

# Enrollment and attendance to Cardiac Rehabilitation after Percutaneous Coronary Intervention in Sarawak: A Prospective Study

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**Abstract: Background:** Cardiac rehabilitation is vital for cardiac patients, especially after the percutaneous coronary intervention as it is proven to reduce recurrent cardiac event and death. The ongoing CR participations of the patients in Sarawak after percutaneous coronary intervention have not been explored.

**Purpose:** To examine the enrollment and attendance to cardiac rehabilitation among patients who have underwent percutaneous coronary intervention in Sarawak.

**Methods:** A prospective study was conducted. Data on baseline characteristics, diagnosis, smoking status, and referrals received for CR were collected for selected subjects prior to hospital discharge. Their attendances to CR programme were followed up at two months after hospital discharge. Independent sample T-test was used to analyse the continuous data and Chi square test was conducted for categorical data to identify the differences in characteristics between patients who was enrolled for CR and those who was not.

**Results:** Three hundred and eighty patients were recruited in this study. Among these patients, 141 patients (37.11%) were referred to CR. Only 58 patients (15.3%) completed all the eight sessions of the CR programme, 276 patients (72.6%) did not turn up and 46 patients (12.1%) dropped out before completing all the sessions. Patients who were enrolled in CR were more likely to be men ( $p=0.001$ ), Malay ( $p=0.000$ ), having travel time of less than 1 hour from home to hospital ( $p=0.000$ ), and able to drive ( $p=0.009$ ).

**Conclusions/ Implications for Practice:** The enrollment and attendance rate of CR in Sarawak is low. Men, Malay, staying near to the hospital, and being a driver were more likely to be referred to CR. Further study on this is needed as CR is proven to benefit the patients.

**Keywords:** Cardiac rehabilitation, enrollment, attendance, Percutaneous Coronary Intervention, Sarawak

## I. BACKGROUND

Cardiac rehabilitation (CR) is a class I indication for patients after Coronary Revascularization procedures (Ministry of Health Malaysia, 2011, 2014). Participation in CR was significantly associated with 42% to 58% reduction in mortality (Beauchamp et al., 2013; Dunlay, Pack, Thomas, Killian, & Roger, 2014; Goel, Lennon, Tilbury, Squires, & Thomas, 2011) and reduction in hospital readmissions (Dunlay et al., 2014; Martin et al., 2012), which in turn could help in lowering the cost of the health care (Dendale, Hansen, Berger, & Lamotte, 2008). In addition, study has also shown that patients who attended only a proportion of CR sessions offered had more than 50% risk of death and myocardial infarction than patients who attended the CR sessions fully (Hammill, Curtis, Schulman, & Whellan, 2010). Despite these benefits, many studies

reported a relatively low attendance rate between 12% to 38% (Ali et al., 2012; Hutchinson, Meyer, & Marshall, 2015; van Engen-Verheul et al., 2013; Poh et al., 2015), and a high discontinuation rate up to 50% in the CR programmes (Ali et al., 2012; De Vos et al., 2013; Mikkelsen, Korsgaard Thomsen, & Tchijevitch, 2014; Soleimani et al., 2009; Turk-Adawi, Oldridge, Tarima, Stason, & Shepard, 2013).

Sarawak is one of the states in Malaysia. In Sarawak, Sarawak Heart Centre is the only government hospital which provides CR. There were very limited studies found in relation to the enrollment and attendance to CR programme in Sarawak. Percutaneous Coronary Intervention (PCI) is one of the most commonly performed procedures to treat coronary heart disease and 4762 PCIs were performed between 2007 and 2014 in Sarawak Heart Centre (Wan Ahmad & Liew, 2016). The ongoing CR participations of these CHD patients after the initial treatment have not been explored. Research in this area is imperative as these patients are at a substantial risk of recurrent cardiac event and death (Marmor, Geltman, Schechtman, Sobel, & Roberts, 1982; Thune et al., 2011). This study aimed to examine the enrollment, attendance, and barriers to CR among patients post percutaneous coronary intervention in Sarawak.

## II. METHODS

### Design, sample, and data collection

A prospective study was conducted in Sarawak. Data were collected on CR programme at Sarawak Heart Centre. In Sarawak Heart Centre, the CR programme consists of inpatient and outpatient CR. Inpatient CR, is also called Phase One CR, mostly involved correction of cardiac misconceptions, risk factor assessment, mobilization and invitation for outpatient CR before hospital discharge. In outpatient CR, Phase Two is delivered four weeks after hospital discharge in group sessions. It involved twice a week attendance for four weeks with a total of eight sessions. Phase Two includes exercise, education, risk-factor monitoring and treatment, stress management, and relaxation training. This study focused on the enrollment and attendance of patients in Phase Two.



Patients who had underwent PCI were included in this study. Those who with residual coronary stenosis and assessed by healthcare professionals to have limited ability to participate CR were excluded. Data on baseline characteristics, diagnosis, smoking status, and referrals received for CR were collected for selected subjects prior to hospital discharge. Data on the reasons for not referring to CR documented by nurses or doctors was also collected. Their attendances to CR programme were followed up at two months after hospital discharge.

*Ethical consideration*

Ethical approval was obtained from Medical Research and Ethic Committee, National Institute of Health (NIH), Malaysia (approval number: 5KKM/NIHSEC/P17-19). Informed consent was obtained from every respondent.

*Statistical analysis*

Statistical analysis was done using SPSS version 22. Continuous data were presented using mean ± standard deviation. Categorical data were described as numbers and percentage. Independent sample T-test was used to analyse the continuous data and Chi square test was conducted for categorical data to identify the differences in characteristics between patients who was enrolled for CR and those who was not.

*Results*

The number of patients who underwent PCI between January 2017 and August 2017 was 461. Among these patients, 81 (17.57%) were excluded. The reasons for the exclusion were 16 (3.47%) of them had residual coronary stenosis and 65 (14.10%) of them had limited ability to participate CR. The remaining 380 patients were all recruited in this study.

The characteristics of the 380 patients are presented in Table 1. The patients' mean age was 55.82 (SD=10.31). Majority of them were male (84.74%), Chinese (32.63%), and able to drive (73.95%). About half of them (47.37%) need to travel more than one hour from home to hospital, where the CR programme was conducted. They had a number of cardiovascular risk factor. The most common indication for PCI was ST segment elevation myocardial infarction (32.89%). Most of the PCIs were done for multiple affected coronary arteries (60.53%).

**Table 1 Patient characteristics**

Characteristics	n=380
Age (years), mean (SD)	55.82 (10.31)
Gender, n (%)	
Male	322 (84.74)
Female	58 (15.26)
Ethnicity, n (%)	
Chinese	124 (32.63)
Malay	122 (32.11)
Iban	95 (25.00)
Bidayuh	22 (5.79)
Others	17 (4.47)
Driving ability, n (%)	
Able to drive	281 (73.95)
Unable to drive	99 (26.05)

Travel time from home to hospital, n (%)	
Less than 1 hour	200 (52.63)
More than 1 hour	180 (47.37)
Body mass index, n (%)	
Less than 18.5	7 (1.84)
18.5-23.0	78 (20.53)
23.1-27.5	197 (51.84)
More than 27.5	82 (21.58)
Risk profile, n (%)	
Smoking	107 (28.16)
Hyperlipidemia	226 (59.47)
Hypertension	231 (60.79)
Diabetes Mellitus	117 (30.79)
Indication for PCI, n (%)	
STEMI	125 (32.89)
NSTEMI	92 (24.21)
Unstable angina	109 (28.68)
Stable angina/silent ischaemia	44 (11.58)
Number of coronary arteries intervened, n (%)	
Single	150 (39.47)
Multiple	230 (60.53)

Of these 380 patients, 141 patients (37.11%) were referred to CR by the doctors or nurses. The significant difference between the patients who were enrolled in CR and those who were not was found in gender, ethnicity, travel time from home to hospital, and ability to drive. Patients who were enrolled in CR were more likely to be men (p=0.001), Malay (p=0.000), travel time of less than 1 hour from home to hospital (p=0.000), and able to drive (p=0.009).

The recorded reasons for not referring the patients to CR were unable to travel far (45.53%), patient declined the offer (22.11%), and no specific reason (32.36%). Among these 141 patients who were referred to the CR, only 58 patients (15.3%) completed all the eight sessions of the CR programme. 276 patients (72.6%) did not turn up to the programme and 46 patients (12.1%) dropped out before completing eight sessions.

**III. DISCUSSION**

In 380 cardiac patients who were eligible for CR, only 37.11% of them were referred to the programme. This finding is consistent with the findings in other countries (Ali et al., 2012; Hutchinson, Meyer, & Marshall, 2015; van Engen-Verheul et al., 2013). Patients who were men, Malay, having travel time of less than 1 hour from home to hospital, and having the ability to drive were more likely to be referred to CR in Sarawak. These finding suggest that many efforts are needed to increase the rate of enrollment.

Men were more likely to be referred to CR by the doctors and nurses in this study when compare to women. This problem was also reported in other studies. In a meta-



analysis, CR referral significantly lower for women than men (Colella et al., 2013). All the women in this study were in the middle-age group. They may have more perceived barriers to attend the CR than men as their roles of being a mother and wife at home. Besides, they were more likely to have transportation problem as most of them were not able to drive.

Besides, ethnicity seems to affect the decision of being referred to CR. Previous study has shown that disparity occurs in the use of CR among ethnic minority patients compared to white patients (Mead, Ramos, & Grantham, 2016). Malay is one of the major ethnics in Sarawak and comprised about 24.4% of the population (Department of Statistics Malaysia, 2017). The result of this study suggests there may be ethnic disparity in the referral of patients to CR in Sarawak.

It was also found that staying far from hospital played a role in the referrals to CR. Sarawak is the largest state in Malaysia located at the Borneo Island with an area of 124,450 km<sup>2</sup> and a population of 2.14 million (Department of Statistics Malaysia, 2017). However, Sarawak Heart Centre is the only government heart centre in the state receiving patients from all over the state. A large number (47.37%) of the patients in this study needed to travel more than one hour to reach hospital for the CR. Previous study has found that patients were significantly less likely to enroll in CR when travel time to attending CR was 60 minutes or more (Brual et al., 2010).

More facilities need to be provided to ensure cardiac patients in Sarawak benefits from CR.

Perhaps home-based CR can be initiated if more heart centres cannot be set up in the state.

The results of this study show that having the ability to drive were more likely to be referred to CR. This suggests that being a driver or a non-driver might affect the health care providers' decision to refer them to CR as patients have high possibility to not turn up for CR if they are not able to drive. Dunley et al. (2009) in their study also reported that non-driver predicted the non-attendance in CR. The health care system needs to address this problem to mitigate disparities in CR use in Sarawak.

The reasons that the patients were not referred to CR by the doctors and nurses were merely collected using the medical records in this study. Perhaps these reasons can be further explored to address the health care providers' concern. In one study, positive perception of CR and patient's travel distance were found to significantly affecting the decision of referral from the physician (Grace et al. 2008). These reasons are worthwhile to be investigated as they could hinder the referrals of the eligible patients.

The rate of CR completion among the patients referred and enrolled was low at 15.3% in this study. Majority of the patients either did not turn up or dropped out before completing all the sessions. This suggests the lack of reinforcement of CR and patients may be demotivated to attend the appointment. Reinforcement of CR attendance and motivational programme have been shown to improve CR participation (Pack et al., 2013). These can be implemented to increase the attendance and adherence to CR in Sarawak.

#### IV. LIMITATIONS

There were only 141 patients out of 380 patients who were enrolled in CR in this study. The characteristics of these 141 patients were not compared and the differences between the groups may be different with the results presented. Besides, the education and socioeconomic status of the patients were not reported in this study, which may affect the referral to CR. Given the sample size was only 141, the results may not be representative of the population of cardiac patients in Sarawak.

#### V. CONCLUSIONS

The enrollment and attendance rate of CR in Sarawak is low. The results of this study suggest that there was disparity in the enrollment with men, Malay, staying near to the hospital, and being a driver were more likely to be referred to CR. Further study on this is needed as CR is proven to benefit the patients. Given that many patients need to travel more than one hour to reach hospital, alternatives to hospital-based programmes like home-based CR can be considered.

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