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Effect of an Early Mobilization Program on Functional Capacity after Coronary Artery Bypass Surgery a Systemic Review

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Introduction to the Study

Cardiac surgery has worldwide excellent results for improving of patients' functions. Coronary artery bypass surgery is an effective treatment of ischemic heart disease. Approximately 90% of patients will have relief of symptoms of angina without requiring ongoing medications. The procedure itself is considered relatively safe with a mortality less than 1% if the patient has normal heart function. CABG is performed to improve the coronary artery blood flow and reduce the symptoms of myocardial ischemia, improve the ventricular function and to prevent the progression of the acute myocardial infarction and reduce the mortality [1,2]. In the CABG surgery, sections of saphenous vein, internal mammary artery, radial artery, subscapular artery, and right gastroepiglotic arteries are used. CABG surgeries were performed via a median sternotomy.

After the CABG patient suffers from variety of musculoskeletal and neurological complications, due to the sternotomy patient develop strain on the chest, back, shoulders, and neck due to the sternal halves are retracted [3]. These muscle areas are essential for normal breathing. Due to strain on these muscles, patients suffer from many muscular and pulmonary complications after surgery. There complications include pleural effusion, atelectasis, low cardiac output syndrome, postoperative bleeding, infection, and difficulty in glycemic control, increase duration of mechanical ventilation, sedation and muscle weakness. Effects of immobility after CABG includes loss of muscle mass and strength due to decrease protein synthesis and increase proteolysis. Which results in decreased functional capacity, and increase respiratory complications [1]. These complications can lead to more hospital costs, even leads to more morbidity and mortality [4]. In prospective studies of Egyptian patients after open-heart surgery, 86% of the patients had postoperative complications with morbidity and mortality rates of 23%and 1.7% respectively. The incidence of postoperative cardiovascular complications was 28.1% (dysrhythmia 9.9%, sudden stroke 3.3%, bleeding 3.3%, thrombus 11.7%). Other complications included pulmonary (4.5%), infections (4.6%) and renal impairment (7.6%) [5]. To prevent all complications, patients can do physical therapy treatments, which include early mobilization, the active style of breathing techniques, positioning, breathing exercises, assistive mechanical devices, breathing exercises and inspiratory muscle training [6].

Definitions

Early mobilization: The gradual increase of activity starting on the first postoperative day until independent ambulation on the fifth postoperative day [1,2].

Early mobilization means bed mobility, ROM exercises and withdrawal of bed and walking. which leads to lung expansion that improves alveolar ventilation, decrease work of breathing, increases functional outcome, improves cardiac output, improves venous return, myocardial contractility, the patient's overall functions and mobility, improve muscle strength, decrease morbidity and mortality rate, and also reduce the length of hospital stay [1]. It is feasible, too. It requires careful patient assessment and management that includes patient safety [5]. Safety during the early mobilization includes fall prevention, removal of endotracheal tubes, removal of intravascular catheters, removal of catheters, cardiac arrest, hemodynamic changes and oxygen desaturation. Barriers for early mobilization includes physiological instability, sedation, delirium, patient refusal, anxiety, poor culture what does poor culture mean, lack of communication, risk of mobility and early ward transfer [7]. To see the effects of early mobilization on functional capacity, A standard test, 6-minute walk test (6MWT) is used, in which patients have to walk as fast as they can in 6- minute without running as recommended by American Thoracis Society [4].

Study done by Da Costa Torres et al., shows that patients who get early mobilization shows improvement in the distance walked in the 6MWT after 7 postoperative days and 60 days after hospital discharge compared to control group. Sternal precaution should be considered during the early mobilization of the patient following the CABG surgery [1]. Arm movements especially shoulder flexion/abduction above 90 degree and scapular adduction should

be avoided Other precaution includes not lifting more than 5 to 10 pounds, avoid weight bearing through the upper extremity and avoid unilateral reaching posteriorly [3]. During the coughing and other activities use of external thoracic support helps to lower the stress on the sternum. According to Jenkins S, soutar S, Loukota J, Johnso L, Moxham J "It has multiple use but there is a lack of standardization in intensity, type, frequency and duration of exercise."

Thus, this study aims to assess the effectiveness of early mobilization on the functional capacity of patients undergoing CABG.

Research Questions

1. Does early mobilization after CABG improves breathing, strength and functional capacity of the patients and henceforth decrease hospital stay after surgery?
2. Does early mobility affect morbidity, mortality and survival rate of uncomplicated cardiac patients after CABG surgery?

Review of the Literature

For a physical therapist, treating patients after coronary artery bypass grafting (CABG) surgery is essential to prevent post-surgical complications, facilitate early discharge of the patient and to facilitate fast recovery of the patient. So, studies used in this paper will provide information regarding the effect of early mobilization on patient's overall recovery and shorter hospital stay after CABG surgery.

Early CABG Surgery

CABG surgery was first performed 50 years ago, on May 9th,1967, by Dr. René G. Favaloro, an Argentine surgeon operating at the Cleveland Clinic. Historically, he officially performed the first coronary artery bypass graft surgery (CABG) of the modern era. According to Braz J Cardiovasc Surg. Due to till the day there was no better therapy found than CABG surgery [9]. Since 1772, the date is wrong and no reference for it Cardiac rehabilitation programs have become an integral part of the standard of care in modern cardiology. Cardiac rehabilitation is a class I recommend in most current guidelines of cardiovascular societies worldwide [10]. According to Warner M, et al., cardiac rehabilitation was described and tested by many researcher and results are always questionable due to lack of technology and findings. As Warner M et al. mentioned in his article that the works of many pioneer researcher helped in establish the physiologic basis of exercise benefits.

This basis led to the development of Cardiac rehabilitation programs as a multidisciplinary approach to help cardiovascular patients to recover and optimize their functional and mental status.

Phase I or Inpatient phase of cardiac rehabilitation is integral part of this study. Mainly because of pre-surgical and post-surgical hospital stay of patients undergoing CABG surgery. The inpatient cardiac rehabilitation programs are mostly limited to early mobilization to make self-care and to perform simple household tasks possible by discharge, and brief counselling [10]. According to study done in 1987, low level exercise program was successful in prevention of deconditioning effect of prolong bed rest and showed decrease in level of anxiety and depression that followed cardiac surgery [11]. The data of study done by Ungerman-deMent P, Bemis A, & Siebens A, et al also stated that patients who did not participated in low-level exercise after bypass surgery discharged from hospital with lower activity levels than patients who participated. Patients who participated showed improved activity level, decrease frequency in loss of functional level by the time of discharge and shorter hospital stay after surgery compare to patients who did not participate in low-level exercise program. A study done in by Van ID, Vliet TP, Versteegh MI, Lok JJ, Munneke M, & Dion RA in 2004 compared effect of low-level and high-level physical activities on 246 patients who underwent CABG surgery. This study also proven that early physical activities in postoperative patients results in shorter stay in hospital [12]. Further studies done by Ahmed HH, Ibrahim Y, Soussi AH & Said MM and Stein R, Maia CP, Silveira AD, Chiappa GR, Myers J & Ribeiro JP also back the previous studies by giving evidence that early mobilization after CABG surgery results in increase in functional capacity and early discharge from hospital in patients [5,13].

Research on Early Effectiveness of Physical Therapy

Da Costa Torres D, dos Santos PMR, Reis HJL, Paisani DM & Chiavegato LD did a study to establish the effectiveness of early mobilization on the functional capacity of patients undergoing CABG and with that also to evaluate the influence on the length of the hospital stay and the development of postoperative pulmonary complications (PPC) [1,2]. By this study they tried to emphasize the importance of identifying the need for specific protocols for continued rehabilitation and new physical therapy strategies. In this study they took 66 post-operative CABG patients of both ganders, aged between 18 to 80 years. These patients were divided in to 2 randomized groups: control group (CG) (n=33) and intervention group (IG) (n=33). The CG received only breathing exercise whereas IG received aerobic exercise and breathing exercise. These patients were assessed on first day, 7th day and 60th postoperative days for functional outcomes like physical activity level (Baecke Questionnaire), Functional Independence Measure, and functional capacity (6min walking test).

In study done by Mungovan S, Singh P, Gass G, Smart N & Hirschhorn A, they tried to determine effect on hospital stay and functional capacity between physical activities (done postoperatively after CABG) under physical therapist's supervision and done independently by patients, during postoperative day 1 to postoperative day 5 [14]. They monitored 83 adults during this study and assessed them on postoperative 6th day using 6-min walk test (6MWT). Step count and physical activity intensity (METs; metabolic equivalents) were taken as the main outcome measures. The result of this study stated that Physiotherapist-supervised activity promote improvements in postoperative physiological functional capacity and reduces length of stay in hospital following cardiac surgery.

Santos P, Ricci N, Suster É, Paisani D & Chiavegato L did study to evaluate the evidence for the effects of early mobilization in patients after cardiac surgery on length of hospital stay, functional capacity and postoperative complications [2]. They collected data from different resources like Medline, Embase, CINAHL, PEDro, Web of Science and Cochrane Central Register of Controlled Trials. They concluded that early mobility prevents bed rest and hence prevent postoperative complications, improve functional capacity and reduce length of hospital stay in patients after cardiac surgery.

History of Work in Cardiac Rehabilitation

Cardiac rehabilitation consists of three phases that help to facilitate the recovery and to prevent the further complication of cardiovascular disease. The aim of cardiac rehabilitation was

to help the patients to regain normal activities of daily living. Cardiac rehabilitation program includes "medical evaluation, prescribed exercise, cardiac risk factor modification, patient and family education and counselling" [15]. The coherence review of exercise based cardiac rehabilitation for coronary heart disease shows in the reduction of mortality from 10.4% to 7.6% in the postoperative myocardial infarction and revascularization patients.

A systemic review done by Dinnes J, Kleinjnen J, Leitner M & Thompson D (1999) revealed that combined approach of exercise and psychological and educational interventions is more beneficial than the single modality intervention. One RCT of multifactorial rehabilitation shows a clear reduction in mortality among the patient who had a Myocardial Infarction [16].

In a study conducted by Hirschhorn, AD et al. on the therapeutic effect of walking training in the early rehabilitation stage shows there is significantly better result of walking group compared to the control group in six-minute walk test (6-MWT) [14]. Study conducted by Kavanagh et al. on the patient who had undergone a 1-year cycle of walking shows decreased of cardiac death risk by 20% and there is an improvement in to the walking distance also noted [17].

Variations on Techniques

Among all cardiac rehabilitation techniques, the following are included in this study.

• **Supervised Respiratory Exercise with an Early Mobilization**

Supervised respiratory exercise program will be performed with bi-level positive airway pressure with orofacial interfaces from 30 to 60 min immediately after tracheal extubation. There are six steps in an early mobilization program. Step 1 includes breathing exercise, 3 sets of 10 repetition, active upper and lower extremity exercises 3 sets of 10 repetitions, lower limb exercise on cycle lasting for 20 minutes, In step 2 active exercise from step 1 plus upright walking on the spot for three series of 1 minutes and lower limb cycle ergometer for 20 minutes, step 3 includes active exercise from step 2 plus ambulation within the inpatient ward for 7 minutes and transfer activities for 30 minutes, step 4 includes same exercise from step 3 plus ambulation within the inpatient ward for 10 minutes and transfer activities for 1 hour, step 5 includes same exercise from step 4 plus ambulation within the ward for 15 minutes and transfer activities for 2 hours, step 6 includes same exercise from previous day plus ambulation within the inpatient ward for 20 minutes and step training 3 times continuously 20 cm standardized step, and step 7 includes exercise from previous day plus step training 6 times continuously 20 cm standardized step, each step is corresponds to 1 day of postoperative intervention [1].

• **Inspiratory Muscle Training**

In this training the patients started breathing at a resistance equal to 15% of their inspiratory muscle strength. Resistance was increased incrementally between 15% and 45% based on patient's tolerance in the following days. An inspiratory threshold- loading device (Threshold Inspiratory Muscle Training, Respironics, Pittsburg, PA, USA) was used to train the patient. The duration and frequency of this training is two time per day for 5 days in preoperative period and two times per day for five days in postoperative period [6].

• **Resistance Exercises**

In this type of exercise training external force or resistance is applied to the muscle with the help of dumbbells, weight cuff, Thera band and Thera- tube. This training program includes muscle training of upper limb especially biceps and triceps with the help of dumbbells and for lower limb quadriceps, hip abductors, adductors and triceps surae muscle with the help of shin pads. The frequency and duration of this training is two times a day for 30 minutes and consist of 10 repetition of each muscle group [18].

Instrumental Issues

All the studies have used various outcome measures to evaluate functional capacity. Some of the most commonly used outcome's measures are mentioned below

• **6 min Walk Test**

Individual has to walk as quickly as possible without running for six minutes in a hallway

30 m, to assess submaximal functional capacity, they use the distance covered during 6

MWT [13].

• **The Baecke Habitual Physical Activity Questionnaire**

This test consists of 16 questions concerning three components from the past 12 months: occupational activities score (8 questions), physical exercise during leisure activities score (4 questions), and leisure and locomotion physical activities score (4 questions).45,46 The patients will be considered sedentary when the score is <9, active when the score is between 9 and 16, and athletic when the score is >16.45 [1].

• **FIM**

The FIM is an instrument that assesses the disability level of patients with functional restrictions of different origins. Its primary objective is to quantitatively evaluate the level of assistance required for a person to perform a series of motor and cognitive tasks needed for daily living. The evaluated activities include self-care, mobility, walking, toileting, communication, and cognition, including memory, social interaction, and problem solving.47 Each of these activities is assessed and receives a score of 1 (total dependence) to 7 (complete independence), thus the total score ranges from 18 to 126 [1].

• **Modified Borg Perception Test**

The perceived level of respiratory discomfort during physical effort will be evaluated by the modified Borg scale, ranging from 0 (least effort) to 10 (most effort). The patient will be instructed regarding the use of the scale and prompted for the spontaneous choice of a value [1]. The other essential primary and secondary outcome measures used in various studies to evaluate functional capacity and self-efficacy are Timed UP and Go scale (TUG), 2-minute step test, Manchester Respiratory Activities of Daily Living Questionnaire (MRADL), etc.

Summary

It is a fact that before and after surgery patients must spent most of his time on bed doing rest. Prolonged bed rest diminish physical and psychological strength of patients. Many researchers have worked to prevent this side effect of prolonged bed rest before and after surgery and to improve overall functional level of patient by discharge. After CABG, patients face many postoperative effects like depressed respiratory functions, generalized muscle weakness and postoperative complications due to bed rest, which also results in longer hospital stay and decrease functional level after discharge. It is proven from these studies, that early mobilization like from the first postoperative day will facilitate better functional level and functional capacity as well as promote early discharge from hospital.

This study has also utilized similar studies to establish relationship between early mobilization and postoperative complications, functional capacity and length of hospital stay in patients after CABG.

Method

As a part of this review, PubMed and Google Scholar were searched for the articles which focused on early mobilization in post CABG patients. The key word used were "post CABG, functional capacity, early mobilization". There were so many studies found on this wide topic.

Search was filtered to Randomized control trials (RCTs).

Inclusion Criteria

- Studies included were only Randomized control trails.
- Studies included Post CABG patients
- Both genders
- Age between 18 and 80 years
- Body mass index (BMI) between 20 and 30 kg/m2
- Hemodynamic stability with or without use of positive inotropic drugs
- Heart rate (HR) 60 HR 100 bpm without respiratory distress such as nasal flaring, the use of accessory muscles, thoracoabdominal asynchrony
- Respiratory rate (RR) 20 without signs of infection

Exclusion Criteria

- Study design other than RCTs
- Previous pulmonary disease and acute lung disease
- Mechanical ventilation > 24 h
- Left ventricular ejection fraction (LVEF) < 35% OR >54%,
- Surgical intervention, intraoperative death or any contraindications for the proposed measurements and/or treatment
- Contraindications for the 6MWT or any proposed protocol
- Orthopaedic impairments
- Unstable angina
- HR > 120 bpm at rest
- Systolic blood pressure > 180 mmHg or diastolic >100 mmHg

The methodological quality of the studies was assessed using the PEDro scale; an 11-item scale with a maximum score of 10. The higher the score, the better the methodological quality of the study. The first item is not used to calculate the total score. It was not possible to conduct a meta-analysis due to the variability of the interventions used as early mobilization.

Results

The initial search identified 2857 studies. Twenty-one randomized trials and meta-analysis studies were selected to be read in full. Of these, 12 studies did not meet the inclusion criteria for this review. As such 6 studies were included in this literature review and their contents were analysed. Table 1 explains the analysis of these 6 studies.

Table 1: Summary of Study Results

Study	Age of Subjects (Years)	IG/CG in Study	Early Mobilization Definition	Duration/ Frequency of Intervention	Primary Outcome Measures/ Methods	Results
Stein et al. [13]	IG=64 + 8 y CG=63 + 7y	n=20 IG=10 CG=10	No specific definitio n of early mobiliza tion	6-day postoperative in-hospital program, use of expiratory positive airway pressure (EPAP) mask and bronchial hygiene techniques, with progressive distance walking and calisthenics and cardiopulmonary training.	Maximal inspiratory (PImax) and expiratory pressure (PEmax) measures using pressure transducer (before surgery, and 7 and 30d after surgery). The six-minute walk test (6MWT) - 7 days after surgery, Maximal cardiopulmonary exercise testing - 30 days after CABG.	PImax – CG-58+22% IG - 61+22% predicted PEmax – CG-82.0+3.5% IG -89.0+3.2% predicted 6MWT – CG – 323+67m IG – 416+78m VO2peak – CG - 14.0+0.8 (mL•min1•kg1) IG – 18+3
Ahmed et al. [5]	CG-35.10+10.7 9 IG – 29.75+10.4 9	n= 40 IG= 20 CG= 20	Early activity means the cardiac surgical patient was started his activity after two hours of surgery.	positioning (supine, left and right sides), early ambulation (dangling, standing near the bed, chair sitting and walking) and chest physiotherapy procedures (Coughing, breathing exercises, percussion, vibration and incentive spirometry).	Lung functions (FVC, FEV1 and MVV) O2 indicator (RR, SaO2) Morbidity rate, mortality rate and hospital stay length in hours.	Post Operatively FEV1 & FVC - significant decrease for both group MVV - decreased significantly in CG RR – CG - increase IG – decrease SaO2 – CG – decrease IG – increase Morbidity rate lower in IG than CG. Hospital stay length shorter in IG (44.95 ± 13.99 hours) than CG (122.45 ± 50.99 hours)

S. F. Mungov an et al. [14]	66 + 12 years	Total n= 83 CABG n = 36 Valve n= 12 CABG+ Valve n=12	No specific definition of early mobiliza tion.	Physiotherapist supervised and independent physical activity undertaken from the first to the fifth day after cardiac surgery (POD1 to POD5), Physiotherapy management included twice-daily sessions of PT supervised: (i) respiratory techniques, (ii) active musculoskeletal movements for the prevention of musculoskeletal complications (iii) walking exercise of up to 10 min per session and compared hospital stay and postoperative physiological functional capacity on POD6.	Vital Capacity (VC) Physical Activities-MET and step count 6MWT Length of stay	Step count & MET- POD1 to POD5- increased in PT supervised group, independent physical activity group and combined group. Patient completed a postoperative 6MWT on POD6. There is significant correlation of 6MWT with step length and MET. Length of stay: moderate negative correlations between: (i) LOS in hospital and overall PT-supervised and independent physical activity step counts and (ii) LOS in hospital and overall PT-supervised and independent physical activity time METs.
S. Savci et al. [6]	IG- 62.82+8.69 CG- 57.48+11.4 8	n = 50 IG = 22 CG =21	Early activities mean mobiliza tion, Active exercise s of upper and lower limbs, chest physioth erapy.	CG=The patients instructed to sit out of bed and stand up on POD1, walk 45 m in the corridor on POD2, walk freely (approximately 150 – 300 m) on POD3 &4, and climb one flight of stairs on POD5. Chest physiotherapy consisted of breathing exercises and coughing techniques. IG= the intervention group trained daily, two times per day, for 10 days (five days in PreOD, five days in POD). Each session consisted of 30 minutes inspiratory muscle training under the supervision of a physical therapist.	Chest x-ray examination, spirometry, respiratory muscle strength evaluation, six-minute walking test was performed; quality of life and psychosocial parameters were measured at baseline and on fifth postoperative day.	Pulmonary function decreased significantly on both groups. The mean inspiratory muscle strength: IG- increase 82.64+29.31 cm H2O at baseline to 95.45+30.32 cm H2O at discharge CG- Decrease 84.62+17.26 cm H2O to 57.24+19.48 cm H2O at discharge Expiratory muscle strength was reduced significantly in both groups. 6MWT: IG- Increase in distance from 319.55+72.17 m to 387.91+65.69 m.

P. Ungerm an et al. [11]	30 to 75 years	CG=44 IG=43	No specific definitio n of early mobiliza tion	CG= no exercise. IG= Supine to sitting exercise started POD1 twice daily. Ambulation up to 300 ft POD2 Standing exercise, 1200 ft ambulation and stair climbing after transfer from ICU to prier to discharge day.	Functional Assessment done on POD 1 to prier to discharge. Standing exercise tolerance, ambulation tolerance, & stair climbing were independently assessed and scored.	CG= 22 patients showed decrease functional tolerance, 20 patients per-formed short distant ambulation. In standing exercise 32 showed no change,8 decreased and 6 improved. IG= only 9 patients showed decrease functional tol-erance. 15 patients am-bulated further distance and only 9 walked shorter distance. In standing exercises 4 patient improved and 1 decreased. Stair climbing = no difference found in both groups. On ob-servation, IG climbed stairs with more ease than CG.
Ximenes NNPS, et al. [18]	CG= 61.8±6.7 IG= 59.9±7	Total= 34 IG=17 CG=17	No specific definitio n of early mobiliza tion	CG= diaphragmatic breathing exercises and progressive ambulation, assisted and active exercises for upper (UL) and lower limbs (LL). IG= dia-phragmatic breathing exercises, progressive ambulation and resist-ance exercises for UL and LL. Resistance exercise = established using a stress test (a set of 10 repetitions using 0.5 kg dumbbells for elbow flexion and 1.0 kg shin pads for knee extension.)		

Research Questions

1. Does early mobilization after CABG improves breathing, strength and functional capacity of the patients and henceforth decrease hospital stay after surgery?
As per this literature review, the effect of early mobilization after CABG is mentioned on table 1. According to table, all 6 studies proves that early mobility improves functional capacity and henceforth shorter hospital stay in intervention group patients. According to Ahmed et al. and Cordeior et al. studies, early intervention improves inspiratory muscle strength, which intern improves lung volumes, oxygenation and hemodynamics parameters. However, other studies showed no change or minimal change in lung volumes in IG, after early mobilization. These also proves improvement in quality of life.

2. Does early mobility affect morbidity, mortality and survival rate of uncomplicated cardiac patients after CABG surgery?
Clinical study done by Froelicher V et al., demonstrated that multifactorial cardiac rehabilitation can be effective in reducing morbidity and mortality. However, studies reviewed in Table 1 and studies done by Toress D et al. demonstrated that early mobility may improve lung volume and oxygenation. Which may indicate that prevention of post-surgical complications like pleural effusion, atelectasis, low cardiac output syndrome, postoperative bleeding, infection, and difficulty in glycemic control, increase duration of mechanical ventilation, sedation and muscle weakness. Prevention of these complication results in decrease in morbidity and mortality rates.

Only two studies, from the Ahmed et al. and S. Savci et al., provided a clear definition of early mobilization, i.e. 'the gradual increase of activity like mobilization, active exercise of upper and lower limbs and chest physiotherapy, starting on the first postoperative day until independent ambulation on the fifth postoperative day'. The remaining studies did not provide a specific definition for early mobilization. A set protocol of early mobilization has not established after completing detailed full review of all literatures.

Discussion

As pulmonary and muscular complications are very common after a CABG surgery, physical therapist should work on its prevention. Initial goal of this review was to focus on improve functional capacity, prevent pulmonary and muscular complications and reducing hospital stay by implementing early mobilization, the active cycle of breathing techniques, positioning, breathing exercises, assisted mechanical devices, breathing exercises and inspiratory muscle training, patient education etc. But to minimize diversity of topic and as early mobilization plays an important role in improving functional capacity and reduce hospital stay, it was changed to only focus on early mobilization exercise. Therefore, the key goal of this study is to know availability of various early mobilization exercise program for post-CABG patient.

Fate of Research Questions/ Other Findings

This study gives answers to stated research questions which the effect of early mobilization on breathing, strength, functional capacity and reducing hospital stay. Along with this positive effects of improving functional capacity S.Savci et al. also found that quality of life was greater in the intervention group for the dimension of sleep and the anxiety scores were significantly lower in the intervention group than the usual care group, length of intensive care unit stay was also found shorter in the intervention group [6]. P.Ungerman et al. also found the shorter hospital stay in the intervention group. All the early mobilization training programs and techniques are found to be effective in improving functional capacity and reduced hospital stay.

Implications for Your Field of Study

A Physical therapist plays an integral role in a rehabilitation team who works with the post- CABG patient. The results of this study are helpful for implementing in field of physical therapy. Understanding of the theories involved behind the variety of musculoskeletal and neurological complications and effect of immobility after CABG like loss of muscle mass and strength which is mentioned in this article. Complications like atelectasis, low cardiac output syndrome, pleural effusion are also associated with reduced functional capacity. By diagnosing correctly, a physical therapist can implicate early mobilization training program strategies on basis of findings and can achieve positive outcomes. The aim of this program or training is to help the patients to regain their normal activities of daily living and reduce the post- CABG complications. This study has also found feasibility of early mobilization training program in inpatient physical therapy practice. This study also focused on outcome measure used for evaluating functional capacity and inspiratory muscle strength which also helps a physical therapist to evaluate the post-CABG patient who are at the risk of developing post-operative complications.

Implications For Future Research Activities Include What You Would Do Differently

The trials included in this review were published between 1983 and 2017. Thus, even after these years, this topic remains current and has not been fully elucidated. This review has evaluated only 6 randomized control trials and early mobilizations. In this study, there is no specific protocol for early mobilization, thus future review can focus on particular protocol for this early mobilization, which includes specific exercises, frequency, intensity, etc. Even every study has used different outcome measures, so further studies can concentrate on just one outcome measure (e.g., 6 min walk test), so it will be easier to get generalized result.

The review revealed diversity in techniques used as mobilization, as well as the period considered 'early.' This review concluded that early mobilization was beneficial in terms of length of hospital stay, functional capacity and prevention of postoperative complications compared with no treatment.

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