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Research Article

Referral Rate of Admitted Cardiovascular Patients Eligible for Cardiac Rehabilitation in a Private Level 3 General Hospital: A Three-Year Retrospective Study

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Abstract

Background: Despite being recommended by most treatment guidelines, referral of eligible cardiovascular patients for cardiac rehabilitation (CR) has been historically poor worldwide. CR-referral rate, which is highly dependent on physician factors, is a performance measure of cardiovascular patient care. In our institution, where cardiovascular cases and interventions are among the most frequent types of cases admitted, data regarding CR referral is limited.

Objective: We aimed to determine the CR-referral rate in eligible adult cardiovascular patients admitted to the Manila Doctors Hospital, a tertiary training hospital.

Population: All adult in-patients from August 1, 2014 to July 31, 2017, who had acute coronary syndrome (ACS), chronic heart failure (CHF), peripheral artery disease (PAD), percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG) or valvular surgery.

Methods: A descriptive cross-sectional study utilizing chart review

Results: Over-all referral rate was 5.3%. The CR referral rate for CABG was 72%; valvular surgery, 63%; PCI, 3%; ACS, 4%; and CHF, 2%. Trend of referral is increasing among patients who underwent CABG. Among referred patients, 96% were enrolled to Phase I of cardiac rehabilitation only.

Conclusion: The CR referral rate of the institution is dismally low at 5.3%. The referral rate is higher for CABG and heart-valve surgery patients than those undergoing PCI. Referral trend is increasing in CABG patients. Enrollment rate to Phase I cardiac rehabilitation was 96%; Phase II, 16%; and Phase III, 2%.

Keywords: Cardiac rehabilitation; Acute coronary syndrome; Coronary artery bypass grafting; Percutaneous coronary intervention; Secondary prevention

Introduction

Cardiovascular disease (CVD) is one of the leading causes of death worldwide [1]. CVD covers a large range of conditions affecting the heart and vascular system, the most common of which are ischemic heart disease (IHD) and heart failure [2]. The World Health Organization (WHO) estimates that coronary heart disease (CHD) is the leading cause of death globally, causing 30.8% of all deaths per annum [3]. In the Philippines, it remains among the top 5 leading causes of morbidity and mortality [4].

Secondary prevention strategies are proven effective means to delay the progression of CVD and development of its complications. One of the key approaches of secondary prevention is cardiac rehabilitation (CR) [5]. Among the different CVDs, guidelines recommend CR as Class I management for those who had recent myocardial infarction; and those diagnosed to have chronic stable angina, stable chronic heart failure (CHF), peripheral artery disease (PAD); and for patients who underwent percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), valvular heart surgery and cardiac transplantation [6-11].

Cardiac rehabilitation is traditionally divided into three phases that aim to facilitate recovery and prevent disease progression [12].

Phase I or inpatient phase is initiated while the patient is still in the hospital. It consists of early progressive mobilization of the stable cardiac patient to the level of activity required to perform simple household tasks.

Phase II is a supervised ambulatory outpatient program and begins as soon as the patient is discharged from the hospital. During this phase the goals of the program are to develop and assist the patient in implementing a safe and effective exercise and physical activity program, return the patient to vocational and recreation activities and provide education to maximize secondary lifestyle management and proper use of medications [13].

Phase III is a lifetime maintenance phase in which physical fitness and additional risk factor reduction are emphasized [14]. This program is also beneficial to help

patients maintain compliance with lifestyle changes and to provide a safer environment for exercise which is why it is ideally conducted in an environment suited for cardiac- and risk-prone individuals [13,14].

Though CR referral for eligible cardiovascular patients is recommended in most treatment guideline, referral to and participation in CR programs has remained poor worldwide [15]. Recent meta-analyses showed that in the last decade, only 43% of eligible patients are referred [16] and those who initiate CR adhere only to an average of 67% of prescribed sessions [17].

Manila Doctors Hospital is a private, level III, general hospital; and its Cardiac Rehabilitation and Preventive Cardiology Program was established in 2014 to complete the comprehensive treatment regimen of patients with cardiac diseases. The program was founded with the core components of CR and secondary prevention.

Research question

Among admitted adult cardiovascular patients considered eligible, what is the rate of referral to the CR program in Manila Doctors Hospital?

- General objective: To determine the CR referral rate among admitted adult cardiovascular patients in Manila Doctors Hospital.
- Specific objectives:
- To determine the CR rate among admitted adult cardiovascular patients in Manila Doctors hospital with the following diagnosis and/or who underwent the following treatment:
- Myocardial infarction (MI) / Acute coronary syndrome (ACS)
- STEMI
- NSTEMI
- Unstable angina
- Percutaneous coronary intervention (PCI)
- Coronary artery bypass surgery (CABG)
- Heart valve surgery or replacement (HVS/R)
- Chronic heart failure (CHF)
- Peripheral artery disease (PAD)
- To describe the trend of CR-referral rate among eligible cardiovascular patients from August 2014 to July 2017.
- To determine the enrollment rate of the eligible admitted cardiovascular patients to the following phases of cardiac rehabilitation:
- Phase I
- Phase II
- Phase III
- To describe the demographic characteristics of adult cardiac rehabilitation patients in Manila Doctors Hospital in terms of the following:
- Age
- Sex
- co-morbid conditions
- history of smoking
- BMI

Methodology

Setting: Manila Doctors Hospital

Study design: Cross-sectional descriptive study

Study population: All patients aged 18 years old and above eligible for enrollment at the MDH CR program from August 1, 2014 to July 31, 2017 were included in the study. Patients were eligible for CR if upon or during admission have the following diagnoses or have underwent the following procedures: AMI / ACS, PCI, CABG, HVS/R, HF, PAD.

However, patients with the above diagnoses or have undergone the procedures but were transferred to another hospital for in-patient care, discharged against

medical advice, and those who expired during their hospital stay were excluded in the study.

Data collection

The list of patients who underwent CABG and HVS/R was retrieved from the Coronary Care Unit (CCU) and Operating Room logbooks. The list of patients who underwent PCI was retrieved from the Cardiac Catheterization Laboratory logbooks. The list of patients with medical conditions that fulfilled the eligibility criteria for CR was obtained from the census of the Cardiology Section of the Department of Internal Medicine. The diagnosis was verified by chart review including review of laboratory reports such as cardiac biomarkers, and echocardiographic findings. The list of patients enrolled to the CR program was obtained from the census of the Manila Doctors Hospital Cardiac Rehabilitation and Preventive Cardiology Program. The baseline characteristics of patients, including demographic profile (age, sex, BMI, comorbidities, and history of illicit drug use and smoking), was recorded using the data collection form.

Since there can be two indications for referral to CR such as patients admitted for MI who eventually underwent PCI or CABG, the most recent event or procedure was taken as the primary indication for referral.

Data Analysis

Quantitative variables were summarized as mean and standard deviation, while qualitative variables were tabulated as frequency and percentage. Referral rate was expressed as a ratio with the denominator defined as all eligible patients with a qualifying event / diagnosis and who do not meet the exclusion criteria and the numerator is defined as all eligible patients with a qualifying event / diagnosis and who have been referred to the program.

$$\textbf{Referral rate} = \frac{\text{All patients referred to the program}}{\text{All patients eligible to be referred to the program}}$$

In order to describe the 3-year trend in cardiac rehabilitation referral rate, the respective years will cover the following 12-month periods: August 2014 to July 2015, August 2015 to July 2016 and August 2016 to July 2017.

Ethical consideration

Data gathering was done purely through chart review with no patient interaction. Identifiers were kept confidential. This protocol was submitted with the approval by the Committee on Research (CORES) of the Section of Cardiology of Manila Doctors Hospital and the hospital's Committee on Research. There were no conflicts of interest for this study. The protocol design, conduct of study, collection of data and writing of the results were done independently by the authors.

Results

There were 160 patients referred to the cardiac rehabilitation and preventive cardiology program, of which 90 (56%) underwent CABG, 30 (19%) underwent PCI, 15 (9%) had ACS, 12 (8%) had HVS; and 13 (8.2%) had HF. The mean age was 60, with predominance of males (76%), majority were overweight with a mean BMI of 26 and a smoking history was seen in 42%, hypertension in 77%, dyslipidemia in 51%, and diabetes mellitus in 49% (Table 1).

	Number of referred cardiac rehabilitation patients (N = 160)
Age (Mean ± SD)	60 ± 13
Sex Male Female	 123 (76.87%) 37 (23.13%)
Cardiac Rehabilitation Indication	
Coronary artery bypass grafting surgery	90 (56%)
Heart valve surgery	12 (8%)
Percutaneous coronary intervention	30 (19%)
Acute coronary syndrome • STEMI • NSTEMI • Unstable angina	15 (9%) 4 (2%) 11 (7%) 0
Heart failure	13 (8%)
Peripheral artery disease	0
Co-Morbidity, n (%)	
Hypertension	110 (77%)
Diabetes mellitus	70 (49%)
Dyslipidemia	73 (51%)
Previous CABG	3 (2%)
Chronic kidney disease	32 (22%)
Chronic lung disease	15 (10%)
Peripheral Artery Disease	1 (1%)
Previous ACS	14 (10%)
Previous CVD	8 (6%)
Smoking history	60 (42%) N = 143
BMI	26 4

Table 1: Demographics of referred cardiac rehabilitation patients from August 1, 2014 to July 31, 2017

Of the 125 patients who underwent CABG, 90 (72%) were referred for cardiac rehabilitation. There were 18 patients who had heart valve surgery and 12 (67%) of them were referred to the program. There were 1135 patients who underwent PCI but only 30 (2.6%) were referred for CR. There were 1155 patients admitted for ACS but only 15 (1.3%) were referred for CR. The referral rate for STEMI patients were 1.5% while 1.7% for NSTEMI. Among the eligible patients admitted for heart failure only 2% were referred. There were no patients with PAD that was referred for CR. Over-all, the CR-referral rate of Manila Doctors Hospital was 5.3% (Table 2).

Indication	No. referred (%)	Total patients eligible for CR
Coronary artery bypass graft surgery	90 (72%)	125
Heart Valve Surgery	12 (67%)	18
Percutaneous coronary intervention	30 (2.6%)	1135
Acute Coronary Syndrome	15 (1.3%)	1155
STEMI	4 (1.5%)	270
NSTEMI	11 (1.7%)	636
Unstable angina	0	249
Heart failure	13 (2.4%)	541
Peripheral artery disease	0	48
TOTAL	160 (5.3%)	3022

Table 2: Referral rate of admitted cardiovascular patients eligible for cardiac rehabilitation from August 2014 to July 2017.

During the first year of the CR program, the referral rate of patients who underwent CABG was 69%, slightly decreasing on the second year to 67%, and increasing to 89% on the third year. The referral rate of patients who underwent HVS/R during the first year was 50%, increasing to 100% during the second year, but going down to 50% again on the third year. The referral rate of patients undergoing PCI remained at 2%-3% in its first three years, while the referral rate for ACS patients was decreasing from 2.1% on the first year, 1.6% on the second year, and 0.4% on the third year. For HF patients, referral rate on the first year was 3.1%, 2.2% on the second year, and 2% on the third year.

Of the 160 patients referred for cardiac rehabilitation and preventive cardiology program, 96% of patients were enrolled to phase I, 16% of patients were enrolled to phase II and only 2% of patients were enrolled to phase III cardiac rehabilitation. (Table 3)

Phases of Cardiac Rehabilitation	Percentage % (n/N)
Phase I	96% (153/160)
Phase II	16% (26/160)
Phase III	2% (3/160)

Table 3: Enrollment rate to the different phases of cardiac rehabilitation

Discussion

In our hospital, the over-all CR-referral rate from August 2014 to July 2017 was only 5.3%, which was significantly lower compared to the average referral rate of approximately 30% in Canada, in the United States and United Kingdom; and around 50% in the rest of Europe [18].

The benefits of a structured CR program are well proven, which is the result of the combination of all its components. CR programs are generally now a

comprehensive medically supervised program integral to the recovery of patients with CVD after a cardiac event, intervention or surgery [19]. From simple exercise training, it has evolved into a multifaceted and multidisciplinary science involving physical activity, lifestyle modifications, and nutritional and risk factor management.

Approximately half of the mortality reduction achieved by a comprehensive CR program can be attributed to reductions in major risk factors, particularly smoking [18]. In study done by Hammill, among Medicare patients hospitalized for ACS, PCI, CABG, there was a 2.2% mortality rate for CR participants vs. 5.3% for nonparticipants after one year. This benefit was sustained at 5 years with a mortality rate of 16.3% for participants vs. 24.6% for nonparticipants. There was a dose–response relationship, such that patients who attended 25 or more sessions had a 20% lower 5-yr mortality rate than those who attended less than 25 sessions [20].

However, despite the proven benefits of CR, referral rates have been low compared to other evidence-based performance measures in our hospital and many centers in the world. Referral after CABG (72%) and HVS (63%) were significantly higher than after PCI (3%), likely due to a general perception that a CR program would benefit more cardiovascular patients undergoing surgical procedures than those with just an invasive but less radical intervention such as PCI. This discounts the comprehensive nature of CR programs, which not only improves physical fitness or functional capacity but overall outcomes—being a holistic secondary prevention program. Similar findings were seen in a study done by Beatty, et al in 2017, showing a marked disparity in the referral in patients undergoing cardiac surgery over PCI. Although referral to a CR program is mainly the attending physician's decision, this may also be influenced by the patient's preference, and patients are less likely to participate after PCI than after cardiac surgery [20].

Other systematic factors, such as departmental policies, hospital policies, and discharge procedures may also influence the CR-referral rate. However, it is more reflective of the differing perceived need for rehabilitation in PCI versus cardiac surgery patients. After cardiac surgery, most patients have significant physical limitations; after PCI, most patients can return to their normal activities within days on their own. A lower perceived need for CR after PCI could contribute to differences in predictors of referral and to a lower referral after PCI, but this phenomenon is not fully understood [21]. A similar explanation may be given for the lower referral rates for those admitted for ACS, CHF and PAD. A study by Pines, et al showed that only 14% of post-ACS patients were enrolled for CR [21]. This mandates a more intensive awareness reeducation of both physicians and patients on the holistic benefit that could be derived from a comprehensive CR program.

There are other known factors affecting referral or enrollment to CR programs. Aside from non-familiarity of patients and even physicians with the full benefits of a comprehensive CR program, other factors include lack of accessibility to program sites, and limited insurance coverage. In many countries like the Philippines, the cost of health care is usually borne through out-of-pocket payments. Hence, one of the barriers for enrollment in the CR program is the poor financial capacity of the patients to pay for the program [22].

Another physician- and patient-related factor influencing CR referral rate is the misconception that it may not be that suitable for some types of patients like women, older adults, and ethnic minorities [20]. Some patients also still have safety concerns, and have to be

reassured that there are no unsupervised exercises in patients participating in a CR program; and all activities are structured and physician-supervised.

Among the various determinants to a CR referral, physician endorsement was found to be one of the strongest predictors of CR referral. Recent studies suggest that automated referral systems and patient education by physicians and other healthcare providers regarding CR benefits may be the most effective strategies to improve CR referral and participation rates [20].

Conclusions

The cardiac rehabilitation referral rate in our tertiary medical center is dismally low at 5.3%. The referral rate is higher for CABG and heart-valve surgery patients than those undergoing PCI. Referral trend is increasing in CABG patients. Enrollment rate to Phase I cardiac rehabilitation was 96%; Phase II, 16%; and Phase III, 2%.

Clinical implications

Cardiac rehabilitation referral serves as one of the performance measures of care for cardiovascular patients, and the relatively low referral rate in many tertiary centers worldwide calls for physician- and patient-directed measures to increase their awareness on the nature of a comprehensive cardiac rehabilitation program and the benefits that could be derived from them on the short- and long-term, particularly in the area of intensive risk-factor management and control that can help prevent recurrence of the cardiovascular event. Core components of a comprehensive CR program include patient assessment, exercise training, physical activity counseling, tobacco cessation, nutritional counseling, weight management, aggressive coronary risk-factor management and psychosocial counseling. Efforts to improve CR referral should also focus on hospital and departmental policies encouraging referral after PCI, in post-ACS patients, and those with CHF and PAD.

Research implications

Considering the generally low CR referral rate and knowing that physician endorsement is one of the strongest predictors of cardiac rehabilitation participation, a research focusing on the knowledge, attitudes and practice of physicians to determine the barriers negatively impacting CR referral can offer additional insights to address this problem.

Limitations of the study

The study gathered data from a review of charts; hence, some data might be incomplete because of documentation.

Conflict of interest

None

Source of funding

None

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Appendix I

Table of the Cardiac Rehabilitation Referral Rates from August 2014 to July 2017

Cardiac Rehabilitation Indication	Aug 2014 - Jul 2015 % (n/N)	Aug 2015 – Jul 2016 % (n/N)	Aug 2016 – Jul 2017 % (n/N)
Coronary Artery Bypass Graft	69% (29/42)	67.3% (33/49)	82.4% (28/34)
Heart Valve Surgery	50% (1/2)	100% (6/6)	50% (5/10)
Percutaneous Coronary Intervention	2.6% (10/385)	2.1% (8/386)	3.3% (12/364)
Acute Coronary Syndrome	2.1% (7/331)	1.6% (6/369)	0.4% (2/455)
Heart failure	3.1% (5/160)	2.2% (4/182)	2.0% (4/199)

Appendix II

Data Collection Form

Patient Code no.:_____Hospital no. _____

Age: ____ Sex:____ Date of Admission:_____ Date of Referral _____

Weight (Kg):_____ Height (cm): _____ BMI: _____

Demographic profile	
A. Indication for Cardiac Rehabilitation	**Classification**
• Acute Coronary Syndrome	• STEMI • NSTEMI • Unstable Angina
• Heart Failure	• HFrEF • HFmrEF • HFpEF
• Peripheral Artery Disease	
• Cardiac Intervention	**Classification** • Percutaneous Coronary Intervention • Coronary Artery Bypass Grafting (CABG) • Heart Valve Surgery
B. Co-morbid Conditions:	**C. History of Smoking**
• HPN • DM • Dyslipidemia	• Yes • No

• Stroke • History of MI • History of PCI • CKD • Valvular Heart disease • Congenital Heart Disease • Chronic lung disease		
Phase of Cardiac Rehabilitation	•	• Phase I • Phase II • Phase III