ORIGINAL ARTICLE

Effectiveness of Modified Cardiac Rehabilitation Education Program (CREP) Among Cardiac Rehabilitation Patient in Teaching Hospital

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ABSTRACT

Introduction: :In Malaysia, the mortality rates of cardiovascular diseases (CVD) remain high. Besides medical and pharmacological interventions, the cardiac rehabilitation education program (CREP) is another practical intervention introduced to all CVD patients. An important component of CREP is delivering knowledge and awareness to CVD patients to prevent recurrent heart attack events. Objective: The aim of this study is to determine the effectiveness of a modified CREP given to patients who have undergone percutaneous coronary intervention (PCI). **Methods:** A quasi-experimental design was used to determine the effects of an intervention. A purposive sample of 60 patients diagnosed with CVD hospitalized and received the PCI procedure at the Cardiac unit/ward, PPPUiTM, Sungai Buloh has been selected. Patients were assigned to two study arms to the intervention group (IG) (n=30) and control group (CG) (n=30). The heart disease knowledge questionnaire, patient motivation inventory, and modified myocardial infarction health behaviours questionnaire were used to measure the effectiveness of modified CREP. The independent and paired-t tests were used to test the effects of the modified CREP between IG and CG. **Results:** Patients in the IG had a greater score than patients in the CG on the level of heart disease knowledge after post intervention: IG (mean=20.37, SD=2.54); CG (mean=16.43, SD=3.24). There was a statistically significant difference between the groups in the level of self-motivation after post intervention, IG (mean=13.47, SD=0.62); CG (mean=12.33, SD=1.91), p=0.00. The health behaviour changes score in the IG (mean=111.37, SD=7.20) was higher than those of the CG after post intervention (mean=106.77, SD=8.41). **Conclusion:** The modified CREP can effectively increase the level of heart disease knowledge, self-motivation, and health behaviour changes among CR patients.

Keywords: : Cardiac rehabilitation, Education program, Cardiac patient, Cardiovascular disease

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INTRODUCTION

The leading cause of mortality worldwide is cardiovascular disease (CVD); more people die annually from CVD than from other cause. In 2017, an estimated 17.9 million individuals died from CVD, comprising 31.0% of all global deaths (1). According to a report from the Department of Statistics Malaysia (2), CVD was the principal cause of death from 2005 to 2014. In 2014, the percentage of death due to CVD was 13.5%, recorded as the highest in Malaysia. The lack of knowledge regarding CVD including modified risk factors is one of the identified common problems (3). Lack of knowledge regarding CVD results in patients becoming demotivated and having little incentive to keep up with the healthy lifestyle (4). There is a high number of coronary patients who do not practise a healthy lifestyle, thereby rising risk factors such as smoking, uncontrolled total and LDL-cholesterol, and obesity (5). PCI (Percutaneous Coronary Intervention), also known as coronary angioplasty, is a nonsurgical procedure for treating coronary artery disease (6). This procedure is a common preference because of its lower mortality and complication rates. Data from Malaysia National Cardiovascular Disease Database (NCVD), shown in the period of 2015 to 2016, there was 19,494 number of patients undergoing PCI recorded in the NCVD-PCI Registry (7). Beside PCI, Cardiac Rehabilitation program (CRP) are widely recognized as essential to the care of cardiac patients. CRP aim to restore a patient to full physical and psycho-social functioning and prevent recurrent cardiovascular events (8). Conclusively been shown that the core components of CRP include

exercise training and psycho educational programmed that focus on education, lifestyle counselling and stress management are vital because the benefit derived from that (5). Education become the first step in promote the awareness how important of CRP to cardiac survivor.

Following an acute coronary incident, education is a cost-effective approach and increases prognosis by reducing hospitalisation and health care costs while prolonging life. Patient education is an integral component of CVD patient recovery, to minimise risk factors and associated coronary events through self-management behaviour (9). However, no standardized and evaluated Cardiac Rehabilitation Education Program (CREP) for patients with CVD has so far been available to be used in interventions and rehabilitation settings (10).

In Malaysia, CREP is delivered only in selected hospitals especially the ones dealing with a lot of cardiac cases. However, there is no standardized and evaluated CREP for routine use in any hospital under the Ministry of Health (MOH) or private cardiac institution. CREP will deliver in phase one of CRP by unit nurses like medical ward nurses to a group of CVD patient before discharge by using the slide show presentation with explanation. However, not any special hangout given to the patient as a guidance for them to use at home. Nevertheless, when patient come for CRP in phase two for exercise program there has a slot about thirty minutes for cardiac rehabilitation sub-teams like cardiologist, pharmacist, dietitian and therapist deliver CREP. For the six times patient's schedules to come for CR phase two, patient will receive CREP for the six topics accordingly given by CR sub-teams as mention above. Nurse became as an educator and CREP delivered only guided by pamphlet with simple verbal explanation. Overall, the content includes the basic information regarding type of heart disease, sign and symptoms of heart attack, risk factors and basic points for prevention. However, the information given in the pamphlet is very minimal. Since heart disease is very serious threatening disease, all the cardiac survivors should be receiving more intensive and informative knowledge before discharge from hospitalizations.

Furthermore, in present years many hospitals, either in Malaysia or other countries, have introduced multidisciplinary cardiac rehabilitation team to improve patient knowledge, increase self-motivation and promote health behaviour lifestyle. The education on CVD is important to ensure successful prevention of new episode of heart attack. The key to achieve an effective CREP is planning and implementing a proper educational program to educate the patients with the help of suitable tools. As the healthcare personnel who deal with the patient care 24 hours a day, nurses should be the best educator who can deliver CREP effectively by gaining the patients' trust since they already have the good rapport.

The records at Cardiac Rehabilitation Clinic in PPPUiTM showed 497 CR patients were admitted and registered from January 2017 until December 2017. However, according to the census in the CR appointment book 2017, only 276 patients came for their appointment at the CR Clinic. This indicated that the patients did not understand or were not aware of the importance of follow up. There were 22 patients who defaulted the CR program in phase two which provided cardiac exercise training session. This situation becomes one of the reasons why the CREP is very important and highly needed. In Malaysia, most post PCI patients are still a lack of knowledge regarding CVD, so that the outcome of this study can become a springboard to engage all the efforts in educating the patients undergoing PCI continuously. Besides, for better health status of the patient, the cost of the treatment could be minimized due to the reduced length of stay in the hospital and also reduce for recurrent new attack. So that, the aim of this study CR patients towards the level of knowledge, self-motivations and health behaviour.

MATERIALS AND METHODS

Approval was received from the Human Research Ethics Committee Universiti Teknologi MARA Ref:(600-IRMI (5/1/16). Each patient was provided with the informed consent, which must be documented and signed. The data will be kept confidential and stored in a safe place within 5 years and after that, the data will be shredded and destroyed.

Participants were recruited at PPPUiTM between 1st April 2018 and 8th January 2019. This research was conducted at the Coronary Care Unit (CCU), Cardiac Rehabilitation Ward (CRW) and Medical Ward. A quasi-experimental design was used in this research, with the CG received the current routine CREP whereas the IG received the current routine CREP plus an additional modified CREP on CVD during appointments. This design is used because of the difficulty in randomizing the subjects due to small sample size. The population of this study was the patients with diagnosed CVD who were hospitalized and had received the PCI procedure at the cardiac unit/ward. They were referred by the cardiologists to the cardiac rehabilitation team to undergo the cardiac rehabilitation program. A purposive sampling was used at the CCU, CRW and Medical Ward. Patients were recruited from the cases referred by cardiologists for CRP. Patient who was discharged on Monday, Tuesday and Wednesday during the recruitment phase were assigned to the IG while those who were discharged on Thursday, Friday, Saturday and Sunday are allocated to the CG. Such allocation method is to prevent the patients from meeting each other as well as to minimize any potential contamination between them during the intervention session.

The inclusion criteria in this study were:

i. CVD patients who underwent PCI procedure.
ii. Age 18 years old or above.
iii. Ability to understand and communicate in spoken Malay language.

The exclusion criteria in this study were:

i. Patients who had received or attended any comprehensive CREP.
ii. Patients who were in life-threatening conditions.
iii. Patients who were mentally unstable.

Sample Size Determination

The sample size for the study was determined following Power and Sample Size Calculation (PS) software.

$$n = 2\sigma^2 \frac{(Z_{\frac{\alpha}{2}} + Z_{\beta})^2}{\Delta^2}$$

Where: n = sample size, Z_(α/2) = desired level of statistical significance (typically 1.96 for a significance of 0.05), Z_β = desired power (typically 0.84 for 80% power). Previous study used mean difference of 0.5 with standard deviation of 0.71 (8). To reduce the risk of committing Type II error due to insufficient sample size and statistical power, the power is fixed at 0.80 and the alpha value is set at 0.05. To anticipate potential attrition of the subjects during the course of the study, an additional 10% of the sample was recruited (8). Thus, the total sample size is 60 (30 in each group).s, the total sample size is 60 (30 in each group).

Instruments

The Heart Disease Knowledge Questionnaire, the Patient Motivation Inventory (PMI) Questionnaire and Modified Myocardial Infarction Health Behaviours Questionnaire (Modified MIHBQ) were used to determine the effectiveness of the modified CREP. These instruments were administered to the patients twice. Firstly, as pre-intervention before delivering the modified CREP when the patients were still in hospitalization period; secondly as post-intervention – the same questionnaires will be given to the patients after six weeks during which they received modified CREP when they came to their appointments at CR Clinic. A validated Malay language questionnaire was utilized for patients who do not understand English language. The original English version of Questionnaires were initially translated into Malaysia's national language, which is the Malay language in order to help the patients understand the questions. The draft of the translation was sent to three experts in CRP for review and comments. Then, the questionnaire sent to the expert to translate it back into the English language. Thus, through the translation and back-translation process and expert reviewed, further minor modifications were made to the instrument to improve its clarity and reduce translation inaccuracies.

Heart Disease Knowledge Questionnaire

This questionnaire was used to determine the knowledge of patients toward CVD and was adapted from a previous study (11). Three close-ended questions were administered to assess a patient's awareness of the leading cause of death. Next, there is a set of 20 true or false questions that evaluate the general knowledge of CVD of a patient, including its causes, risk factors, symptoms and treatments. The knowledge score was the total number of correct answers with a potential range between 0 and 23, and higher scores indicate higher knowledge.

Patient Motivation Inventory (PMI) Questionnaire

This questionnaire was used to assess the level of self-motivation of a patient. The PMI consists of 16 items that are answered as 'true' or 'false' respectively. The items for the PMI are adapted from previous study (12). The PMI consisted of 3 sub scales: i) "Internal motivation", ii) "Lack of confidence in the unit" and iii) "a feeling of failure". For the PMI, scores are obtained for each of the following items by awarding a score of '1': i) "Internal Motivation" – items 2, 5, 6, 9, 10, 11 and 12 marked 'true'. ii) "Lack of confidence in the unit" 'false' item 1 and 'true' items 8, 13, 14, 15 and 16. iii) "A feeling of failure", marked 'true' by items 3, 4, and 7. Higher scores indicate greater level of self-motivation.

Modified Myocardial Infarction Health Behaviour Questionnaire (MIHBQ)

Modified MIHBQ was adapted from a previous study (4). Modified MIHBQ was used to measure health behaviour of CVD patient. The questionnaire consisted of five health behaviour subscales: i) dietary modification- 8 items, ii) exercise- 8 items, iii) adherence to medication- 6 items, iv) managing stress- 6 items, and v) smoking cessation - 6 items. The score was graded as 1= never, 2 = sometimes, 3 = often, and 4 = routinely. The score was reversed, except for the negative questions (2, 4, 5, 6, 12, 13, 14, 15, 16, 17, 30, 31, 32, 33). The average score is between 34 and 136. Higher scores suggest more regular health behaviour success hence signifying higher level of patient's health behaviour change.

Development of Modified CREP

The tool for the modified CREP, the CRP guide booklet, was designed by UiTM Press and validated by three experts: a cardiologist, a cardiothoracic surgeon and a cardiac rehabilitation specialist to determine the validity of the content. The development of the module was based on the guideline from by WHO (2009), the Ministry of Health and from other references as well. The content covered the anatomy and physiology of the heart, atherosclerosis, CVD disease, risk factors, laboratory investigations, treatments, modifications of healthy lifestyles and importance of attending the follow up. A pilot study was conducted among 30 respondents to make sure the content of the CRP guide booklet is suitable for the patients. The pre- and post-test showed

Table I: Summary of differences between current CREP and modified CREP

Current CREP	Modified CREP
No CRP Guide Booklet provided	CRP Guide Booklet to take home
No lecture offered	20 to 30 minutes of one-to-one health education lecture
No discussion offered	10 to 15 minutes discussion

improvement among the participants. The qualitative assessment showed that all participants evaluated the program positively and considered it to be valuable. The CRP guide booklets were printed in colour and written in Malay language. .

Data Collection

The summary of the data collection is illustrated in Figure 1.

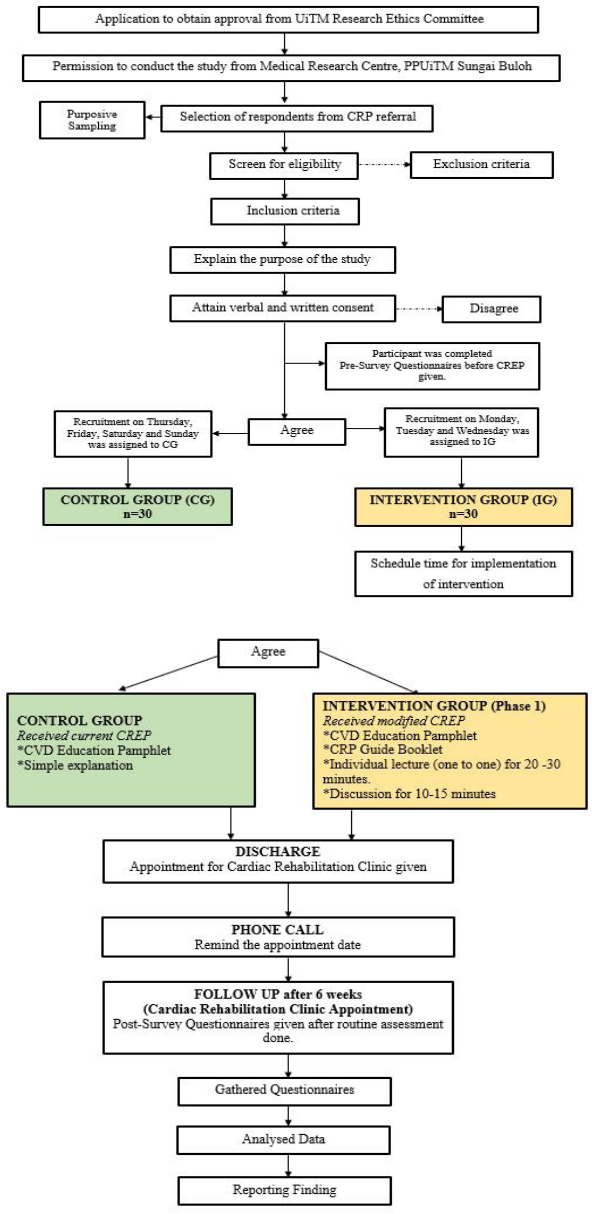

Figure 1.: The summary of the data collection

Pre-intervention: The purpose of the study was explained to patients and written consent was obtained. The three sets of questionnaires were given and answered by the patients.

Intervention: Patients in the CG and in the IG all received routine health education session. Intervention was given by nurses who work at cardiac rehabilitation by using a pamphlet from the MOH containing simple basic information regarding CVD like types of heart disease, sign and symptoms of heart attacks, risk factors of CVD and prevention including physical exercise, healthy diet, weight management, stress management, sugar control for diabetic patient and importance of routine medical check-up. After the routine health education session, the additional intervention, which was modified CREP, was delivered only to the IG patients by nurses who are specialized in cardiac rehabilitation. Modified CREP includes the provision of health education regarding CVD using CRP guide booklet. The health education was given via face to face and one to one by the researcher for approximately 20 to 30 minutes and another 10 to 15 minutes for discussion. The discussion is all about the content in CRP guide booklet including anatomy and physiology of the heart, atherosclerosis, CVD disease, risk factors, laboratory investigations, treatments, modifications for healthy lifestyles and importance of attending the follow up.

Post-intervention: Before discharge, all patients were given date of appointments at Cardiac Rehabilitation Clinic after six weeks. All patients were asked to answer back the same sets of questionnaires when they came for the appointments. Patient who did not attend was contacted by telephone and rescheduled for new appointment date. Since cardiac rehabilitation clinic was run every week on Wednesday, patient appointment was rescheduled for next Wednesday, and all patient completed their appointment within the time frame. Patients need to answer the questionnaire within the time frame to prevent biases on the result.

Statistical Analysis

All data were analysed using Statistical Package for IBM Social Sciences (SPSS) version 24.0. Levels of heart disease knowledge, self-motivation and health behaviour pre and post intervention were examined through descriptive statistics. Paired t-test was used to compare pre-intervention and post-intervention; independent t-test was use for comparing between the control and the intervention group.

RESULTS

Demographic Characteristics

For both groups, the patients had a mean (SD) age of 56.32 years (9.79), ranging between 34 to 78 years. The majority of the patients in both groups were males (88.3%). The majority were of Malay race (73.3%),

followed by Chinese (18.3%), Indian (6.7%) and others (1.7%). The demographic characteristics of patients in the two groups are listed in Table II.

Table II: Demographic Characteristics

Characteristic	Variable	Group				Total	
		Control		Intervention			
		n=30	(%)	n=30	(%)	N=60	(%)
Age	Mean (SD)	56.27	(9.45)	56.37	(10.28)	56.32	(9.79)
Weight (kg)	Mean (SD)	79.2	(14.74)	78.9	(17.70)	79.0	(16.15)
Height (cm)	Mean (SD)	166.0	(9.92)	164.4	(9.41)	165.2	(9.62)
Gender	Male	26	86.7	27	90.0	53	88.3
	Female	4	13.3	3	10.0	7	11.7
Race	Malay	21	70.0	23	76.7	44	73.3
	Chinese	6	20.0	5	16.7	11	18.3
	Indian	2	6.7	2	6.7	4	6.7
	Other	1	3.3	0	0	1	1.7
Education level	Primary	5	16.7	10	33.3	15	25.0
	Secondary	16	53.3	9	30.0	25	41.7
	Tertiary	9	30.0	11	36.7	20	33.3
Medical History	Hypertension	22	73.3	21	70.0	43	71.7
	Dyslipidaemia	21	70.0	21	70.0	42	70.0
	Diabetes Mellitus	19	63.3	13	43.3	32	53.3
Family History	Heart Disease	15	50.0	12	40.0	27	45.0

Effect of Intervention on Level of Heart Disease Knowledge

The mean score of heart disease knowledge for pre- and post-intervention for the IG and the CG are tabulated in Table III. There is a statistically significant increase in the level of patients' heart disease knowledge in IG for pre-intervention (mean=13.93, SD=2.97) to post-intervention (mean=20.37, SD=2.54), t(29)=9.472, P<0.05 (two-tailed). The mean increase in the level of patients' heart disease knowledge scores is even higher at 6.44. For the CG, there is also a statistically significant increase in the level of patients' heart disease knowledge from pre-intervention (mean=14.77, SD=2.61) to post intervention (mean=16.43, SD=3.25), t(29)=4.513, p<0.05 (two-tailed).

Table III: Comparing pre-intervention and post-intervention scores on the level of heart disease knowledge within groups (Intervention and Control)

Group (n)	Mean (SD)		Mean diff (95% CI)	t-stat (df)	p -value*
	Pre-intervention	Post-intervention			
Both Group (60)	14.35 (2.80)	18.40 (3.50)	4.05 (3.06, 5.04)	8.213 (59)	0.001
Intervention Group (30)	13.93 (2.97)	20.37 (2.54)	6.44 (5.04, 7.82)	9.472 (29)	0.001
Control Group (30)	14.77 (2.61)	16.43 (3.25)	1.66 (0.91, 2.42)	4.513 (29)	0.001

*Paired *t*-test

There was a significant difference of the mean score of level heart disease knowledge between the IG (mean=20.37, SD=2.54, n=30) and the CG (mean=16.43, SD=3.25, n=30) t(58)=-5.229, p<0.05, two tailed) after six weeks. The patients in the IG had higher mean scores compared to the CG and showed that the mean different score is 3.93 marks. The results are presented in Table IV.

Table IV: Effects of intervention on the level of heart disease knowledge between groups (Post intervention)

Group (n)	Mean (SD)	Mean diff (95% CI)	t-stat (df)	p-value*
Intervention Group (30)	20.37 (2.54)	-3.93 (-5.44, -2.43)	-5.229 (58)	**0.001**
Control Group (30)	16.43 (3.25)			

*Independent *t*-test

Both groups scores: Mean (SD)= 18.40 (3.504)

Effect of Intervention on Level of Self-Motivation

The mean of level of self-motivation scores for pre- and post-intervention for the IG and the CG is presented in Table V.

There was a statistically significant increase in self-motivation scores for overall both group from pre-intervention (mean=11.98, SD=1.87, n=60) to post intervention (mean=12.90, SD=1.52, n=60), t(59) =4.600, p<0.05 (two-tailed). Taking only the IG (n=30), there is a statistically significant increase in the overall level of patients' self-motivation from pre-intervention (mean=12.37, SD=1.71) to post-intervention (mean=13.47, SD=0.26), t(29)=3.754, P<0.05 (two-tailed). For the CG (n=30), there is also a statistically significant increase in the level of patients' self-motivation from pre-intervention (mean=11.60, SD=1.97) to post-intervention (mean=12.33, SD=1.91), t(29)=2.707, P<0.05 (two-tailed). The mean of level of self-motivation score is tabulated in Table V.

Table V*: Comparing pre-intervention and post-intervention scores on the level of self-motivation within groups (Intervention and Control)

Variable	Mean (SD)		Mean diff (95% CI)	t-stat (df)	p-value*
	Pre-intervention	Post-intervention			
Both Group (60)					
Self-Motivation	11.98 (1.87)	12.90 (1.52)	0.92 (0.51, 1.31)	4.600 (59)	**0.001**
Internal Motivation	6.75 (0.68)	6.88 (0.49)	0.13 (-0.01, 0.28)	1.823 (59)	0.073
Lack of Confident	3.13 (1.53)	3.97 (1.17)	0.84 (0.48, 1.18)	4.764 (59)	**0.001**
Feeling of Failure	2.10 (0.39)	2.05 (0.28)	-0.05 (-0.16, 0.06)	-0.903 (59)	0.370
Intervention Group (30)					
Self-Motivation	12.37 (1.71)	13.47 (0.26)	1.10 (0.50, 1.69)	3.754 (29)	**0.001**
Internal Motivation	6.83 (0.64)	6.97 (0.81)	0.14 (-0.12, 0.38)	1.072 (29)	0.293
Lack of Confident	3.37 (1.60)	4.50 (0.57)	1.13 (0.58, 1.68)	4.196 (29)	**0.001**
Feeling of Failure	2.17 (0.37)	2.00 (0.00)	-0.17 (-0.30, -0.02)	-2.408 (29)	**0.023**
Control Group (30)					
Self-Motivation	11.60 (1.97)	12.33 (1.91)	0.73 (0.17, 1.28)	2.707 (29)	**0.011**
Internal Motivation	6.67 (0.71)	6.80 (0.66)	0.13 (-0.02, 0.29)	1.682 (29)	0.103
Lack of Confident	2.90 (1.44)	3.43 (1.38)	0.53 (0.09, 0.96)	2.504 (29)	**0.018**
Feeling of Failure	2.03 (0.41)	2.10 (0.40)	0.07 (-0.10, 0.23)	0.812 (29)	0.423

*Paired *t*-test

Table VI*: Effects of intervention on level of self-motivation (Post Intervention)

Variable	Mean (SD)		Mean diff (95% CI)	t-stat (df)	p-value*
	Intervention Group (30)	Control Group (30)			
Self-Motivation	13.47 (0.62)	12.33 (1.91)	-1.14 (-1.87, -0.39)	-3.076 (58)	**0.004**
Internal Motivation	6.97 (0.18)	6.80 (0.66)	-0.17 (-0.41, 0.85)	-1.325 (58)	0.194
Lack of Confident	4.50 (0.57)	3.43 (1.38)	-1.07 (-1.61, -0.52)	-3.906 (58)	**0.001**
Feeling of Failure	2.00 (0.00)	2.10 (0.40)	0.10 (-0.04, 0.24)	1.361 (58)	0.184

*Independent t-test

As Table VI indicates there was a significant difference of the mean score of level of self-motivation between the IG (mean=13.47, SD=0.62, n=30) and the CG (mean=12.33, SD=1.91, n=30) t(58)=-3.076, p<0.05, two tailed) six weeks after receiving CREP. Overall, the patients in the IG had higher mean scores of all three sub scales compared to the CG.

Effect of Intervention on Level of the Health Behaviour Changes

The mean of level of health behaviour score for the IG and the CG is tabulated in Table VII. Overall, the patients in the IG had higher mean scores of all five sub scales compared to the CG. However only stress management significantly showed an increase compared to other domains with the mean difference 1.36 point with a 95% confident interval ranging from -2.16 to -0.56, t(58)=-3.421, p<0.05, (two-tailed).

DISCUSSION

The Effects of Intervention on Level of Heart Disease Knowledge

Table VII: Effects of intervention on the Health Behaviour Changes (Post intervention)

Variable	Mean (SD)		Mean diff (95% CI)	t-stat (df)	p-value*
	Intervention Group (30)	Control Group (30)			
Health behaviour	111.37 (7.20)	106.77 (8.41)	-4.60 (-8.64, -0.55)	-2.274 (58)	**0.027**
Medication adherence	20.30 (1.02)	19.87 (1.63)	-0.43 (-1.14,0.27)	-1.231 (58)	0.223
Exercise	18.63 (5.19)	17.50 (4.30)	-1.13 (-3.59, 1.33)	-0.920 (58)	0.361
Dietary modification	27.70 (1.84)	26.93 (2.39)	-0.77(-1.87,0.33)	-1.391 (58)	0.169
Stress management	23.73 (0.58)	22.37 (2.10)	-1.36 (-2.16, -0.56)	-3.421 (58)	**0.002**
Smoking Cessation	21.00 (3.93)	20.10 (4.80)	-0.90 (-3.17, 1.37)	-0.794 (58)	0.431

*Independent *t*-test

The study showed that CR patient who received modified CREP had significantly higher scores in the knowledge level and gave a positive effect to the patient's knowledge. It was clear that the CR patient in the intervention group more knowledgeable compared to the CR patient in the control group. This is supported in other study, showed significant improvement in patients' overall knowledge between pre and post CREP (13). Similarly, the results previous study indicate that the educational intervention was useful for improving cardiovascular knowledge compared with the patients who not received educational intervention. Having increased knowledge about anatomy physiology of heart, atherosclerosis, CVD disease, risk factors, laboratory investigations, and treatments may have influenced the IG to more motivated and have positive effect on health behaviours. Many studies found that the cardiac educational program significantly improved cardiac-related knowledge (13,14,15). Possible explanation for the significant improvement in patients' knowledge of the IG because combination of face-to-face education and intensive booklet help improve patients' knowledge. In addition, the using of discussion one to one during the modified CREP and giving lecture presentation may have contributed to the success of the modified CREP. Results from this study focusing on patient education for CR patients in PPPUiTM demonstrated that an evidence and theoretically based comprehensive education intervention significantly improves patients' knowledge about CVD.

The Effects of Intervention on Level of Self-Motivation

The high score for the Patient Motivation Inventory of the CR patient in the IG demonstrated higher self-motivation than the CR patient in the CG. These results are consistent with previous studies that patients in a CRP had significantly higher levels of motivation than a comparison group that had not attended a CRP (16). Patients who attended and completed CRP scored higher on motivation measures than those who did not attend (17). However, this study's findings contradict (18) those who discovered that motivation was unaffected by the CRP and that motivation scores did not change significantly. In this study, lack of confidence is the most substantial area in terms of the significant findings in this domain. However, among the three self-motivation subdomain, internal motivation and feeling of failure does not give significant effect in this study. A possible reason why CR patients in IG have a higher level of confidence may be this program providing face-to-face communication in delivered essential critical information to motivate and urge patients to take action related to their manifestation and treatment of the disease. In this study, the intervention could increase self-motivation as generally but as specifically to restore their internal motivation and feeling of failure, not the easy way. It is because psychological factor has a strong relationship with the impact toward the self-motivation among CVD patients. These results raise the question about the needed length of a modified CRP to improve internal motivation and decrease the feeling of failure among CR patients.

The Effect of Intervention on Health Behaviour Changes

The intervention seemed to have had a positive effect on health behaviour changes for both groups. These results are consistent with a previous study, CRP conducted by a nurse can significantly improve health behaviours (19). In this study, patients in the IG also demonstrated a significantly better performance in stress management, however no effect on medication adherence, exercise, dietary modification, and smoking cessation. Furthermore, a study found a significant improvement in diet adherence and medication adherence (19). A possible explanation for why modified CREP program did not affect the medication adherence, exercise, dietary modification, and smoking cessation in this study may be because the factors associated with self-lack of internal motivation and feeling of failure among CR patients, studies have reported self-motivation has been found to be associated with the behaviour (20). Exposure to modified CREP might have contributed to the positive result on stress management in this study. Patients are receiving first-time PCI face several difficulties in attempting to comply with prescribed drugs after discharge (21). Among the five health behaviours subdomain, smoking cessation is the weakest area in terms of significant findings from this study. Besides subdomain medication adherence, unfortunately, this program also failed to give a significant effect. The reasons could have been less intensive in intervention, such as short program durations and no follow-up care reminders. This finding gives the significance that modified CREP needs more attention to revise for better

outcome programs in health behaviour changes among CR patients. .

Practical Implications for Nursing

The current research findings might be applied to establish new and more effective interventions. Self-motivation and change of health behaviour are very challenging processes, which are influenced by many factors such as knowledge, attitude and support. CVD patient may benefit from extra attention by cardiac rehabilitation nurses during hospitalization especially before discharge, by supporting patient in promoting speedy recovery and preventing recurrent heart attacks. Providing education and support to the CVD patients during hospitalization period is a significant factor for a successful cardiac rehabilitation to build up self-motivation and promote health behaviour change.

Cardiac Rehabilitation Program guide booklet may be useful to guide other nurses in the implementation of intervention even if they are not trained in cardiac rehabilitation. In this way, all nurses who are involved in cardiac care patients especially in CCU, CRW and medical ward have the opportunity to educate patients about important and necessary information regarding CVD and also cardiac rehabilitation program. Education strategies also need to target family members such as their spouse and children with particular attention to the main carer. Nurses play an essential role in emphasizing to the main carer their role in encouraging and supporting the self-motivation and health behaviour changes of cardiac patients.

Study Limitations

In this study, there were several limitations. Firstly, this study used a non-randomized design in recruitment, thus limiting the generalizability of the results. Due to time, financial and human resource constraints, the intervention was conducted only in one centre. Therefore, the effectiveness of the intervention cannot be generalized across other hospitals or medical centres and may not represent the actual practice in the other states in Malaysia. Secondly, the participation of female patients was very low. We only managed to get seven females out of 60 participants. However, it is well established that one of the non-modified risk factors of CVD is male gender; this is a good reason why less female cardiac patients were admitted and referred for cardiac rehabilitation.

CONCLUSION

The evidence from this study suggested that the modified CREP was an effective approach to increase level of heart disease knowledge, level of self-motivation and health behaviour change among cardiac rehabilitation patients. The results were significant enough for healthcare personnel especially the nurses to use the modified CREP to educate and support the cardiac rehabilitation patients.

Future studies could implement the intervention to a large group of patients instead of one to one; researchers could also compare the effectiveness of intervention with different methods of delivery.

ACKNOWLEDGEMENTS

I wish to acknowledge and would like to express my sincere appreciation to Associate Professor Dr Mohd Nazam Dzolkarnaini and Dr Nadia Mustafa for supervised me at the research site.

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