficient yet meaningful to the patient within today's health care environment.

Rice\(^67\) randomized 50 adult coronary artery bypass graft surgery patients who received pre-admission self-instruction or post-hospital admission instruction of therapeutic exercises (e.g., coughing). Self-instructed subjects reported higher positive mood scores, performed correctly significantly more exercise behaviors, and required less teaching time following hospital admission. Postoperatively, no group differences were found on mood states, physical activity, analgesic use, or length of hospital stay. Both groups, however, tended to use less pain medication than that reported by other researchers and experience shorter hospital stays than that assigned under the Diagnostic Related Groups prescription.

Cuppes\(^68\) studied the effectiveness of preadmission preoperative education for patients having coronary artery bypass graft surgery (CABG). The sample consisted of 40 patients scheduled for an initial, elective CABG procedure. A randomized, experimental, post-test only design was used. Subjects in the experimental group received both pre-admission and post-admission preoperative education; those in the control group received only routine post-admission preoperative education. Outcome measures were (1) preoperative knowledge of CABG surgery and routine, (2) postoperative state anxiety, (3) postoperative mood state, and (4) physiological recovery. Subjects in the experimental group had significantly higher preoperative knowledge levels, decreased anxiety, more
positive mood states, and more favorable physiological recoveries than those in the control group.

**EFFECT OF ANXIETY AFTER CARDIAC SURGERY**

Tully\textsuperscript{69} reviewed that the most common anxiety disorders appear to be Generalized Anxiety Disorder (GAD) and panic disorder. Emphasis on panic disorder and GAD is possibly the result of recognition of their higher prevalence, and also, that each disorder is generally associated with adverse cardiac outcomes among CAD patients. With respect to other anxiety disorders in CABG patients, it is estimated that between 2.5% and 4.3% meet the criteria for social phobia; and between 0.6% and 2.1% meet criteria for obsessive compulsive disorder.

Dao\textsuperscript{70} examined the effect of clinical depression, post-traumatic stress disorder, and co-morbid depression with post-traumatic stress disorder on in-hospital mortality after a coronary artery bypass grafting surgery. An audit of 62,665 electronic medical records were carried out. The results suggested that deceased patients were more likely to have depression (alive, 24.8%; deceased, 60.3%), post-traumatic stress disorder (alive, 13.4%; deceased, 56.1%), and co-morbid depression with post-traumatic stress disorder (alive, 7.8%; deceased, 48.5%). They concluded two noteworthy findings - First, depression, post-traumatic stress disorder, and co-morbid depression with post-traumatic stress
disorder are prevalent in patients undergoing coronary artery bypass grafting procedures. Second, depression, post-traumatic stress disorder, and co-morbid depression with post-traumatic stress disorder increased the risk of death by magnitudes comparable with well-established physical health risk factors after coronary artery bypass grafting surgery.

McKenzie\textsuperscript{71} conducted a systematic review to provide an overview of the literatures related to the pre-operative prediction of post-operative depression and anxiety in individuals who have undergone CABG surgery. 46 studies were identified through a literature search of electronic databases conducted using explicit inclusion and exclusion criteria. The study characteristics, methodological features, and psychometric and clinical outcomes were summarised in a systematic manner. Collective appraisal of the studies indicated that symptoms of depression and anxiety exhibited after CABG surgery are best predicted by pre-operative measures of functioning in that area. Papers were inconclusive with respect to the predictive qualities of gender and age. Further research is required to clarify the predictive values of these and other factors, including pre-morbid ill health and socio-economic status. The findings of this review indicate a range of pre-operative predictors of post-operative depression and anxiety in patients with CABG. Prominent among these are pre-operative depression and anxiety. These findings have clinical implications concerning the importance of pre and post-operative psychological assessment and intervention for individuals at risk of poor psychological recovery.
Phillip\textsuperscript{72} conducted a study which indicated that the number of Coronary Artery Bypass Graft (CABG) surgery patients affected by depression (i.e., major, minor, dysthymia) approximates between 30\% and 40\% of all cases. A longstanding empirical interest on psychosocial factors in CABG surgery patients highlights an association with increased risk of morbidity in the short and longer term. Recent evidence suggests that both depression and anxiety increase the risk for mortality and morbidity after CABG surgery independent of medical factors, although the behavioural and biological mechanisms are poorly understood. Though neither depression nor anxiety seem to markedly affect neuropsychological dysfunction, depression confers a risk for incident delirium. Following a comprehensive overview of recent literature, practical advice is described for clinicians taking into consideration possible screening aids to improve recognition of anxiety and depression among CABG surgery patients. An overview of contemporary interventions and randomized, controlled trials are described, along with suggestions for future CABG surgery research.

Fariborz\textsuperscript{73} studied the effect of preoperative information and reassurance in decreasing anxiety of patients with CABGs. With experimental study in the form of before and after intervention 85 of 256 patients who were candidate for CABGs for the first time selected randomly to be studied during 6 months. Spielberger Questionnaire State – Trait Anxiety Inventory (STAI) is used for the evaluation of state and trait anxiety. 55 patients were male (64.7\%) and 15.3\% patients were university educated. Among patients with mild anxiety mean score changed from 34\(\pm\)4.2 to 39.38 \(\pm\)5.8 after reassurance education which was significant statistically. These numbers changed from 52.61\(\pm\)3.8 to 50.75\(\pm\)5.4
and 63.88±2.8 to 53.88±7.6 among patients with moderate and severe anxiety disorders. They concluded to do reassurance and education programs in patients with severe anxiety.

Gallagher conducted a study to determine (1) the course of anxiety, depression and perceptions of control, and (2) the influence of perceptions of control over their cardiac illness, in patients undergoing coronary artery bypass grafts before surgery, after surgery in hospital and 2 weeks after discharge. A descriptive design was used with a convenience sample of patients having coronary grafts (n=155). Anxiety and depression were measured by the Hospital Anxiety and Depression Scale and perceptions of control over their cardiac illness by the Control Attitudes Scale before surgery, after surgery, during hospitalization and 2 weeks after hospital discharge.

Patients had low levels of anxiety at each time point; however, borderline or clinically significant levels were common before surgery (38.7%) and after discharge (38.6%). Depression levels were low, but increased over time (F = 27.03). Patients had low to moderate perceptions of control over their illness before surgery, which increased over time (F = 25.51). Those with stronger perceptions of control were less anxious or depressed at all times and those who were more anxious or depressed before surgery continued to be so afterwards. Therefore routine assessment of anxiety, depression and perceptions of control are justified to identify patients at risk and to intervene to promote control perceptions.
Spezzaferri\textsuperscript{75} found that Coronary Artery Bypass Graft Surgery (CABG) is often followed by anxiety and depression that require early identification in order to provide adequate psychological support. The predictive role of tests administered soon after CABG on long-term psychological outcomes has been only incompletely explored. Aim of this study was to assess post-operative and 12-month persistence of psychological disorders by means of the Minnesota Multiphasic Personality Inventory (MMPI-2) and the depression and state and trait anxiety scales of the Cognitive Behavioural Assessment (CBA) in 118 male patients admitted to cardiac rehabilitation after CABG.

Early after CABG it was observed that a high prevalence of depression (11.8\% by MMPI-2 and 12.7\% by CBA) and state anxiety (23.5\%). At 1-year the MMPI-2 indicated stable mean score and high scores at entry were predictive of persistent depression. Conversely the CBA scale significantly decreased (from 3.86 +/- 3.19 to 2.91 +/- 3.45, \( p = 0.017 \)). Also ST1 state anxiety significantly decreased (from 35.17 +/- 6.95 to 32.55 +/- 6.72, \( p = 0.003 \)) whereas ST2 trait anxiety was stable. It was found that there was no association between psychometric results and ventricular function, number of grafts or time since diagnosis of coronary artery disease. Therefore it was concluded that state anxiety and depression by CBA significantly decreased 1-year after CABG; conversely trait anxiety and depression, investigated by MMPI-2, a more specific personality questionnaire, were stable. High scores for the depression in the scale of MMPI-2 early after CABG seem to be predictive of the persistence of the disorder at 1-year.
Fredericks\textsuperscript{76} used a descriptive correlation design to examine the relationship between anxiety and the achievement of knowledge, use of self-care behaviours, and management of symptoms which included a convenience sampling technique of Post-operative coronary artery bypass graft (CABG) patients. The requirement of educational interventions to support recovery and prevention of surgical complications was assessed. However, the effectiveness of these interventions is questionable, as stress related to the hospitalization process can result in increased levels of anxiety that may impact on the success of the education. The results indicated statistically significant correlations between anxiety and the outcomes of interest. Implications for practice include provision of educational interventions at times when anxiety levels are low.

Tully\textsuperscript{77} conducted a study to determine the association between depression, anxiety and general stress symptoms with hospital readmissions after coronary artery bypass graft surgery. 226 coronary artery bypass graft patients completed baseline self-report measures of depression, anxiety and stress and 222 patients completed these measures after surgery in the hospital ward. The hospital readmission outcomes at six months were analysed using multivariable proportional hazard models. When analysed as continuous variables in multivariable analyses, preoperative anxiety and postoperative depression predicted readmissions independent of medical covariates. In multivariable analyses with dichotomized anxiety, depression and stress, more than two-fold increase in readmission risk was attributable to preoperative anxiety and postoperative depression, independent of covariates. These results lend further support to previous research that has shown the
symptoms of depression and anxiety are associated with morbidity following coronary artery bypass graft surgery. The findings highlight the need to develop suitable interventions for anxiety and depression among coronary artery bypass graft surgery patients.

Gallagher\textsuperscript{78} conducted a study to describe the concerns of patients undergoing coronary artery bypass surgery and to identify concerns that were associated with higher levels of anxiety. Patients (n = 172) were interviewed to determine their concerns and anxiety levels before surgery, before discharge, and 10 days after discharge. Multiple regressions was used to determine the predictors of anxiety.

Although individual concerns changed over time, anxiety levels did not change from before to after surgery, remaining low to moderate. Being female and having more concerns about waiting for the surgery, being in pain/discomfort, and resuming lifestyle were predictors of increased anxiety before surgery. Predictors of increased anxiety while hospitalized after the surgery included taking anxiolytic or antidepressant medications, higher anxiety levels before surgery, concerns about personal things being inaccessible, and difficulty in sleeping. Patients with higher anxiety levels after discharge were older, more anxious before surgery, and had concerns about being in pain/discomfort.

Patients waiting for coronary artery bypass surgery should be routinely assessed for anxiety before the procedure, and interventions to prevent or reduce anxiety should be provided. Interventions must be multifactorial, including information and support for pain management and realistic information about surgery schedules and resuming lifestyle after the surgery. Women and older patients may need to be targeted for intervention.
Lie\textsuperscript{79} evaluated the effects of a home-based intervention program (HBIP) on anxiety and depression 6 months after coronary artery bypass grafting (CABG). In a prospective randomized controlled trial, 203 elective CABG patients were included. An HBIP structured for respondents in the intervention group was performed 2 and 4 weeks after surgery. Anxiety and depression symptoms were measured by the Hospital Anxiety and Depression Scale (HADS) in both patient groups before surgery, 6 weeks after surgery, and 6 months after surgery. A total of 185 patients completed the study: 93 patients in the intervention group and 92 patients in the control group. On 6-week and 6-month follow-ups, significant improvements in anxiety and depression symptoms were found in both groups. These improvements did not differ significantly between the groups. However, in a predefined subgroup of patients with anxiety and/or depression symptoms at baseline (n=65), improvement was significantly larger in the intervention group (n=29) than in the control group (n=36) after 6 months. Patients experiencing high levels of psychological distress before CABG surgery benefited from a structured informational and psychological HBIP. Implementation of psychological screens of patients scheduled for CABG might serve to identify patients experiencing anxiety and/or depression.

Gallo\textsuperscript{80} found that many patients experience decrements in cognitive function and emotional adjustment following coronary artery bypass graft (CABG) surgery. Moreover, cognitive decline and emotional distress are often positively related. This study evaluated the cross-sectional and prospective associations of emotional and subjective cognitive complaints, to assess the hypothesis that they would be mutually reinforcing. Participants
were 76 CABG patients recruited from Akron General Medical Centre. Depression and anxiety symptoms and perceived cognitive difficulties were evaluated at a baseline post-surgical visit and re-assessed 5 months later. Emotional symptoms and perceived cognitive difficulties were significantly related both within and across time. After controlling for numerous potential confounds, baseline perceived cognitive difficulties predicted a more negative course of emotional symptoms during follow-up. Baseline emotional symptoms did not predict the course of perceived cognitive difficulties. Perceptions of cognitive decline may contribute to emotional distress in patients post-CABG.

Gehi\textsuperscript{81} reported that Unipolar depression is characterized by depressed mood and/or loss of interest or pleasure, among other symptoms. The reported 15\% to 20\% prevalence of uni-polar depression among CABG surgery patients is consistent with that found generally among cardiac patients. Comparatively, the point prevalence among the general population is 5\% to 9\% for females and 2\% to 3\% among males suggesting CABG surgery patients have higher prevalence of depression than community samples.

Mallik\textsuperscript{82} followed 963 patients who underwent first CABG between February 1999 and February 2001. At baseline and at 6 months after CABG they were interviewed to assess depressive symptoms using the Geriatric Depression Scale (GDS) and physical function using the Short Form-36 Physical Component Scale (PCS). The patient's physical function was considered improved if the PCS score increased $> =5$ points at 6 months.
Patients with high GDS scores were younger, were more often female, and had worse physical function and higher co-morbidity than patients with low GDS scores. Rates of improvement in physical function were 60.1% for a GDS score <5 (below 75th percentile), 49.8% for a GDS score between 5 and 9 (75th to 90th percentile), and 39.7% for a GDS score > or =10 (> or =90th percentile;). Depressive symptoms remained a significant independent predictor of lack of functional improvement after adjustment for severity of coronary artery disease, angina class, baseline PCS score, and medical history. A GDS score > or =10 was a stronger inverse risk factor for functional improvement after CABG than such traditional measures of disease severity as previous myocardial infarction, heart failure on admission, history of diabetes, and left ventricular ejection fraction.

Hartford\textsuperscript{83} studied the effectiveness of an information and support telephone intervention for reducing anxiety in patients who have undergone coronary artery bypass graft surgery and their partners. The design adopted was randomized controlled trial. Intervention began at discharge; 6 telephone calls were made to patients and partners over 7 weeks. Primary outcome was Beck Anxiety Inventory measured at baseline in hospital, at home on day 3, week 4, and week 8. The results proved that Patients' anxiety was moderate to severe the day before discharge. It was significantly lower in the treatment group than in the control group at day 2 at home. Partners always had lower anxiety than patients. A more sustained decrease in anxiety in the partner treatment group was found at both day 2 and week 4. They concluded that Intervention effect is in the early period after discharge.
**Connerney**\(^{84}\) followed up for 1 year 207 men and 102 women, who had undergone coronary artery bypass graft surgery and assessed depression with a structured psychiatric interview (diagnostic interview schedule) and a questionnaire (Beck depression inventory) before discharge. Cardiac events included angina or heart failure that needed admission to hospital, myocardial infarction, cardiac arrest, percutaneous transluminal coronary angioplasty, repeat CABG, and cardiac mortality. Non-cardiac events consisted of all other reasons for mortality or readmission. They found out that 63 patients (20%) met modified diagnostic statistical manual IV criteria for major depressive disorder. At 12 months, 17 (27%) of these patients had a cardiac event compared with 25 of 246 (10%) who were not depressed. Five variables had significant univariate associations with cardiac events: sex, living alone, low ejection fraction (≤0.35), length of hospital stay, and depression. In a Cox proportional-hazard model with these five and two other variables of cardiac severity, major depressive disorder, low ejection fraction, and female sex were associated with adverse outcomes.

**McCrone**\(^{85}\) conducted a longitudinal study to describe the incidence and pattern of anxiety and depression in older patients who undergo coronary bypass graft surgery and to determine the influence of gender and age on psychological recovery. A sample of 31 patients was assessed pre and post-operatively at 2 to 3 days and at 2, 4, 8, and 12 weeks. Younger subjects experienced higher anxiety, reaching statistical significance at 2 and 4 weeks. Women had significantly higher trait and state anxiety and a higher, non-significant incidence of depression at all times. Younger subjects were more depressed at
2 to 3 days and at weeks 2 and 4. As women and younger patients are at higher risk for psychological distress, they should be targeted for interventions.

**Ingela**$^{86}$ studied sense of coherence and emotional state as indirect measures of quality of life in relation to coronary artery bypass grafting surgery. 111 patients were studied by a developed questionnaire on five occasions in relation to the surgery: the week before the surgery, the day before surgery and then at 3, 6, and 12 months post-operatively. The main findings were: (1) The sense of coherence was changed (more than ±10%) from before to 1 year after surgery in 41% of the patients, which is contrary to the theory of sense of coherence as a stable personality characteristic in adults. (2) Experience of depressed mood, stress, and anxiety decreased significantly from before to after surgery. (3) Beneficial outcome with regard to sense of coherence was significantly related to less experience of loneliness, depressed mood, stress and anxiety, and to less experience of chest pain 1 year after surgery. They concluded that sense of coherence and emotional state variables, are suggested to be valuable as measurements of quality of life in relation to coronary artery bypass grafting surgery.

**Duits**$^{87}$ conducted a review to study predicting psychosocial outcome after coronary artery bypass graft surgery (CABG). 17 prospective studies, appearing in the MEDLINE and PsycLIT databases between 1986 and 1996, were reviewed regarding objectives, methodological issues, results, and clinical relevance. All studies reported that psychological factors had bad predictive value. In particular, preoperative anxiety and
depression predicted postoperative psychological maladjustment; social support, preoperative feelings of control, denial, and optimism contributed to psychological adjustment.

Many specific psychological outcomes seem to be best predicted by preoperative assessment of functions in that specific area, especially in the case of anxiety and depression. Furthermore, personality factors including denial, optimism, control, and the need for support appear to be predictors of psychological outcome. Appropriate identification of predictive factors might improve the development of individually tailored interventions for patients at risk of postoperative psychological problems.

**EFFECT OF PAIN AFTER CARDIAC SURGERY**

Koranyi\(^{88}\) compared the efficacy of psychological interventions as an adjunct to standard care versus standard care alone or standard care plus attention in adults undergoing open heart surgery on pain, pain medication, mental distress, mobility, and time to extubation. Acute post-operative pain is one of the most disturbing complaints in open heart surgery, and is associated with a risk of negative consequences.

19 trials were included (2164 participants). No study reported data on the number of participants with pain intensity reduction of at least 50% from baseline. Only one study reported data on the number of participants below 30/100 mm on the Visual Analogue Scale (VAS) in pain intensity. Psychological interventions have no beneficial effects in reducing pain intensity measured with continuous scales in the medium-term interval nor
in the long-term interval. No study reported data on median time to remedication or on number of participants remedicated. Only one study provided data on postoperative analgesic use. Studies reporting data on mental distress in the medium-term interval revealed a small beneficial effect of psychological interventions. Likewise, a small beneficial effect of psychological interventions on mental distress was obtained in the long-term interval. There were no beneficial effects of psychological interventions on mobility in the medium-term interval nor in the long-term interval. Only one study reported data on time to extubation.

For the majority of outcomes (two-thirds) it could not perform a meta-analysis since outcomes were not measured, or data were provided by one trial only. Psychological interventions have no beneficial effects on reducing postoperative pain intensity or enhancing mobility. There is low quality evidence that psychological interventions reduce postoperative mental distress. Due to limitations in methodological quality, a small number of studies, and large heterogeneity, it rated the quality of the body of evidence as low. Future trials should measure crucial outcomes (e.g. number of participants with pain intensity reduction of at least 50% from baseline) and should focus to enhance the quality of the body of evidence in general. Altogether, the current evidence does not clearly support the use of psychological interventions to reduce pain in participants undergoing open heart surgery.

Kaur conducted a study to assess the effect of planned preoperative teaching on self-care activities for patients undergoing cardiac surgery. A quasi-experimental design was used based on convenient sampling technique. Total 40 subjects 20 each in the
experimental (Group I) and control group (Group II). In each group an equal number of subjects 10 each were included undergoing two types of cardiac surgery i.e. open (Group A) & closed (group B) heart surgery. A checklist with 40 items was framed to assess the level of performance during preoperative period, before the implementation of teaching on self-care activities and as well as on the 4th and 7th postoperative day. The control group did not receive any preoperative teaching. Data analysis showed that statistically there was no significant (P>0.05) difference of pre-test performance scores was found between the two groups. A comparison of post-test performance scores between both groups shows that experimental group had strongly statistically significant (P<0.001) increase in performance of total scores as well as each variable of self-care activities. The findings of the study reflect that the preoperative teaching is an extremely effective medium to increase the level of performance and enhance the early recovery of the subjects.

Tore\textsuperscript{90} tested the efficacy of an information intervention upon emotional recovery following coronary artery bypass surgery. A Randomized trial of Video information was combined with individualized information sessions carried out by nurses at admission and at discharge from the hospital. The video was shown pre-operatively and again during the session at admission. Patients were helped to express their questions and worries and congruent information and support was provided. Control group patients received standardized information and no video. Recordings were made at baseline,
discharge from hospital and during a 2 years follow-up period. 109 patients were randomized to the intervention or the control groups.

MANOVA was used to test of the variance of the outcome variables at each time point. At discharge intervention patients reported less anxiety (p = 0.046) and better subjective health (p = 0.005). They reported better subjective health during the whole follow-up period (0.040 ≥ p ≥ 0.000), less anxiety up to 1 year (0.042 ≥ p ≥ 0.004), and less depression from 6 months to 2 years following discharge (0.023 ≥ p ≥ 0.004).

Miaofen conducted a study to explore the effects of breathing relaxation therapy in reducing pain and increasing heart rate variability in cardiac surgical patients. Pain is the most common problem for cardiac surgical patients. The physiological-theoretical basis of the breathing relaxation therapy was cognitively inducing respiratory sinus arrhythmia, thus increasing heart rate variability. With the development of non-pharmaceutical pain control, the effect of breathing relaxation therapy in pain control was increased of respiratory-driven parasympathetic activity and heart rate variability.

30 patients were randomly assigned into experimental and control group, respectively. The control group received ward routine without intervention of breathing relaxation therapy. Before the operation, the patients in experimental group had trained and practiced of breathing relaxation therapy. After the patients were transferred from ICU to ordinary ward, the breathing relaxation therapy was done twice a day until 7th post-operative day. The effects of breathing relaxation therapy in reducing pain in cardiac surgical patients were evaluated in this study by the following parameters: level of pain, heart rate variability index. Visual Analogue Scale measured the level of pain. Biocom
Heart Rhythm Scanner, Version 2.0 was used to measure patients' heart rate variability index.

The study revealed that breathing relaxation therapy could reduce pain and increase heart rate variability. Therefore Breathing relaxation therapy is really a simple and effective non-pharmaceutical pain control treatment, and it is worth to widely applied in the clinical practice.

Shuldham\textsuperscript{92} conducted a randomized controlled trial designed to elucidate the consequences of pre-operative education, given before admission, on postoperative pain, anxiety, depression and well being in the 6 months following a first episode of coronary artery surgery.

356 people were randomized into the study, with 188 in the experimental and 168 in the control group. Patients in the experimental group received the intervention, a day of education by members of the multidisciplinary team, prior to admission for surgery. Experimental and control subjects had the usual care, which involved education on admission and throughout their stay in hospital. Measurement was conducted on entry to the study, before randomization, and at 3 days, 6 weeks, 3 months and 6 months following operation. A variety of tools were used: the SF-36 Health Status questionnaire, the Hospital Anxiety and Depression scale, the General Well-Being questionnaire and a pain measurement tool. Analysis showed no significant differences between groups in the primary outcomes namely anxiety (P=0.09) and pain (P=0.48), or in depression (P=0.62) and wellbeing ('worn out' P=0.11; 'tense and uptight' P=0.29) 6 months after operation.
This was also the case 3 days after coronary artery surgery. There was a significant difference in length of hospital stay (P=0.01) with the experimental group having the longer stay.

Hsing-Yu Yang\textsuperscript{93} conducted a study to find the effect of breathing relaxation therapy in reducing pain and physiological responses in cardiac surgical patients. Pain is an unavoidable problem for cardiac surgical patients, and it can induce many changes in physiology and affects the recovery from the surgery. With the development of non-pharmaceutical pain control, the effect of relaxation therapy in pain control was emphasized and confirmed in the recent years.

This experimentation collected 60 cardiac surgical patients from the cardiac surgical ward of a medical centre. There were 30 patients in experimental and control group, respectively. The patients in control group received only routine care without intervention of relaxation therapy. Before the operation, the patients in experimental group had trained and practiced of breathing relaxation, which was aided by 15 minutes of records through the earphone. After the patients were transferred from ICU to ordinary ward, the relaxation therapy was done twice a day until 5\textsuperscript{th} post-operative day. The effect of relaxation therapy in reducing pain in cardiac surgical patients was evaluated in this study by the following parameters: level of pain, physiological responses (including heart rate, systolic pressure, diastolic pressure, mean arterial blood pressure, and digital temperature). The result of this study revealed that relaxation therapy could effectively reduce pain and diastolic pressure and increase digital temperature. The relaxation therapy's effect were influenced by individual characteristic and therapeutic history, such
as age, sex, status, religion, diagnosis of cardiac diseases. As a whole breathing relaxation therapy is really a simple and effective non-pharmaceutical pain control treatment, and it is worth to be widely applied in the clinical practice.

Watson\textsuperscript{94} conducted a pilot study to evaluate the effect of preadmission educational booklet for patients undergoing their first uncomplicated CABG. Patients have been found to receive inadequate analgesia despite moderate to severe pain after coronary artery bypass graft (CABG) surgery. A Randomized Controlled Trial (RCT) was undertaken at the largest cardiovascular centre in Canada. Repeated measures were used to compare data from 3 interviews: at baseline, day 3, and day 5. Patients were randomly assigned to one of 3 groups at the preadmission clinic 2 to 7 days before surgery: (1) generic hospital booklet and videotape (control), (2) control + pain booklet, or (3) control + pain booklet and interview. 45 subjects completed all 3 interviews. Measures were the McGill Pain Questionnaire-Short Form and the American Pain Society Patient Outcome Questionnaire. For all groups, analgesic administration was inadequate despite unrelieved pain. However, patients receiving the interventions in addition to control care received 46% more analgesia than patients receiving control care alone and had fewer concerns about asking for help and taking analgesia. Changes were not required in the intervention booklet or measures.
QUALITY OF LIFE AFTER CABG SURGERY

Macken\textsuperscript{95} conducted a study to examine Health-Related Quality-Of-Life (HRQOL) outcomes in coronary artery bypass surgery (CABS) patients and partners enrolled together in cardiac rehabilitation versus a usual care group.

After CABS, couples were randomly assigned to the Partners Together in Health (PaTH) intervention (n = 17) or usual care (n = 17) groups. Health-related quality-of-life was operationalized as physical function (SF-36 Physical Functioning subscale), depression (Patient Health Questionnaire), and marital adjustment (Dyadic Adjustment Scale). Data were measured in patients and partners at the start (T1) and end of cardiac rehabilitation (T2), and 3 months after cardiac rehabilitation (T3). Patients in both groups, and partners in the PaTH group, significantly improved physical function between T1 and T2. At T1, 18\% of patients and 6\% of partners were depressed. At T2 and T3, only 3\% of patients and no partners were depressed. Almost 12\% of patients and partners were maritaly distressed at T1. At T2 and T3, patients' marital distress was unchanged, but more partners reported marital distress (15\%). Patients and partners are impacted by CABS as a shared life experience, couple-centred interventions may improve HRQOL outcomes more than individually focused interventions.

Thomson\textsuperscript{96} studied the increased understanding of patients' and partners' HRQOL before and after CABG. Further he explored whether patients' and partners' pre-operative socio-
demographics and HRQOL predict their own, and also partners' HRQOL 4 months after CABG.

This study recruited 84 client (patients 84% males, aged 64.5 years; partners 94% females, aged 61.05 years). Patients' and partners' perceived health status was assessed using the Short-Form 12 Health Survey. Patients' physical limitation, angina symptoms and treatment satisfaction were assessed using the Seattle Angina Questionnaire. Partners' emotional, physical and social functioning were assessed using the Quality of Life of Cardiac Spouses Questionnaire. Patients most likely to have poorer physical health post-operatively were associated with partners who had poorer pre-operative physical health. Partners most likely to have poorer emotional, physical and social functioning post-operatively were associated with patients who had poorer pre-operative mental health. Patients' and partners' poorer post-operative HRQOL was also explained by their poorer pre-operative HRQOL.

The partners' involvement should be considered as part of patients' pre-operative assessment. Special attention needs be paid to patients' pre-operative mental health since it is likely to impact on their post-operative mental health and the partner's emotional, physical and social functioning.

Rothenhäusler assessed the course of health-related quality of life, cognitive and emotional change during the six months after elective CABG, and to investigate how cognitive impairments, depression and post-traumatic stress symptoms were related to quality of life. In a prospective study, they followed up for 6 months 138 of the original 147 patients who had undergone elective CABG surgery. Preoperatively, and at 6 months
after surgery, a series of psychometric observer-rating and self-rating scales were administered to evaluate cognitive functioning (SKT), depressive symptoms (BDI), post-traumatic stress symptoms (PTSS-10), and Health-Related Quality Of Life (SF-36 Health Status Questionnaire). The measurements of Health-Related Quality Of Life (HRQOL) indicated significantly higher SF-36 values on all of the eight health-related domains from preoperative to 6-month follow-up assessments. However, at 6-month follow-up, patients with clinical depression had significantly lower SF-36 values on all of the eight health-related domains when compared with patients without depression. Also, at 6-month follow-up, patients with posttraumatic stress disorder (PTSD) had significantly lower SF-36 values on six of the eight SF-36 health categories when compared with patients without PTSD. Finally, at 6-month follow-up, patients with cognitive deficits had significantly lower SF-36 values on physical functioning when compared with patients without cognitive impairments. They suggested for early and comprehensive bio-psycho-social diagnosis and therapy of post-CABG patients in order to treat emotional distress and CABG-related cognitive impairments and enhance patients' quality of life at an early stage after cardiac surgery.

Azzopardi\textsuperscript{98} did a longitudinal study to examine patient-perceived health-related quality of life (HRQOL) and depressive symptoms 2 years after coronary artery bypass graft surgery (CABGS) compared with the results from pre-operative and 1 year post-operative data and to compare the 2-year follow-up data with Australian population normative scores. 87 participants were recruited pre-operatively, and their HRQOL was assessed
before, 6 weeks, 1 year, and 2 years post-operatively using the Short Form-36 (SF-36) health survey questionnaire and the Beck Depression Inventory.

48 participants completed both questionnaires 2 years after CABGS. Short Form-36 mean scores indicated an overall improvement in all aspects of HRQOL, with a statistically significant improvement in 5 of the SF-36 health domains and in the physical component summary. Comparison of 1- and 2-year SF-36 scores revealed a moderate, non-significant deterioration in 6 of the health domains and in the physical component summary, whereas Mental Health and the Mental Component Summary showed a moderate, non-significant improvement. Two-year postoperative SF-36 scores were similar to normative scores of the Australian population with heart disease. Beck Depression Inventory mean scores were within the normal range (<or=9) at 2 years postoperatively and not significantly different from preoperative scores. The research indicated that most of the participants had significant improvements in their perceived health status 2 years after CABGS and no significant depressive symptoms had been noted. This has important implications for the planning of nursing care and patient education after CABGS.

Rantanen studied the changes in health-related quality of life and associated factors among patients having coronary artery bypass grafting and their significant others. Data was collected at 1, 6 and 12 months after coronary artery bypass grafting surgery from patients and significant others at one university hospital in Finland in 2001-2005 from 163 patients.
The findings suggested that Patients' and their significant others' health-related quality of life was at its lowest one month after the operation and improved during follow-up. The change in the mean health-related quality of life score differed between patients and significant others; the improvement in the patients' health-related quality of life was greater than that in the significant others. Neither the background variables used in the study nor social support was associated with change in health-related quality of life.

Lee reported of Health-Related Quality Of Life (HRQOL) five years after CABGS. Patients participated in the follow-up study using the quality of life Short-Form 36 (SF-36) questionnaire. Angina and breathless symptoms were also recorded. Patients were interviewed (face-to-face) and 19 completed postal questionnaires. The SF-36 component summaries of the face-to-face patients indicated that their physical (PCS) and mental (MCS) health was relatively good (45.8 and 53.6, respectively, with 0=worst health and 100=best health and 50 being the mean score), compared to the postal patients' mean PCS of 30.8. The postal MCS was also lower but not statistically significant (49.6, p=.081). At follow-up, the majority of patients were asymptomatic in terms of angina and breathlessness compared to their pre-operative status.

The findings demonstrate that patient perceived HRQOL five years after CABGS is generally good and patients remain relatively asymptomatic although data collection methods highlight differences in physical HRQOL.
Ballan conducted a study to investigate recovery from Coronary Artery Bypass Graft Surgery (CABGS) on the basis of patient perceived QOL and in particular, physical and mental health. Traditionally, evaluation of outcome post cardiac surgery has focused on objective measures of cardiovascular status. The emphasis has shifted to examining an individual's Quality Of Life (QOL). However a gap in Australian prospective research assessing QOL from a pre-operative period to the early stage of six weeks post-operatively exists. Prospective longitudinal quasi-experimental study in a tertiary hospital in Melbourne, Australia. 54 patients undergoing their first or second CABGS completed pre- and post-operative questionnaires.

The Short Form 36 (SF-36) questionnaire was used to measure physical and mental QOL pre- and post CABGS and gives eight domain scores as well as a physical (PCS) and mental component summary score (MCS). SF-36 scores following CABGS were significantly improved in three of the eight domains: physical functioning; general health perception; energy/vitality; and PCS. No statistical difference was found in patients' MCS pre- and post-operatively. Of importance, patients reported higher levels of pain at six weeks post-operatively compared to their pre-operative levels but scores were not significantly different.

The SF-36 demonstrates improvements in physical QOL six weeks after CABGS compared to preoperative results but no difference in mental QOL suggesting psychological adaptation. An increase in the pain score at six weeks suggests inadequate pain management in these patients.
Thornton\textsuperscript{102} assessed neuropsychological deficits, self-reported health-related quality of life, and mood, together with proxy rating of patients' activities after bypass surgery. 71 patients were followed over a period of 6 months period. Assessment was done 1 week before surgery and post-operatively at 2 and 6 months. Within patient change was assessed with the neuropsychological test battery and procedures recommended by the Consensus Panel, the Short Form-36 to measure self-reported health-related quality of life, and the Hospital Anxiety and Depression Scale questionnaire to assess anxiety and depression. Proxy ratings were documented with the Functional Activities Questionnaire. 

The results show that POOR preoperative health-related quality of life was largely unrelated to medical variables. Cognitive deficit was found in 42% of patients at 2 months and 22% of patients at 6 months. Physical health-related quality of life improved, but benefit for emotional and social functioning was unconvincing, especially over the short term. Although cognitive deficits were largely unrelated to Short Form-36 health-related quality of life, and only partially related to anxiety and depression, they were associated with proxy ratings of patient functioning.

Arthur\textsuperscript{103} examined the effect of a multidimensional preoperative intervention on pre-surgery and post-surgery outcomes in low-risk patients awaiting elective CABG. The primary outcome measured was Postoperative length of stay. Secondary outcomes were exercise performance, general health-related quality of life, social support, anxiety, and utilization of health care services.
During the pre-operative period, the treatment group received exercise training twice per week, education and reinforcement, and monthly nurse-initiated telephone calls. After surgery, participation in a cardiac rehabilitation program was offered to all patients.

Length of stay differed significantly between groups. Patients who received the pre-operative intervention spent 1 less day in the hospital overall and less time in the intensive care unit. During the waiting period, patients in the intervention group had a better quality of life than controls. Improved quality of life continued up to 6 months after surgery. Mortality rates did not differ.

Hunt\textsuperscript{104} studied the relationship between preoperative risk factors, postoperative chronic pain, sleep, and gender on perceptions of quality of life (QOL) in a sample of 123 coronary artery bypass graft (CABG) surgery patients 12 months after surgery. A secondary purpose was to determine whether there is concordance between spousal and patient reporting of QOL after CABG surgery. A cross-sectional comparative study included patients living in the community, who had CABG surgery 12 months earlier at The Alfred hospital Melbourne, Australia.

Results were assessed using The Medical Outcome Study Short Form-36 (SF-36) questionnaire and additional questions given at 12 months after CABG surgery. The Cleveland Clinical Severity Score (CSS) was used preoperatively as a tool to predict QOL outcome.
Significant improvements in QOL, as measured by the SF-36, were seen in physical functioning, bodily pain, social functioning, and role limitations resulting from emotional status. Other significant associations were found between poor QOL and patients who reported severe pain or poor quality sleep. Low-risk patients, as identified by the preoperative CSS, were more likely to have improved QOL at 12 months. Alteration in QOL was reported equally by patients and their spouses or NOK (next of kin).

N Caine determined the long term health related quality of life of coronary artery bypass graft patients, changes between one and five years after surgery, and the ability of pre-operative variables to predict longer term outcome. 100 male patients aged < 60 years at time of surgery were selected; among them 77 had three vessel disease and 84 received three or more saphenous vein grafts. The results showed that in comparison with the five year results with one year, there were slight improvements, in the dimensions of pain, sleep, social isolation, and emotional reactions, whereas signs of deterioration were noted in the physical mobility and energy scores. Chest pain was experienced by 34 of 84 patients at five years compared with 17 of 89 patients at one year. The proportion of patients who were unrestricted in their activities ranged from 61-70% at five years compared with 82-88% at one year. Absence of dyspnea before surgery, indicating relatively good left ventricular function, was a predictor of good outcome at both one and five years.
Jaarsma\textsuperscript{106} studied the recovery and quality of life after bypass surgery. Data was collected from 56 samples during hospital admission and during two home visits at 6 and 12 months after Coronary Artery Bypass Grafting (CABG). Patients reported improved state of health and quality of life. Most of the changes occurred within the first six months after discharge. However, for most patients life had more or less returned to normal one year after CABG. It was also found that few of the patients changed their risk behaviour after surgery.

Guadagnoli\textsuperscript{107} compared the quality of life in post-CABG patients greater than 65 years of age versus those less than 65 years of age. Surprisingly, results revealed that the two age groups had similar improvements, from pre-admission to post-CABG, in activities of daily living, and emotional and social functioning. The only significant difference was found in mental health status. The age group less than 65 years scored lower, possibly because it expected to recover more quickly and had greater expectations of the benefits of the surgery.

\section*{SUMMARY}

This chapter deals with the review of literature related to the present study. The reviewed literature is related to effect of Pulmonary Rehabilitation & patient education after CABG Surgery. It also tried to observe the effect of anxiety after cardiac surgery and overall how it will affect Quality of life after CABG Surgery
Current guidelines recommend Pulmonary Rehabilitation Programs as a means to improve patients functional status after coronary revascularization. A combination of variables to predict HRQL (Health Related Quality Of Life) after CABG, such as functional capacity, psychological status and physiological status, including existence of co-morbidity is important to determine if physical fitness combined with other confounding factors, mentioned above, can predict the HRQL of a patient after CABG. This information could be extremely beneficial to allow surgeons to predict if CABG would improve a patients’ HRQL. Therefore, more research is needed in order to accomplish these goals.

Therefore it would be interesting to test the effectiveness of the program. The program would be aimed at improving health by encouraging active participation of health care consumers by identifying effective interventions for client with CABG Surgery