Improving Secondary Prevention of Cardiovascular Disease Through Increased Referral to Cardiac Rehabilitation

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Abstract

Objective: To review and summarize the evidence on factors predicting referral and strategies for improving referral to cardiac rehabilitation (CR).

Methods: All published systematic reviews relating to referral to CR were first retrieved. Recently published individual papers (2004–2006) were then sought through MEDLINE, CINAHL, and EMBASE using the search terms “cardiac rehabilitation” and “secondary prevention” combined with “referral,” “physician endorsement,” “automatic referral,” and “referral bias.”

Results: Determinants of referral to CR are described according to 3 clusters: sociodemographic determinants, patient health status determinants, and health care system determinants. Strategies that have been shown to improve referral are primarily related to health care system determinants, particularly automatic referral mechanisms and physician endorsement.

Conclusion: CR is underutilized due to overall suboptimal referral of eligible patients and inequities among those who are referred. Automatic processes that have received the a priori endorsement of physicians would lead to reducing the treatment gap in CR and secondary prevention of cardiovascular disease.

Cardiovascular disease remains the leading cause of death and disability worldwide, and coronary artery disease (CAD) is the primary cause of cardiovascular mortality and morbidity [1]. The major risks for CAD are well known and include both modifiable and nonmodifiable factors. The nonmodifiable risk factors are advancing age, male sex, ethnicity, family history, and genetic contributors. Modifiable factors include tobacco smoking, physical inactivity, obesity, hypertension, dyslipidemia, diabetes, and depression. Although favorable downward trends in smoking have been observed in North America in the last few decades, significant increases in obesity, the metabolic syndrome, and diabetes have created concern about the potential for a worsening epidemic of cardiovascular diseases in the foreseeable future.

Cardiac rehabilitation (CR) is a systematic process of long-term chronic disease care that targets the modifiable cardiac risk factors through both lifestyle changes and best use of pharmacologic agents. The American Heart Association (AHA) has endorsed the definition of CR as a coordinated, multifaceted intervention designed to optimize a cardiac patient’s physical, psychologic, and social functioning, in addition to stabilizing, slowing, or even reversing the progression of the underlying atherosclerotic processes, thereby reducing morbidity and mortality [2]. While CR can and should begin during a patient’s in-hospital stay, the above definition (as well as the focus of this paper) refers to supervised/monitored outpatient programs. Comprehensive CR, as described by the AHA, has been found to significantly reduce cardiac mortality after an acute event. The most recent meta-analysis and Cochrane Library review of randomized controlled trials in CR demonstrated a 26% relative reduction in cardiac mortality for CR compared with usual care as well as significant improvements in lipid values and systolic blood pressure and lower self-reported smoking rates [3]. CR may also reduce rates of rehospitalization for cardiac disease and the need for invasive revascularization procedures such as percutaneous coronary intervention (PCI) or coronary artery bypass graft surgery (CABG) [4].

Current Utilization of Cardiac Rehabilitation

Referral of patients, understood as a prescription, advice, or recommendation to participate in CR, does not have well-defined procedures. Clinical practice guidelines for rehabilitation of patients with CAD describe the importance and benefits of CR for all eligible patients and define indications and contraindications [2,5]. However, they do not specify the processes related to referral, such as when, where, and how patients should be referred. On the question

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of who should refer, a recent joint scientific statement from the AHA and the American Association for Cardiovascular and Pulmonary Rehabilitation clearly states that all patients must be referred by a physician or his/her appropriately licensed delegate [6].

Despite the documented efficacy of CR, a minority of eligible patients are referred. Multiple publications within the past 5 years have consistently documented CR referral rates that range between 10% and 30% [7-13]. According to Ades [11], the primary reasons for suboptimal referral are the geographic location of available programs and failure of physicians to refer patients. Low rates of referral result in insufficient patient enrollment and participation, which diminishes the potential impact of this effective intervention.

**Factors Associated with Referral to Cardiac Rehabilitation**

Recently, Cortes and Arthur [14] published a systematic review on determinants of referral to CR. Studies were identified by searching MEDLINE (1966–2004), CINAHL (1982–2004), HealthSTAR (1975–2004), EMBASE (1966–2004), and the Cochrane Library of Controlled Trials. Search terms were “myocardial infarction,” “acute myocardial infarction,” and “coronary artery disease,” combined with “rehabilitation,” “cardiac rehabilitation,” “secondary prevention,” “exercise training,” “referral,” and/or “consultation.” Forty-five studies were identified and independently assessed by 2 reviewers using predetermined eligibility criteria. Ten published observational studies (1999–2004) including 30,333 CAD patients were selected for inclusion. After analyzing the data, determinants of referral to CR fell into 3 natural clusters: sociodemographic determinants, patient health status determinants, and health care system determinants. Results from the systematic review, along with recent additions to the literature, are described below.

**Sociodemographic Determinants**

Being English-speaking appears to be the strongest predictor of referral in this domain of determinants (relative risk [RR], 9.56 [95% confidence interval [CI], 2.18–41.99]) [14]. This may, however, reflect the fact that most of the research related to CR referral has been done in English-speaking countries and published in English-language journals. Older age is negatively associated with being referred to CR, particularly patients older than 75 years [15–18]. Sex differences have been observed in most studies, with men being referred more often than women [12,17–21]. Based on a recent systematic review [14], men may be about 20% more likely to be referred to CR than women (odds ratio [OR], 1.19 [CI, 1.04–1.33]).

Few studies have examined ethnicity as a determinant of referral or nonreferral. King and Teo [22] and Allen et al [23] both reported significantly lower referral rates for patients from ethnic minority groups. Mochari et al [24] examined referral to CR among 304 women hospitalized with coronary heart disease. They found that white women were more likely than ethnic minority women to report receiving instruction from their physician to attend CR. Although a number of observational or descriptive studies have reported disparities in referral on the basis of sex and, to a lesser degree, ethnicity, many are hampered by small sample size or other methodologic limitations that preclude firm conclusions. Nonetheless, it behooves both clinicians and investigators to be vigilant about the potential for referral bias in marginalized or vulnerable populations. This is clearly an area for further investigation.

**Patient Health Status Determinants**

Having a myocardial infarction (MI) has been reported to be an independent predictor of referral compared with other clinical presentations of CAD [12,16,19]. Furthermore, those having Q wave MI may be more often referred compared with those having non-Q wave MI [16,25]. Recent evidence is accumulating to suggest that coronary revascularization interventions are independent determinants of referral to CR. Jackson et al [21] and Norris et al [12] found that patients treated with PCI or CABG were more likely to be referred. Jackson et al [21] reported that patients with a primary diagnosis of angina or hypercholesterolemia were also more likely to be referred to CR.

**Health Care System–Related Factors**

In the systematic review by Cortes and Arthur [14], the most important health system predictors of referral to CR were (1) being admitted to hospitals with existing CR programs, (2) having insurance coverage, and (3) previous referral to CR.

Jackson et al [21] conducted a review of 32 studies involving 16,804 patients; 10 studies were focused on referral to CR whereas the remainder focused on participation or long-term behavior change. The clearest predictor of referral was physician endorsement of CR and attitude toward the effectiveness of CR. Consistent with this work is that of Grace et al [26] who endeavored to describe physician’s preferences in managing cardiac patients and the barriers they faced in referring patients to CR. From a random sample of 510 primary care physicians, cardiologists, and cardiovascular surgeons, 179 responded to a mailed survey that included a hypothetical case scenario. Physicians identified a number of health system factors that influenced their decision to refer to CR, including (1) geographic access of a CR program, (2) uncertainty about which health care provider was most responsible for making the referral, and (3) ease of the referral process.

Although various factors associated with likelihood of referral have been identified, it appears that some may have
a stronger influence on the referring physician than others. Cortes and Arthur [14] proposed a possible hierarchy, which has been modified to include additional evidence and is suggested below:

- Higher association with referral to CR (RR > 4): English speaker, admitted to a hospital with a CR program
- Medium association with referral to CR (RR, 2.0–3.98): Having insurance coverage (this relates primarily to data from studies in the United States), previous participation in CR, prior MI, CABG, and younger age (45–59 years)
- Low association with referral to CR (RR, 1.3–1.98): Hypercholesterolemia, smoking, hypertension

Strategies for Improving Referral

Early studies indicated that physician referral and the strength of physician endorsement of CR were the main predictors of CR enrollment [27]. Subsequently, Pasquali et al [28] reported that a telephone call initiated by a medical student 6 weeks after CABG increased CR enrollment from 31% to 56%. Lack of physician referral was the most common reason (cited by 78% of patients) for not enrolling in CR, and the observed improvement in attendance was attributed to facilitation of the referral process. Similarly, Harkness et al [29] reported that patients who received a nurse-initiated phone call after hospital discharge were significantly more likely to attend their CR intake appointment compared with standard care patients (78.1% vs. 50.1%; P < 0.001). Hierarchical logistic regression analysis revealed the nurse-initiated phone call as the strongest predictor of attendance at a CR intake explaining 56.9% of the total variance (OR, 3.429 [95% CI, 2.919–4.028]; P < 0.001).

Recently, Smith, Harkness, and Arthur [30] published a historic prospective study of patients who underwent CABG between 1 April 1996 and 31 March 2000 and lived within the geographic referral area of a multidisciplinary CR center in Central-South Ontario, Canada. CABG patients were automatically referred to CR at the time of hospital discharge. Consecutive health records of 3536 eligible patients were reviewed for medical history, cardiac risk factor profiles, and evidence of CR intake attendance and enrollment. In addition to confirming the previously reported determinants of referral, the findings of this study revealed that the health system process of physician-endorsed automatic referral resulted in 60% of patients (2121/3536) attending their first CR appointment and a CR uptake rate of 41.5%.

Grace et al [31] reported that an automatic referral system for CR resulted in a 42.9% attendance rate in a group of patients with established CAD, which is lower than the 60% attendance rate found by Smith, Harkness, and Arthur [30]. These discrepant findings may be partially explained by differences in the patient populations and different automatic referral processes.

The study by Grace et al [31] included patients who were referred to CR after MI, PCI, or CABG or with CAD, whereas those in the study by Smith, Harkness, and Arthur [30] were from a more homogeneous group of post-CABG patients only. Patients after CABG have been reported to be more likely to participate in CR than those after MI or percutaneous transluminal coronary angioplasty [32].

In terms of differing automatic referral processes, patients in the study by Grace et al were automatically referred to a CR program close to home; however, the referral was sent by mail after hospital discharge and it was the patient’s responsibility to contact the CR facility to schedule an appointment. In the study by Smith, Harkness, and Arthur, hospital staff arranged a CR intake appointment for the patient at the time of hospital discharge. This referral occurred in person, with both the patient and family, and included information about the reason for the referral and the importance of CR in recovery from CABG.

Worcester et al [33] implemented an automatic, in-hospital, referral system to CR and reported comparable attendance rates to those of Smith, Harkness, and Arthur. Thus, factors such as timing of the referral (pre- versus post-discharge) and brief personal contact from a health professional to reinforce the importance of CR may be necessary components of the automatic referral process in order to maximize the potential for attendance and enrollment.

Recommendations

Public and Professional Education

The beneficial effects of CR on the outcomes related to CAD are in large part attributable to the positive effects of exercise training on vascular biology, cardiovascular risk factors, and the atherosclerotic disease process [34]. Positive outcomes may also be attributed to the benefits of comprehensive, proactive chronic disease management with respect to improved CAD risk factor management and improved patient adherence to lifestyle interventions and prescribed medications.

Population-wide education is needed to emphasize how lifestyle choices can lead to the early development and sustained progression of vascular disease. This education must include the strong message that cardiovascular disease is largely preventable but is not curable, particularly after it has become clinically manifested. This message is in strong contrast to the common acute care, cure-oriented message that patients tend to receive. In the context of CR and secondary prevention, public education messages must focus on patient self-management as an integral part of chronic disease management.
For health professionals, it appears there is a need to further educate about the scientific evidence supporting the benefits of CR. As recently as 2004, Grace et al. [26] found that physicians’ attitudes toward CR reflected a certain amount of skepticism about its benefits. In addition, health professionals caring for patients at risk for or with known CAD need to be aware of an individual’s risk of developing symptomatic vascular disease, the scientifically established and validated treatment targets to reduce or eliminate this risk, and the current best evidence, practices, and techniques to facilitate achievement of those treatment targets. The work being done through AHA’s “Get with the Guidelines” program is an important step in improving adherence to secondary prevention guidelines. In 24 hospitals in Massachusetts, a combination of quarterly meetings, didactic and best-practice presentations, and interactive multidisciplinary team workshops were used to improve adherence to guidelines. In the case of CR, this multidimensional intervention resulted in 10- to 12-month improvements in referral from baseline levels of 34% (95% CI, 25.9%–39.7%) to 73% (95% CI, 63.2%–82.9%) [35].

Access to Cardiac Rehabilitation—Referral and Enrollment

Some research has suggested that, generally speaking, physicians intend to refer patients to CR. Barriers to CR access identified include geographic location of the program, lack of physician familiarity about CR programs within a 30-minute drive of their practice, and uncertainty about which service provider is responsible for making the referral. Interestingly, principal among reasons for referral or nonreferral was the physician’s perception of the patient’s motivation. Yet patients themselves list physician recommendation and endorsement of CR programs, not their own motivation or beliefs, as the main reason for attending CR programs [27]. This “dance of communication” between physicians and patients could be partly rectified by a systems-level intervention such as physician-endorsed automatic referral.

Since referral to CR rests primarily with the physician, recommendations for physicians include (1) increasing personal awareness of existing local CR programs, (2) referring patients to the CR program closest to home, and (3) improving referral of patients in marginalized groups and those with important comorbidities such as diabetes and obesity. A reimbursement update (January 2006) was recently issued by the Centers for Medicare and Medicaid Services that expands coverage to patients with acute MI, CABG, stable angina pectoris, heart valve repair/replacement, percutaneous transluminal coronary angioplasty, and heart or heart/lung transplant. Further, in a joint statement, the American Association of Cardiovascular and Pulmonary Rehabilitation and American College of Cardiology support the need for a variety of acceptable physicians to meet the requirement in the delivery of CR services and not just the “referring physician.” As these changes are legislated, there are potential positive implications for increased patient referral to CR [36].

Commonly, no local CR program is available to patients. If this is the case, referring patients to a program that offers monitored, home-based CR may be an option. There is evidence to support the effectiveness of monitored, home-based CR [37–39] in terms of improvements in both functional capacity and health-related quality of life and social support. Although definitions of home-based CR may vary, in general they refer to programs in which the majority of exercise training is performed without formal supervision by CR staff. However, home-based should not be construed to mean unsupervised. Effective home-based programs require regular monitoring of patients, which is typically done by telephone but may include intermittent visits to the CR center for education, individual counseling sessions, or exercise testing. Home-based exercise training programs require careful and systematic risk stratification at the time of referral to ensure that inappropriate, high-risk individuals are not prescribed unsupervised exercise training. Similarly, in order for the exercise prescription to be effective, regular updating by a CR program exercise specialist is required.

Research Priorities

As discussed, there remains substantial underutilization of CR services, particularly among ethnic minorities, women, and the elderly along with significant underreferral of most eligible patients. In light of these suboptimal referral and enrollment issues, it has been suggested that the following priorities be addressed [40]:

- Develop and validate a priority rating system for referral to CR to aid in clinical decision making for the optimal placement of patients
- Evaluate the most appropriate intervention opportunities during the CR referral and intake assessment process in order to maximize patient outcomes
- Better understand the relative contribution of patient, provider, and health care system factors in the underutilization of CR
- Develop and further evaluate interventions to increase referrals, such as automatic referral or care maps
- Assess and implement regional models of CR services utilizing a model of regional coordinating centers linked to satellite programs, in order to facilitate access in nonurban or tertiary care centers
Cardiac Rehabilitation

- Link information about in-patient rehabilitation progress with discharge procedures and post-hospitalization follow-up communication

**Conclusion**

Unfortunately, underreferral of patients appropriate for CR and underutilization of CR is a world-wide problem. Although clinical practice guidelines on the management of chronic, stable ischemic heart disease almost invariably mention the need for CR, less than 30% of appropriate patients are actually enrolled in CR programs. And although published guidelines recommend CR as integral to the continuum of cardiac care, it is clear that the guidelines have not yet been translated into specific recommendations at the level of individual health services organizations.

Low referral results in inequity in health services delivery and inaccurate measurement of the effect of CR as an intervention. Automatic referral has the potential to reduce bias in the selection of patients for referral to CR due to the universality of the referral decision. Additional suggestions for closing this care gap include (1) the development of standard referral forms for use at the time of patients’ hospital discharge, (2) the utilization of standardized patient care maps, (3) improved communication among tertiary care, community care, and CR providers to facilitate access to CR programs, and (4) the referral of patients by physicians-delegates such as nurse practitioners.

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**References**

referral to outpatient cardiac rehabilitation services. J Cardiopulm Rehabil 2004;24:165–70.


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