

BEHAVIOURAL CHANGES AMONG POST-MYOCARDIAL INFARCTION PATIENTS UNDERGOING CARDIAC REHABILITATION-MEDICATION THERAPY ADHERENCE CLINIC (CR-MTAC)

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ABSTRACT

Cardiac rehabilitation management for post-myocardial infarction patients involves participation from multidisciplinary teams. Pharmacist contributions in influencing patients' outcome needs to be further explored. This study aimed to evaluate the behavioural impact of a pharmacist-managed Cardiac Rehabilitation-Medication Therapy Adherence Clinic (CR-MTAC) on post-myocardial infarction patients compared to Usual Care (UC). This was a cross-sectional, cohort observational study conducted between January and April 2011 at a tertiary public hospital. A total of 45 patients from CR-MTAC and 43 patients from UC were randomly selected and medical records were evaluated retrospectively for the past 2 years. All patients were under the care of physicians. The CR-MTAC group was counselled on non-pharmacotherapy and pharmacotherapy approach along with medications directly dispensed in the clinic by the pharmacist, while the UC group obtained the medications from the outpatient pharmacy. Behaviour changes were measured by medication adherence and assessed using Modified Morisky Scale (MMS) and A Single Question (ASQ). Baseline patient characteristics were similar between both groups. There was a higher percentage of adherent patients among CR-MTAC group at the end of the study in contrast to UC group using MMS (86.7 vs 41.9%, $p < 0.001$) and ASQ (95.6 vs 53.5%, $p < 0.001$). Patients with high adherence demonstrated better reduction of low density lipoprotein-c (LDL-c) level ($p < 0.001$) post CR-MTAC intervention. Pharmacist intervention through CR-MTAC showed improvement in medication use behaviour changes among post-myocardial infarction patients compared to UC patients.

Keywords: Cardiac Rehabilitation, Medication Therapy, Adherence Clinic, Myocardial Infarction

INTRODUCTION

Medication adherence as important component in patient behaviour is especially important since appropriate use of medications has been associated with reduction of 3% per year mortality over a 10-year period in post myocardial infarction (MI) patients ¹. However, studies have found that significant number of MI patients did not adhere to the prescribed medication ²⁻⁴. Non-adherence to medications was also found to increase mortality in MI patients ⁵⁻⁸ with self-reported medication non-adherence associated with a greater than two-fold higher rate of subsequent cardiovascular events ⁹.

Pharmacists have been playing a significant role as part of the health care team in managing patients with cardiovascular diseases (CVD). Numerous studies have demonstrated that the pharmacists involvement is beneficial in controlling patients' lipid profile ¹⁰⁻¹² and improvement in medication adherence ¹³⁻¹⁵. Simpson et al. (2010) evaluated a 4-month intervention program involving pharmacist and reported a 10-year reduction in risk of CVD ¹⁶. Pharmacist-managed pharmacotherapy clinics also showed significant increase in the number of coronary heart disease (CHD) patients appropriately treated for hypercholesterolemia and achieving target LDL level compared to the usual care ¹⁷. Reilly and Cavanagh (2003) reported that having a pharmacist in a secondary heart disease prevention clinic conferred clinical and economic benefits by optimising drug and lifestyle therapy ¹⁸.

Medication Therapy Adherence Clinic (MTAC) is one of the clinical pharmacy services provided in selected Malaysian government hospitals in collaboration with the physicians. These clinics involve several specialty areas including diabetes, warfarin and post-myocardial infarction. It is aimed to improve patients' knowledge on disease and medication-taking behaviour. The CR-MTAC is run by pharmacists who have undergone an additional intensive one-month training on cardiac rehabilitation. Among the activities are assessing medication adherence, identifying and solving pharmaceutical care issues, educating on cardiac rehabilitation and medication counselling. Patient outcomes are measured using Modified Morisky Scale (MMS) to determine the level of patient motivation and knowledge on medication, and lipid control based on

the fasting serum lipid levels. However, studies evaluating the impact of CR-MTAC on patients' outcome are still scarce. Therefore, the aim of this study was to evaluate the impact of Cardiac Rehabilitation Medication Therapy Adherence Clinic (CR-MTAC) towards patients' behavioural changes in their medications adherence compared to UC among post MI patients.

MATERIALS AND METHODS

Study Design

This cross-sectional cohort observational study was conducted at the CR-MTAC at the Physician Clinic of Hospital Kuala Lumpur (HKL). The group of subjects who attended the clinic from January until March 2011 were followed up and the medical data were evaluated retrospectively for a period of more than 3 months and less than 2 years prior to clinic appointment. Patients were divided into two groups, the experimental and the control group. The control group consisted of post-MI patients who attended the physician clinic and collected their medications from the outpatient pharmacy while the experimental group consist of post-MI patients attending both physician clinic and CR-MTAC at Hospital Kuala Lumpur and who were provided their medications at the CR-MTAC.

Participant Selection

Patients with the history of MI, in stable condition and scheduled for a follow-up appointment with CR-MTAC and Physician Clinic between January until March 2011 were screened and included based on the eligibility criteria. Only patients with primary diagnosis of MI, baseline low density lipoprotein-c (LDL-c) level more than 2.6 mmol/L, duration of two years of follow up from index event and had at least one clinic previous visit were included.

Sample Size

The sample size equation by Kadam & Bhalerao (2010) ¹⁹ was used with the minimal of 40 experimental subjects and 40 control subjects have to be studied to be able to reject the null hypothesis that the population means of the experimental and control groups are equal with a test power of 90% and a two-tailed 95% confidence interval. However, taking into accounts a 20% drop out rate, 8

patients were added to each arm making the final sample size of 48 patients per arm.

Randomisation

The appointment lists of patients who will be seen at the CR-MTAC and Physician Clinic (PC) were generated every week. Random sampling was used to select participants, using random numbers generated by Microsoft Office Excel 2003 every week until the sample size achieved.

Study Instruments

Patients' demographic data, psychosocial and behavioural factors, co-morbidities, current drug regimen, baseline and current fasting serum lipid levels were obtained from the Cardiac Rehabilitation Clinic Records, which is shared between the doctors and pharmacists for CR-MTAC group and Physician Clinic Records for the Usual Care group.

Medication adherence was measured by validated Modified Morisky Scale (MMS) consisting of six questions. This tool was designed to predict medication-taking behaviour and patient's long-term continuation of therapy in chronic diseases. Questions 1, 2, and 6 measure forgetfulness and carelessness and are considered to be indicative of motivation. Questions 3, 4, and 5 measure the understanding of the long-term benefits of continued therapy and are considered to be indicative of knowledge. Patients from both groups were interviewed through phone conversation. The Morisky scales were summed up for each domain and a score above one for each domain implies that the patients are motivated and knowledgeable (Appendix A). CARDIA Questionnaire is a 3-item, structured and validated medication adherence tool on overall medication adherence, unintentional (forgot to take) and intentional (decided to skip) non-adherence to medication²⁰. However, in this study only a single item on overall medication adherence from the questionnaire was used to study the accuracy of self-reported medication adherence among out-patient coronary heart disease Table 1. The mean age of the patients in the study was 50.75±5.56 years. Women comprised only 9.1% of the total population. Majority were Malays (53.4%), followed by Indians (31.8%), Chinese (11.4%) and others. Only 4.5% of patients did not receive formal education. About 7 out of 10 patients were self-employed or worked in private

patients (Appendix B). Gehi et al. (2007) found that by selecting the one single question, this may be a simple and effective method to identify patients at higher risk for adverse cardiovascular events because self-reported medication non-adherence is associated with a greater than 2-fold increased rate of subsequent cardiovascular events⁹. Good medication adherence is defined as patients who adhered to medication based on the MMS and ASQ.

Statistical Analysis

All the statistical tests in this study were performed using the PASW software (version 18.0). Descriptive analysis involving demographic data and number of patients achieving defined endpoints were presented in percentage, means and standard deviations. Bivariate analysis using Chi-square test was used to compare differences in demographic data and level of adherence between study groups. Pearson's correlation was used to describe the association between medication adherence and LDL-c levels. All statistical tests were two-tailed and a p-value of ≤0.05 was used for statistical significance.

Ethical Approval

This study was approved by Ministry of Health Research Ethics Committee, Malaysia (NMRR-11-15-8004).

RESULT

The medical records of 86 and 123 patients enrolled in CR-MTAC and physician clinic, respectively were screened for 12 weeks (January to March 2011). Only 67 of the CR-MTAC and 85 of the UC group were selected, as shown in Fig. 1.

Demographic data

Eighty-eight patients were included in the final analysis. Baseline characteristics of these randomly selected patients were similar between groups as shown in

sector and only one retiree in each group. Although UC group received a higher monthly salary between RM 2 000 and RM 4 000 compared to CR-MTAC group, the difference was not significant. The average duration of follow-up from index event was 12 months.

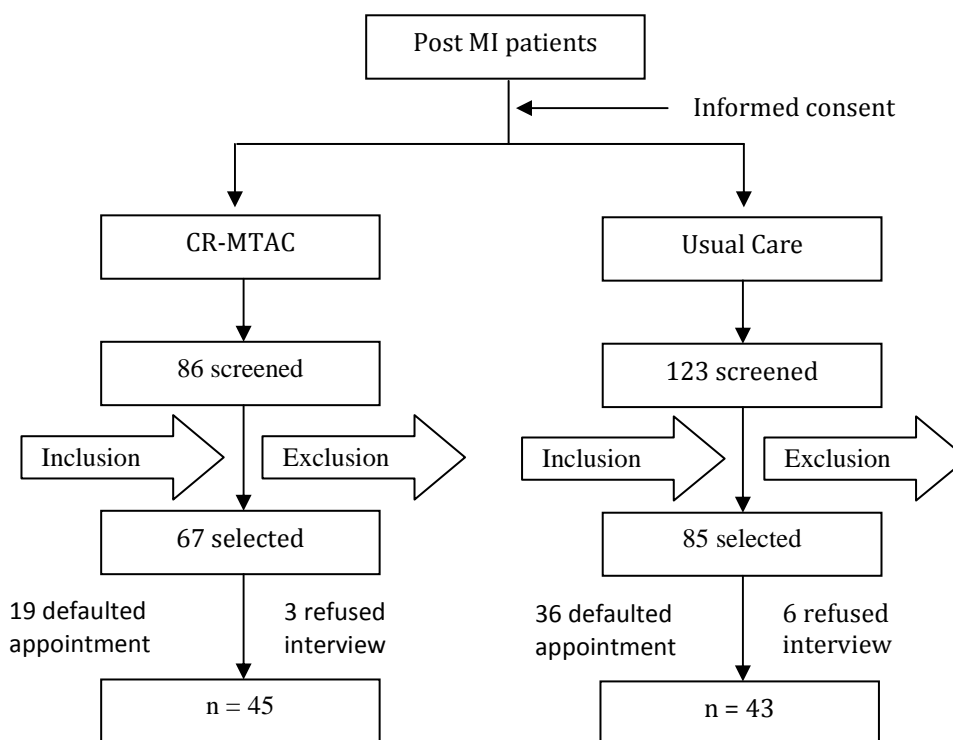


Fig. 1 : Study Flowchart

Table 1: Baseline demographic data and clinical characteristics

Characteristics	CRMTAC (n=45)	Usual Care (n=43)	p-value
Demographic data			
Age, years (Mean ± SD)	50.42 ± 5.90	51.09 ± 5.24	0.58 ^a
Male, n (%)	41 (91.1)	39 (90.7)	1.00 ^b
Race, n (%)			0.84 ^b
Malay	24 (53.3)	23 (53.5)	
Chinese	4 (8.9)	6 (14.0)	
Indian	15 (33.3)	13 (30.2)	
Married, n (%)	33 (73.3)	30 (69.8)	0.89 ^b
Education, n (%)			0.43 ^b
Primary	19 (42.2)	15 (34.9)	
Secondary	20 (44.4)	25 (58.1)	
Graduate	4 (8.9)	1 (2.3)	
Employment, n (%)			0.76 ^b
Unemployed	2 (4.4)	2 (4.7)	
Private/ Self - employed	32 (71.1)	33 (76.7)	
Government	10 (22.2)	6 (14.0)	
Monthly income, n (%)			0.26 ^b
< RM 2 000	23 (51.1)	13 (30.2)	
RM 2 000 – RM 4 000	16 (35.6)	22 (51.2)	
> RM 4 000	4 (8.9)	5 (11.6)	
Duration of follow-up from index event, months (Mean ± SD)	12.29 ± 5.36	12.12 ± 4.62	0.87 ^a
Psychosocial and behavioural factors			
Live with family, n (%)	36 (80.0)	30 (69.8)	0.39 ^b
Active smoker at index event, n (%)	35 (77.8)	36 (83.7)	0.49 ^b
Body Mass Index in kg/m ² , n (%)			0.23 ^b
Pre-obese (23 – 27.4)	20 (44.4)	17 (39.5)	
Obese I (27.5 – 34.9)	12 (26.7)	19 (44.2)	
Obese II (≥ 40.0)	1 (2.2)	1 (2.3)	
Co-morbidities			
Hypertension, n (%)	23 (51.1)	24 (55.8)	0.82 ^b
Diabetes mellitus type 2, n (%)	15 (33.3)	14 (32.6)	1.00 ^b
Dyslipidemia, n (%)	37 (82.2)	31 (72.1)	0.38 ^b
Cardiovascular medication use			
No. of medications (Mean ± SD)	5.53 ± 0.89	5.49 ± 0.94	0.82 ^a
Max. dose frequency per day			
Three times a day	36 (80)	37 (86)	0.73 ^b

a: Independent Student t test, b: Chi-square test

Medication Adherence

Fifty seven (64.8%) patients were found to adhere to their medications based on the MMS. However, based on 'A Single Question' from CARDIA Questionnaire, 66 (75%) patients reported that they adhere to their medication.

Patients who adhered to the treatment with the value of more than one for both motivation and knowledge domain based on the six-item MMS were 86.7% for CR-MTAC group and 41.9% for the UC group. There was significant difference on medication adherence for both groups ($p < 0.01$ [between group comparisons]). Almost half of the UC group were neither motivated to take their medications nor knowledgeable about their medications ($p < 0.01$ [within- and between group comparisons]), as tabulated in Table 2. The relationship between the motivation domain and knowledge domain in MMS was strong and positively correlated ($r = 0.70$, $p < 0.01$).

Significantly high percentage (88.9%) of patients in the CR-MTAC group knew the long-term benefits of taking their medications compared to the UC group (25.6%) ($p < 0.01$). About 70% of the UC group forget to take their medication as compared to only one in three patients in CR-MTAC group ($p < 0.01$). Overall, about one in 10 patients (CR-MTAC: 4.4%, UC: 16.3%) were careless about the time to take their medications ($p = 0.14$). The percentage of patients who forgot to refill prescription was five times higher in the UC group compared to the CR-MTAC group (37.2%) ($p < 0.01$). Almost 50% of the patients in the UC group decide to skip their medications when they felt better as compared to only 20% of the patients in CR-MTAC group ($p < 0.01$).

According to the patient self-administered multilingual 'A Single Question' (ASQ), the CR-MTAC group had a higher percentage (95.6%) of patients taking medications as prescribed by the doctors at least 90% of the time, compared to the UC group (53.5%). Patients' responses are shown in Fig. 2.

Table 2: Response to Modified Morisky Scale

	CR-MTAC, n (%)		p-value within group ^{1,a}	Usual Care, n (%)		p-value within group ^{1,a}	p-value between groups ^{2,a}	
	Motivation domain			Motivation domain				
	Yes	No		Yes	No			
Knowledge domain	Yes	39 (86.7)	2 (4.4)	0.62	18 (41.9)	1 (2.3)	< 0.01*	< 0.01*(for both domains and overall)
	No	3 (6.7)	1 (2.2)		5 (11.6)	19 (44.2)		

1: p-value between baseline and current values within each group, 2: p-value between CR-MTAC and Usual Care group

a: Chi-square test

* Statistically significant, $p < 0.05$

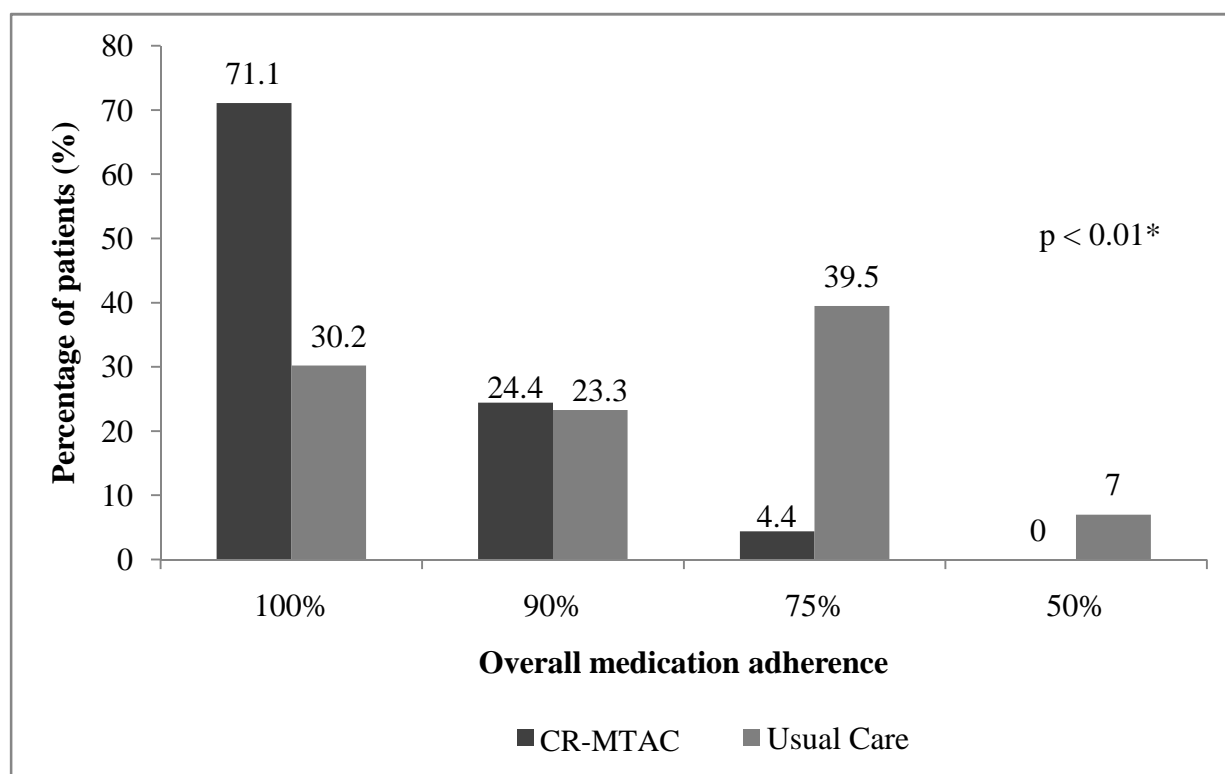


Fig. 2: Response to 'A Single Question'

There were 86.7% and 39.5% of patients who were classified with good adherence in CR-MTAC and UC group, respectively ($p < 0.01$). An interesting unintended finding was that patients who adhere were also found to be more likely to quit smoking ($p = 0.02$).

The baseline patient characteristics for MMS and ASQ (adherent versus non-adherent group) were similar. With reference to MMS as the gold standard, ASQ had a sensitivity of 98.2% and specificity of 67.7% with a positive predictive value of 84.8% and negative predictive value of 95.5%. The relationship between MMS and ASQ was strong and positively correlated ($r = 0.73, p < 0.01$).

DISCUSSION

Adherence to medication is associated with patients' belief of the necessity of treatment and their concern about adverse events²¹⁻²². Although patients may be initially enthusiastic, those with slow or incomplete recovery may become despondent to the treatment, while patients who recover quickly may subsequently dismiss risks as unimportant²³. Patients who do not perceive any physical harm from their disease or immediate benefit from medication may believe therapy is not necessary and may be poorly motivated to adhere to the treatment²⁴. This issue was also discussed by Cramer et al (2008) who reported that only 63% of the patients continued with their medication for a year and that patients only take their medication 72% of the time²⁵. Therefore, pharmacists may improve patients' medication adherence by reinforcing the need for treatment and addressing patient's apprehensions.

In general, patients in CR-MTAC group were found to be highly motivated with good medication adherence since pharmacists encouraged them to participate actively in their own care and may ask for clarification of incomplete or incorrect information related to their disease and medication. Incomplete or incorrect information about coronary heart disease and its treatment which contributed to non-adherence have been previously reported²⁶⁻²⁷. Lee et al. (2009) showed that 51.7% of patients with hyperlipidemia under the physician-pharmacist collaborative care adhered to the prescribed lipid lowering medications²⁸. Therefore, provision of continued

education, motivation, and support to patients in CR-MTAC group could contribute to improve adherence to medication.

Patient education may play an important role in promoting positive behaviour changes in their medication taking behaviour and improving lipid management. Alm-Roijer et al. (2004) reported that there was statistically significant positive correlation between knowledge and medication adherence among CHD patients²⁹. In the Lipid Treatment Assessment Project (L-TAP) survey, patients with a higher level of education were more likely to reach recommended lipid levels which may be due to a greater understanding of their disease³⁰. Faulkner et al. 2000, conducted a pharmacy counselling program, using weekly follow-up telephone calls to patients in the first 12 weeks of therapy, and showed significant improvements in adherence and lipid profiles for up to two years compared with patients in the Usual Care group³¹. Gehi et al (2007) demonstrated that non-adherent patients were more likely to have depressive symptoms and higher cholesterol levels⁹.

MMS was used to assess motivation and knowledge status and ASQ for the adherence rate of the patients. Positive and strong correlation between MMS and ASQ may imply that adherent patients according to MMS were more likely to report good adherence according to ASQ. Morisky et al. (1986) have shown that self-report approach by questioning patients may encourage patients to feel comfortable in telling the truth and may probably facilitate the identification of poor adherence³². However, during the assessment of self-reports, adherence may be overestimated in an effort to "please the investigator" and should be handled carefully. Although this issue may arise, this simple and straightforward method to assess patient-self reported medication adherence is still considered practical to be used among Malaysian patients.

Pharmacist-managed CR-MTAC showed significant positive behavioural changes among patients in the CR-MTAC group compared to the UC group. The implementation of CR-MTAC at the other public healthcare institutions may improve patients' adherence and knowledge among post-myocardial infarction patients.

APPENDIX A

Modified Morisky Scale

Medication adherence assessment	Motivation	Knowledge
Do you ever forget to take your medicine?	Yes (0); No (1)	
Are you careless at times when taking your medicines?	Yes (0); No (1)	
When you feel better do you sometimes stop taking your medicine?		Yes (0); No (1)
Sometimes if you feel worse when you take your medicine, do you stop taking it?		Yes (0); No (1)
Do you know the long-term benefit of taking your medicine as told to you by your doctor or pharmacist?		Yes (1); No (0)
Sometimes do you forget to refill your prescription medicine on time?	Yes (0); No (1)	
	Total Score	
	Scale > 1	Yes/ No Yes/ No

Interpretation

Patient is deemed adherent if the scale for each domain is above one, otherwise non-adherent.

Source: Morisky DE, Green LW, Levine DM. 1986. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care.* 24:67-74.

APPENDIX B

'A single question'

In the past month, how often did you take your medications as the doctor prescribed?	
<input type="checkbox"/>	All of the time - (100%)
<input type="checkbox"/>	Nearly all of the time - (90%)
<input type="checkbox"/>	Most of the time - (75%)
<input type="checkbox"/>	About half the time - (50%)
<input type="checkbox"/>	Less than half the time - (<50%)
Outcome:	
<input type="checkbox"/>	90 -100% (Adherent)
<input type="checkbox"/>	≤ 75% (Non - adherent)

Source:

Cutter GR, Burke GL, Dyer AR, Dyer AR, Friedman GD, Hilner JE, Hugher GH, Hulley SB, Jacobs DR Jr, Liu K, Manolio TA. 1991. Cardiovascular risk factors in young adults: the CARDIA baseline monograph. *Control Clin Trials.*12:1S-77S.

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