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BRIEF REPORT

Cardiac Rehabilitation After Percutaneous Coronary Intervention in a Multiethnic Asian Country: Enrollment and Barriers

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Abstract

Objective: To determine the enrollment or barriers to cardiac rehabilitation (CR) among Asian patients who have undergone percutaneous coronary intervention (PCI).

Design: Prospective observational study.

Setting: Department of cardiology at a university hospital.

Participants: Patients (N = 795) who underwent PCI between January 2012 and December 2013 at a tertiary medical institution.

Interventions: Not applicable.

Main Outcome Measures: Data on enrollment in phase 2 CR and its barriers were collected by dedicated CR nurses.

Results: Of 795 patients, 351 patients (44.2%) were ineligible for CR because of residual coronary stenosis, while 30 patients (3.8%) were not screened because of either early discharge or death. Of the remaining 416 patients (90.8% men; mean age, 55y), 365 (87.7%) declined CR participation and 51 (12.3%) agreed to participate. Of these 51 patients, 20 (39%) did not proceed to enroll and 4 (8%) dropped out, leaving 27 patients (53%) who completed at least 6 sessions of the CR program. The top 3 reasons provided by patients who declined to participate in CR were (1) busy work schedules (37.5%), (2) no specific reason (26.7%), and (3) preference for self-exercise (20.1%). Nonsmokers were more likely to participate in CR ($P = .001$).

Conclusions: CR participation of Asian patients after PCI was found to be lower than that reported in Western countries. The exclusion criteria used in the institution under study differed from those provided by international associations. A busy work schedule was the most common reason for declining CR after PCI.

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Cardiac rehabilitation (CR) has been shown to decrease the risks of cardiac and all-cause mortality,[1,2] improve cardiovascular risk factor control,[3] and promote overall wellness and good mental health.[4] Both the American College of Cardiology[5,6] and the European Society of Cardiology[7] advocate CR for patients with stable angina, previous myocardial infarction, as well as after percutaneous coronary intervention (PCI) or coronary artery bypass grafting, giving it the highest class I level of recommendation. Nonetheless, the rate of enrollment in CR programs around the world remains suboptimal, at approximately 20% to 30%.[8] Various barriers to CR have been identified, such as the lack of a perceived need for CR, time constraints, and inaccessibility.[9]

So far, there are limited data on rates of enrollment in Asian countries. Asia is home to more than half of the world's population, but data on enrollment of Asian patients in CR are very limited. The incidence of cardiovascular disease is growing in developing Asian countries because of a rapid increase in cardiovascular risk factors.[10-14] Therefore, cost-effective therapy such as CR is a crucial means of improving the health of Asian patients with cardiovascular disease. Because patients' perceptions of CR and readiness to participate in CR programs differ between Asian and Western countries, CR enrollment rates in Asia

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and the West are expected to be different. In Singapore, cardiovascular diseases account for most of the total disability-adjusted life years and are the second leading cause of mortality after cancer.[15,16]

In light of this substantial disease burden, we thus sought to identify the rate of enrollment in CR and the barriers to CR participation among cardiac patients admitted to a tertiary institution in Singapore. The patients were asked to indicate their interest in joining a phase 2 CR program and were categorized accordingly into 3 groups: keen to participate in CR, not keen to participate, and ineligible to participate. We identified and analyzed the patients' rate of enrollment in CR, rate of completion of the 12-session rehabilitation program, reasons given for rejecting CR, and criteria for ineligibility.

Methods

Study design and patient recruitment

This prospective study was conducted in Singapore. Data were collected on the CR program run by the National University Heart Centre, Singapore. As per standard practice at this institution, post-PCI patients were monitored at the coronary care unit for at least 1 day. Patients presenting with clinically stable angina were discharged the next day, whereas those who presented with acute coronary syndrome were monitored for up to 5 days. Informed consent was obtained from each patient, and the study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the institution's human research committee (DSRB-C 2012/00051).

CR program

The CR program under study consists of 4 phases. Phase 1 is carried out in an inpatient setting, Phases 2 and 3 are conducted in an outpatient setting, and phase 4 occurs in a community-based setting. During phase 1, patients receive post—heart event and procedure advice from CR nurses or cardiothoracic and vascular surgery case management officers, as well as physiotherapists and dieticians. During phase 2, patients are offered 12 sessions of exercise training and counseling and a further 7 educational talks over 4 to 6 weeks. The sessions are conducted by nurses, pharmacists, dieticians, physiotherapists, occupational therapists, and medical social workers. Phase 3 provides another 12 sessions of exercise training and counseling. On completing phase 3 CR, patients are advised to undertake phase 4 CR as outpatients in either of the Singapore Heart Foundation's 2 CR facilities. The target of the present study was the enrollment of patients in the phase 2 CR.

The CR team consists of cardiologists, cardiac surgeons, physiotherapists, nurse clinicians, pharmacists, dieticians, occupational therapists, clinical psychologists, and medical social workers. The criterion for patients' inclusion in the program is the occurrence of any of the following: PCI, coronary artery bypass surgery, valve surgery, electrophysiology study, cardiac device implantation, myocardial infarction, heart failure, or peripheral vascular disease. All phase 2 CR participants are recruited by a CR nurse or care management officer and screened by an advanced nurse practitioner, a cardiologist, or a cardiac surgeon. High-risk patients must be recommended for CR by a primary cardiologist or cardiac surgeon and prescribed telemetry monitoring during CR sessions.

List of abbreviations:

CR **cardiac rehabilitation**
PCI **percutaneous coronary intervention**

Data collection

We collected data on the patients' baseline demographic, clinical, procedural and angiographic characteristics; medications used pre-, peri- and postprocedure; and various in-hospital outcomes such as death and other complications. We also documented the referrals received by each patient for smoking cessation counseling and CR during their time in the hospital.

Statistical analyses

Categorical variables are presented as numbers and percentages, and continuous variables are described as mean ± SD. Differences in the characteristics between the patients who were keen to participate in CR and those who declined participation were analyzed using the chi-square test/Fisher exact test for categorical data, or independent-sample *t* test for continuous data. All of the statistical analyses were carried out using STATA version 13,[a] assuming a 2-sided test with a 5% level of significance.

Results

The initial sample comprised 795 patients who underwent PCI between January 2012 and December 2013. Of these 795 patients, 351 (44.2%) were deemed ineligible for CR, and 30 (3.8%) were not screened because of either early discharge or death. Of the remaining 416 patients, 365 (87.7%) declined to participate in CR. The remaining 51 patients (12.3%) agreed to participate. Of these 51 patients, 27 (53%) completed at least 6 sessions of the phase 2 CR program, whereas 20 patients (39%) did not proceed to enroll in the program. The remaining 4 patients dropped out of CR before completing 6 sessions. The enrollment in CR of the 795 sampled subjects is outlined in figure 1.

The CR nurses deemed 351 patients ineligible for participation in CR. The criteria for CR ineligibility are presented in table 1. The main reason for ineligibility was residual coronary stenosis (89.7%). The demographic and clinical characteristics of the 416 patients approached to participate in CR are presented in table 2. The patients' mean age ± SD was 54.8±9.7 years; 90.8% were men and 62.8% were Chinese. The sample population exhibited a large number of cardiovascular risk factors. The most common clinical presentation leading to PCI was ST-segment elevation myocardial infarction (37.7%), and most of the PCIs had been conducted for single-vessel diseases. The only significant difference between the patients who were keen to participate in CR and those who declined participation was that the former were more likely to be nonsmokers ($P = .001$). No other significant differences were observed in demographic characteristics, medical history, or the type of clinical presentation leading to PCI.

The reasons given for rejecting CR by the 365 patients who declined to participate in the program are presented in table 3. The top 3 responses were as follows: busy work schedules (37.5%), no specific reason (26.7%), and a preference for self-exercise (20.1%).