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Cardiac Rehabilitation Enrollment Rates and Different Referral Strategies

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CARDIAC REHABILITATION ENROLLMENT RATES WITH

DIFFERENT REFERRAL STRATEGIES

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Abstract

Cardiovascular disease is the leading cause of hospitalizations and deaths in the United States. Although cardiac rehabilitation is recognized as a standard element of continuum of cardiac care only 10-60% of eligible patients participate. Various barriers exist preventing cardiac patients to enroll in cardiac rehabilitation. These barriers are categorized into three different levels: 1) patient barriers, 2) physician barriers and 3) healthcare system barriers. Patient barriers can include lack of insurance, transportation, need to return to work, family issues and the perception cardiac rehabilitation is not needed but lack of physician referral is the leading deterrent for patients not enrolling in cardiac rehabilitation. Numerous reasons have been found to influence whether or not a physician processes a referral including age and gender of the patient, motivation of patient, type of physician (primary care versus cardiologist) and lack of knowledge on local cardiac rehabilitation facilities. One way researchers have found to overcome the obstacles related to issuing a referral is for the hospital and staff to utilize an automatic referral system along with trained liaisons to increase the enrollment rates of cardiac rehabilitation. While this strategy has proven to be effective in increasing referral and enrollment rates there is still a need for strategies that address other barriers for cardiac patients. Home-based cardiac rehabilitation programs can address the problems of transportation, family and work-related issues and the preference of not exercising in group settings. Home-based programs give the patients more freedom and therefore can help increase exercise adherence rates.

Introduction

Cardiovascular disease is a broad term used to refer to a number of diseases affecting the structure and function of the heart (American Heart Association [AHA], 2013; Mayo Clinic, 2013). Atherosclerotic diseases of the cardiac and vascular systems, electrophysiological abnormalities, infections and defects are all included under this umbrella term (Mayo Clinic, 2013). Patients with cardiovascular disease have poor patient-reported outcomes, decreased functional ability and increased morbidity and premature mortality rates (AHA, 2013; Mayo, Clinic 2013; Brooks, 2005). Cardiovascular disease has been the leading cause of death every year since 1900, except 1918 during the flu epidemic (Brooks, 2005), and claims more lives each year than cancer, chronic lower respiratory disease and accidents combined (AHA Statistics, 2013).The disease is also costly to treat. In 2008, heart disease cost the United States $297.7 billion and increased to 312.6 billion in 2009 (AHA Statistics, 2013).The AHA predicts that by 2030 the cost of this disease will be over $1.4 trillion.

Types of Cardiovascular Disease

There are numerous types of cardiovascular disease including coronary artery disease (CAD), peripheral artery disease (PAD), valvular heart disease, congestive heart failure (CHF), cardiomyopathy (CM) and congenital heart defects (American Association of Cardiovascular and Pulmonary Rehabilitation, 2014; AHA Statistics, 2013; AHA, 2013).

Coronary Artery Disease

CAD is the most prevalent type of cardiovascular disease affecting over 15.4 million people over the age of 20 years and is estimated to increase 18% by 2030 (AHA Statistics, 2013). CAD consists of plaque buildup (atherosclerosis) inside the coronary arteries which reduces the flow of oxygen-rich blood to the heart (National Heart, Lung and Blood Institute [NHLBI], 2012).The progression of plaque buildup on the artery walls isn’t completely understood but it is thought to be initiated by an injury to the inner lining of the vessel (Brooks, 2005).This injury can be caused by a number of reasons including mechanical stress from high blood pressure, inflammation/infection, immune responses, trauma and lipid impaction (Brooks, 2005).The next step to a plaque formation is the introduction of monocytes that migrate to the injured area (Brooks, 2005).The monocytes then mature into macrophages to help heal the injured area and remove the debris including lipids in the bloodstream (NHLBI, 2012). A high concentration of low-density lipoprotein (LDL) cholesterol causes the macrophage to take on a foam-like structure causing other particles to “stick” to the macrophage (Brooks, 2005). Over time this foam cell grows with more macrophages, white blood cells, platelets, fibrous connective tissue and cholesterol to form a plaque inside the artery (Brooks, 2005). An elevated level of LDL cholesterol in the blood stream accelerates the formation of these foam cells and plaques that narrow arteries and restrict blood flow (Brooks, 2005; NHLBI, 2012). As the disease progresses, the plaque can rupture causing a thrombosis or blood clot in the vessel (Brooks, 2005).The effect on the heart depends on the degree of plaque buildup. An artery that is not completely blocked but causes insufficient blood flow may cause angina (defined as chest pain) and/or cardiac arrhythmias (Brooks, 2005). A completely blocked coronary artery from a thrombus (blood clot) causes death to the myocardium resulting in a myocardial infarction (MI) (Brooks, 2005). In the United States alone a MI occurs every 44 seconds (AHA Statistics, 2013).

Peripheral Artery Disease

PAD is also the result of the development of plaque buildup in the arteries, specifically in the lower limbs. Prevalence of PAD is currently estimated to be 8-12 million people in the United States (AHA Statistics, 2013; Womack et al., 2009). PAD is the cardiovascular disease with the greatest functional impairment (Norgren et al., 2010) and individuals with PAD have an increased risk of stroke and heart attacks (Mayo Clinic, 2012).The narrowed arteries restrict blood flow and, therefore, oxygen to the muscles of the extremities causing intermittent claudication defined as pain, cramping and/or aching in the muscle of the legs with activity (Mayo Clinic, 2012).The location of the pain depends on the location of the stenosis and/or occlusions but generally the most common location of claudication experienced by PAD patients is in the calves (Mayo Clinic, 2012).This can cause ambulation to be extremely painful even to walk a short distance (Womack et al., 2009).Typically walking ability, functional performance, and patient-reported outcomes are negatively affected in patients with PAD. Epidemiologic studies suggest 45% of PAD patients experience claudication while 50% are asymptomatic (Brass et al., 2013). If left untreated, this disease may progress to the most severe form of the disease called critical limb ischemia (CLI) which affects an estimated 5% of the PAD population (Brass et al., 2013). Patients with CLI present clinically with rest pain in the foot and non-healing ulcer wounds which may lead to amputation (Mayo Clinic, 2012).

Valvular Heart Disease

Damage or defects to one or more of the four valves in the heart is called valvular heart disease (John Hopkins, 2013).This type of cardiovascular disease can present itself at birth or later on in life and accounts for less than 1% of all cardiovascular disease mortality (Friedman et al., 2009). If not acquired at birth there are numerous reasons a valve may become damaged. Rheumatic fever, heart tissue degenerating with age, an infection of the inner lining of the heart muscle and valves, high blood pressure and atherosclerosis are all causes of a damaged valve (John Hopkins, 2013). Normal valves ensure blood flows through the heart with the proper force, direction and time. A damaged valve may become too narrowed or hardened to open completely (John Hopkins, 2013). This may cause blood to back up in the adjacent chamber (John Hopkins, 2013). Another possibility is the damaged valve may not fully close causing blood to leak into the preceding chamber (John Hopkins, 2013).This inefficient system causes stress on the heart as well as blood pooling in the cardiac chambers which increases the risk of stroke or pulmonary embolism (John Hopkins, 2013). Also to compensate for poor pumping, the heart muscle enlarges and thickens losing elasticity and efficiency causing circulatory problems (John Hopkins, 2013). If not treated, this circulatory problem can lead to congestive heart failure (John Hopkins, 2013).

Congestive Heart Failure

CHF affects about 5.1 million Americans and is projected to increase 25% by the year 2030 (AHA Statistics, 2013). CHF is the most common reason for hospital visits among the elderly and 50% of people diagnosed with this disease will die within 5 years if lifestyle changes are not accomplished (AHA Statistics, 2013). Patients with CHF do not have the ability to meet the circulatory demands of the body (Braith, 1998). This disease is further characterized by systolic and diastolic dysfunction (Braith, 1998; Myers et al., 2009). With systolic dysfunction the ventricles do not contract normally because of the loss of healthy myocardium due to MI or loss of contractility (Braith, 1998; Myers et al., 2009). Diastolic dysfunction is estimated to comprise 50% of new cases of CHF in those greater than 70 years each year (Zile et al., 2002). Increased resistance to the filling of one or both of the ventricles, elevated diastolic pressure in the ventricles and reduced ventricular compliance are the characteristics of diastolic dysfunction (Braith, 1998; Myers et al., 2009).This type of cardiovascular disease is a serious debilitating health problem that also causes economic distress. The current cost of the disease is estimated to be as high as $32 billion a year in the United States and by 2030 the AHA estimates this cost will increase 120% to $70 billion (AHA Statistics, 2013).

Cardiomyopathy

CM is typically inherited or acquired later and refers to diseases of the heart muscle (AHA, 2014; NHLBI, 2011).There are four different types of CM including: dilated CM, hypertrophic CM, restrictive CM and arrhythmogenic right ventricular dysplasia (AHA, 2014; NHLBI, 2011). Dilated CM is the most common type of CM, usually affecting individuals between the ages of 20-60 years (NHLBI, 2011). About one third of these cases are inherited but the other two-thirds can be caused by other diseases including CAD, MI, chronic high blood pressure and diabetes (NHLBI, 2011).This type of disease starts with dilation of the left ventricle causing the chamber to stretch and the muscle walls to become thinner (NHLBI, 2011). When the ventricle dilates the chamber enlarges and can't contract normally therefore cannot pump blood efficiently (NHLBI, 2011). These events can lead to heart failure. Hypertrophic CM is the most common inherited heart defect affecting 1 in every 500 people (AHA Statistics, 2013) and is a common cause of sudden cardiac arrest in young people (NHLBI, 2011). Even though this type of CM is usually inherited there is still a chance someone can acquire this disease later in life (AHA, 2014). If acquired later in life it is usually due to aging and/or chronic high blood pressure (AHA, 2014). In this type of CM the heart muscle cells enlarge causing the ventricle wall to thicken thereby decreasing the size of the chamber (NHLBI, 2011). Decreased amounts of blood are pumped through the heart because of the decreased ventricle size. The walls of the ventricles may also stiffen because of the enlargement ultimately prohibiting the ventricles to fully relax (NHLBI, 2011). This can lead to increased blood pressure and arrhythmias (NHLBI, 2011). Restrictive CM mostly affects older adults and is usually caused by a condition that produces lumps of cells on organs of the body (NHLBI, 2011). Restrictive CM refers to the ventricles becoming stiff and rigid because abnormal tissue, such as scar tissue, replaces the normal heart muscle tissue (NHLBI, 2011). The ventricles cannot relax and fill with blood and reduces blood flow to the body and therefore can lead to heart failure (AHA, 2014; NHLBI, 2011). Arrhythmogenic right ventricular dysplasia is inherited and rare and usually affects teens and young adults (AHA, 2014; NHLBI, 2011). The muscle tissue in the right ventricle infarcts and is replaced with scar tissue disrupting electrical signals and causing arrhythmias and potentially sudden cardiac arrest (AHA, 2014; NHLBI, 2011).

Congenital Heart Defects

Congenital heart defects are characterized by abnormalities or malformations that develop before birth such as structural problems of the heart chambers, valves and blood vessels near the heart (AHA Statistics, 2013; AHA[2], 2014). A person with one or more of these abnormalities is more at risk for certain diseases including pulmonary hypertension, arrhythmias, infective endocarditis (infection of the heart) and chronic heart failure (AHA[2], 2014). The AHA's 2013 Heart Disease and Stroke Statistics estimates about 1 in every 125 live births has developed some type of heart defect while in utero and on average 25% of these births require surgery in the first year of life. Congenital heart defects can range in severity from tiny pinholes between chambers that may resolve without intervention to major malformations such as complete absence of one or more chambers and valves that can require multiple surgeries (AHA Statistics, 2013; AHA[2], 2014). The most common heart defect is a ventricular septal defect (Mayo Clinic, 2014). With this defect the septum wall between the ventricle chambers doesn't fully form allowing oxygenated rich blood mixing with blood that has yet to be oxygenated (Mayo Clinic, 2014). If the hole is small enough it may resolve itself requiring no medical treatment but there are cases where the hole is large enough to require surgery (Mayo Clinic, 2014; AHA[2], 2014). A more concerning heart malformation is when the aorta and the pulmonary arteries are transposed, meaning the aorta arises out of the right ventricle and the pulmonary artery arises out of the left ventricle (Mayo Clinic, 2014). This transposition prevents oxygen rich blood from being circulated throughout the body and can be quickly fatal to a newborn (Mayo Clinic, 2014). There are 18 distinct congenital heart defects but the more common types include aortic valve stenosis, atrial septal defect, coarctation of the aorta, pulmonary valve stenosis, complete atrioventricular canal defect and Ebstein's anomaly (Mayo Clinic, 2014; AHA[2], 2014). While some of the malformations are life threatening, novel and innovative technological advances in healthcare can provide patients suffering from congenital heart defects with normal lives (AHA[2], 2014).

Risk Factors of Cardiovascular Disease

Several risks factors exist increasing the likelihood of cardiovascular disease. These risk factors are separated into modifiable and non-modifiable factors. Modifiable risk factors include physical inactivity, dyslipidemia, hypertension, obesity, diabetes and smoking (AHA, Statistics 2013; Mayo, 2013). Cardiovascular disease is chiefly attributed to one or more of these risk factors and each risk factor can be prevented by living a healthy lifestyle (American College of Sports Medicine [ACSM] Guidelines, 2010; Mayo Clinic, 2013; AHA, 2013; Haskell et al., 1994). Living a healthy lifestyle includes getting the recommended amount of physical activity, consuming a balanced and nutritious diet and not smoking (Mayo Clinic, 2013; AHA, 2013; Haskell et al., 1994).

Physical inactivity may directly affect other risk factors. Studies have shown that physical activity can improve cholesterol levels (Szapary et al., 2003), insulin resistance (Mayer-Davis et al., 1998; Holloszy et al., 2005) and obesity (Klesges et al., 1991). The ACSM and AHA guidelines for health include a minimum of 30 minutes of moderate physical activity five days per week or 150 minutes per week (ACSM Guidelines, 2010). The 30 minutes of physical activity can even be broken up into three 10 minute bouts (ACSM Guidelines, 2010). Moderate activity can include walking at three miles per hour, riding a bike with light effort (10-12 miles/hour), golfing without a cart and even some household cleaning is considered moderate activity (ACSM, Guidelines 2010). Along with exercise, a healthy diet is critically important for healthier living. Diets low in sodium and fats have typically decreased high blood pressure, triglycerides and LDL cholesterol levels (Craddick et al., 2003).

Non-modifiable risk factors include: age, gender and family history. Males 45 years of age and older and females 55 years of age and older are at an increased risk for cardiovascular disease (ACSM Guidelines, 2010). Females have a lower risk of cardiovascular disease than males before menopause (Brooks, 2005). After menopause, the risk increases substantially and equals the risk level of men (Brooks, 2005). A person who has a first-degree relative who suffered a MI, coronary revascularization or sudden death before the age of 55 years for men and 65 years for women has a three to six times greater risk of receiving a diagnosis of cardiovascular disease (ACSM Guidelines, 2010).

Cardiac Rehabilitation

Patients hospitalized after a cardiac event or procedure should be referred to a structured long-term cardiac rehabilitation (CR) program. The American Association of Cardiovascular and Pulmonary Rehabilitation defines CR as coordinated multifaceted interventions designed to optimize a cardiac patient's physical, psychological and social functioning, in addition to stabilizing, slowing or even reversing the progression of the underlying atherosclerotic process thereby reducing morbidity and mortality (American Association of Cardiovascular and Pulmonary Rehabilitation, 2014). CR also reduces the cost of overall healthcare by decreasing treatment time and preventing other disabilities (American Association of Cardiovascular and Pulmonary Rehabilitation, 2014). Cardiac conditions eligible for CR include MI, angina pectoris, coronary artery bypass graft, percutaneous transluminal coronary angioplasty, valve repair or replacement, heart transplant, heart failure and coronary artery disease equivalents such as diabetes or PAD (American Association of Cardiovascular and Pulmonary Rehabilitation, 2014).

Phases of Cardiac Rehabilitation

There are three main phases to a CR program: Phase I (inpatient CR), Phase II (outpatient CR) and Phase III (maintenance phase) (Gonzalez et al., 2004). Inpatient CR starts while the patient is still in the hospital after their cardiac event or procedure to provide early assessment and mobilization (ACSM Guidelines, 2010). Exercise starts with self-care activities, arm and leg range of motion and postural change within the first 48 hours (ACSM Guidelines, 2010; Gonzalez et al., 2004). Early activity has been shown to reduce anxiety and depression and help prevent some of the adverse effects of bed rest, such as muscle atrophy, decreased aerobic capacity, tachycardia and pulmonary atelectasis (Brooks, 2005). Patients progress from these early mobilization activities to walking short to moderate distances with minimal or no assistance three to four times a day (ACSM Guidelines, 2010). Besides mobilization, goals for inpatient CR include: 1) offsetting the deleterious physiologic and psychological effects of bed rest, 2) providing additional medical surveillance, 3) enabling patients to safely return to activities of daily living within limits imposed by their disease, and 4) preparing the patient and support system at home or in a transitional setting to optimize recovery and facilitating patient entry, including physician referral into an outpatient CR program (ACSM Guidelines, 2010). By the time of discharge the patient should be able to meet the demands of low-level activities such as showering, dressing and walking up a flight of stairs (Gonzalez et al., 2004).

Phase II or outpatient CR can begin as soon as the patient is discharged from the hospital but usually starts on average two weeks after discharge. 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 (ACSM Guidelines, 2010). Outpatient rehabilitation usually consists of 36 sessions that are monitored by a healthcare professional. Patients typically need to participate in exercise at least 2-3 days a week to elicit benefits (Gonzalez et al., 2004). This program allows the supervisor to ensure satisfactory medical status by monitoring resting and exercise ECG, blood pressure response to various stimuli and symptoms (Brooks, 2005). The exercise program consists of both an aerobic and resistance training component. The techniques used to build an exercise program for the apparently healthy adult population may be applied to many low- and moderate-risk patients with cardiac disease (ACSM Guidelines, 2010). There are a few key elements that need to me considered when developing an exercise prescription for an individual with a cardiac disease. These elements include: safety factors such as clinical status, risk-stratification category, exercise capacity, ischemic/angina threshold and cognitive/psychological impairment that might result in non-adherence to exercise guidelines, musculoskeletal limitations, premorbid activity level and personal health/fitness goals (ACSM Guidelines, 2010). The healthcare professional supervising the program also needs to take into account special considerations such as those with sternal precautions (ACSM Guidelines, 2010). Outpatient cardiac rehab also includes the patient attending educational classes (Gonzalez et al., 2004). These classes inform the patient on nutrition, stress management, medications, counseling and risk factors associated with heart disease such as hypertension, hyperlipidemia, diabetes, obesity, physical inactivity and smoking (ACSM Guidelines, 2010; Wenger, 2008).

Phase III or the maintenance phase is to prevent recurrence of a cardiac event and to improve physical working activity (ACSM Guidelines, 2010; Brooks, 2005). 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 (Brooks, 2005). The design of the maintenance program should reflect the physical requirements of the patient's job and lifestyle (Brooks, 2005). Phase III includes both aerobic and resistance training.

Benefits of Cardiac Rehabilitation

Numerous studies have been conducted to demonstrate the benefits of CR (Witt et al., 2004; Morrin et al., 2000; Hambrecht et al., 2004; Brown et al., 2009; Cortes et al., 2006; Maniar et al., 2009; Listerman et al., 2011). A study by Witt et al. (2004) evaluated 1,821 individuals who suffered their first MI between the years 1982-1998. A little over half (55%) of the patients participated in a CR program after their MI. Those who participated in CR showed a marked survival advantage. The three year survival rate for CR participants was 95% compared with 64% for those who did not participate (Witt et al., 2004). The patients who took part in CR also showed a 28% reduction in the risk of a recurrent MI (Witt et al., 2004). Individuals who have completed a CR program have also shown an improved sense of well-being, reduced anxiety and depression, improved exercise capacity as well as reduced blood pressure, cholesterol and triglyceride levels (Brooks, 2005).

Morrin et al. (2000) examined whether there were greater advantages to be gained with a six month CR program compared with the traditional three month program. Over the course of six months 126 participants who suffered a cardiac event exercised two times a week at a CR facility and 2-5 times a week at home to reach a goal of 200-400 minutes a week. The individuals also attended two 3-hr education classes on cardiac risk factors and nutrition. Outcome measures of cardiac risk factors (blood pressure, cholesterol, physical activity and body composition) and patient-reported outcomes were taken at baseline, 3-months and 6-months. There were significant improvements in all risk factor measures except body mass index at the 3-month time point. Improvements in systolic and diastolic blood pressure, triglyceride levels and physical activity levels were also demonstrated at the 6-month outcomes assessment time point but not at a significant level. Total cholesterol showed greatest improvements between the 3 and 6-month time points. Mental health and other patient-reported outcomes showed the greatest change at 6-months suggesting patients may require more than the standard-length CR program to establish new lifestyle patterns (Morrin et al., 2000).

Another study by Hambrecht et al. (2004) sought to determine whether an exercise training program or a percutaneous coronary intervention (PCI) would be more beneficial to patients with stable CAD. Ninety-four male participants ≤ 70 years with stable CAD were randomly assigned to either an exercise group or PCI group. The exercise training consisted of riding a bicycle ergometer for 20 minutes a day, seven days a week, at a target heart rate and participating in a 60 minute group program once a week for 12 months. Assessment of cardiac symptoms, cholesterol and progression of the disease were taken at baseline and at the end of the study. After 12 months both groups demonstrated significant improvement in symptoms (e.g. angina). In addition to improvement in symptoms the training group also showed a 30% increase in ischemic threshold (defined as the point during physical activity when there is inadequate oxygenation of myocardial tissue) from baseline. Patients randomized to the training group also significantly increased high-density lipoprotein (HDL) serum levels while patients in the PCI group actually had a decline in HDL. Progression of CAD was found in 15 of the 47 training group patients and in 21 of the 47 PCI patients. Overall there were 27 cardiac events during the study; 21 events occurred in 15 patients who had a PCI and 6 events occurred in 6 patients in the training group. The cost of both interventions was calculated to see which program was more cost effective. For one year of exercise training the total cost was $3708 ± 156 while the cost of one PCI was $6086 ± 370. Overall both groups were equally effective in improving symptom free exercise tolerance but the exercise training program resulted in a higher event-free survival rate and was more cost effective than the PCI group.

Some research has found that age and medical comorbidities are associated with a lack of referral to and participation in CR (Witt et al., 2004; Cortes et al., 2006). Maniar et al. (2009) investigated whether age was a factor in the success rate of CR. Patients were separated into two different groups: the younger group (<65 years) and the older group (≥65 years). Risk factors such as hypertension, dyslipidemia, smoking, obesity, physical activity level, diabetes, depression and perceived health were assessed at baseline and at the end of a typical CR program (36 sessions). The younger group had greater improvements in total cholesterol and six-min walk test while the older group had greater improvements in diabetes management. While there were differences in the amount of improvement, overall the researchers found both groups achieved significant improvements in most secondary prevention goals. Listerman et al. (2011) found that different levels of existing comorbidities do not affect the success rate of CR. Over the course of 12 years, 794 individuals completed a CR program and were included in the study. At baseline each participant was placed into one of three groups based on comorbidity level and various risk factors measures were taken. When 36 CR sessions were completed each individual was reevaluated. The authors noted that regardless of the level of comorbidity burden, participants benefited from their participation in CR (Listerman et al., 2011).

Barriers for Cardiac Rehabilitation

The benefits of CR have been proven but still participation rates average below the national target of 85% (Ghisi et al., 2013). Studies have found that participation rates ranged on average from 15-60% of those referred to CR (Cortes et al., 2006; Ghisi et al., 2013). Reasons for low participation rates can be categorized into patient barriers, physician barriers and healthcare system barriers (Gravely-Witte et al., 2010).

Patient Barriers

Barriers highlighted at on the patient level include: lack of insurance, lack of transportation, obligation to return to work and perception that CR is unnecessary (Dunlay et al., 2009; Yohannes et al., 2007). The number one patient barrier is lack of physician referral (Ghisi et al., 2013; Dunlay et al., 2009; Grace et al., 2008; Mazzini et al., 2008; Yohannes et al., 2007; Pasquali et al., 2001). A major motivating factor affecting participation in CR is support from the patient’s physician (Ghisi et al., 2013; Grace et al., 2008). A physician’s lack of referral to and support of CR severely decreases the patient’s desire to attend and continue CR.

Physician Barriers

A systematic review by Cortes et al. (2006) found physicians refer CR on average to 10-60% of eligible cardiac patients. Whether or not the physician was a cardiac specialist had a significant impact on if a patient was referred to CR (Grace et al., 2008). Primary care physicians cite a lack of familiarity with CR program quality and are unfamiliar with relevant locations, thus they were less inclined to refer a patient (Grace et al., 2008). Being admitted to a hospital with an existing CR program increased the likelihood of referral (Cortes et al., 2006). Other factors affecting whether or not a physician refers a patient to CR include the patient being over 75 years, being female, medical characteristics of the patient, geographic accessibility, patient motivation and the referral process (Ghisi et al, 2013; Grace et al., 2008; Cortes et al., 2006). Healthcare system barriers consist of the type of referral system utilized by the physicians and hospital. Different referral systems such as automatic referrals and liaisons have shown to increase referral rates and therefore increase CR enrollment rates when compared with standard referral systems (Gravely-Witte et al., 2010).

Types of Referral Systems

Several types of strategies have been implemented by hospitals to refer eligible patients to CR. Studies are showing benefits for using different strategies to increase not only referral rates but enrollment rates as well.

Standard Care Referral

Standard care referrals are made at the physicians' discretion. The physician barriers discussed earlier have a major impact in standard care referral systems. If a physician feels CR is not necessary or suited for a patient or doesn't believe the patient will attend, a referral most likely will not be made. Some studies have also demonstrated that the inconvenience and time taken to send out a referral form is another deterrent for the physician with standard care referrals (Grace et al., 2008). Not having a standard form or not being familiar with CR programs are other barriers found to decrease referral rates (Grace et al., 2008; Cortes et al., 2006). Use of standard care referral strategies average a 15-45% referral rate (Labresh et al., 2004; Grace et al., 2005; Mazzini et al., 2008; Gravely-Witte et al., 2010) and because of this, researchers have focused on different strategies to remove physician biases and healthcare system limitations.

Automatic Referral Systems

Automatic referral systems are the implementation of electronic patient records or standing referral orders to CR based on eligible diagnosis supported by clinical guidelines (Grace et al., 2012; Fisher et al., 2008). There are two different automatic referral systems. One uses manual paper-based hospital discharge order sets that include a CR referral form (Gravely-Witte et al., 2010). With this system the physician is already provided the necessary form in the patient's discharge information so all that is needed is a signature. The second method utilizes electronic medical records to prompt a referral to CR (Gravely-Witte et al., 2010). With this system the referral is either sent directly to the CR facility and then the CR facility contacts the patient with the form ready for the physician's signature (Gravely-Witte et al., 2010). Either method of automatic referral system has been associated with significant positive effects on referral rates (Gravely-Witte et al., 2010). A study following 661 patients with acute coronary syndrome found that an automatic referral system generated a 67% referral rate versus a 34% referral rate for standard care (Grace et al., 2007). Another study conducted by Grace and colleagues (2008) found an even greater increase when an automatic referral system was utilized resulting in a referral rate of 85% compared to the 45% seen in a standard care system. While automatic referral systems have been proving to be beneficial in increasing referral rates to CR it does not guarantee increased enrollment rates.

Liaison Referral Systems

Liaison referral strategies consist of multiple aspects that could include one or all of the following: interview with the patient discussing the benefits of CR and providing any information the patient might need, assisting with setting up an initial appointment and follow up phone calls to see if the patient enrolled in CR and their experiences thus far (Gravely-Witte et al., 2010). Liaison strategies have been shown to positively influence patient motivation and attitudes, increase knowledge about CR and reduce ambivalence and noncompliance to the program (Gravely-Witte et al., 2010). Liaison strategies are utilized more to increase enrollment and participation rates in CR rather than increase referral rates. Pasquali et al. (2001) determined 1) a phone call discussing the health benefits of attending a CR program following surgery, 2) assistance in the process of contacting the CR program, and 3) aquiring a referral from the patient's PCP increased enrollment rates from 31% to 56%. Carroll et al. (2007) found that a significantly greater amount of patients enrolled in CR after a home visit 72 hours after discharge and follow up phone calls made 2-, 6-, and 10-weeks after initial visit.

Combined Referral Strategies

Some studies have looked at whether combining different strategies may work better to increase referral and enrollment rates than one strategy alone. Harkness et al. (2005) sought out to find if a phone call made by a nurse 2 weeks before an initial intake appointment for CR would increase the likelihood of attendance. The phone calls were to check the health status of the patient and reschedule the intake appointment if needed, to discuss the patient's risk profile and explain how participating in CR would benefit them, discuss and find possible solutions to any perceived barriers the patient might have and finally to answer any other question or concerns from the patient. Of the 3,536 eligible patients who received an automatic referral to CR 1,251 received one of these liaison phone calls as well. The results from this study found of those who were contacted by a nurse before the initial intake appointment 78.1% participated in CR. This percentage was found to be significantly greater than the 50.1% of patients who only received an automatic referral and attended CR. Therefore Harkness et al. found that a pre-initial intake appointment phone call greatly increased the likelihood of a patient attending CR.

Grace et al. (2011) explored the difference in enrollments rates between automatic referral, liaison referral, a combination of automatic and liaison and standard care referral. The results showed all strategies yielded higher referral and enrollment rates than standard care. The combination strategy related to significantly greater rates than either strategy alone. The referral strategy did not affect the number of sessions attending once enrollment was attained. These studies suggest that a combination between automatic and liaison strategies is the most effective way to get patients to participate in CR.

Other Referral Systems

Get With The Guidelines Program

Get With The Guidelines (GWTG) was initiated by the AHA and the American Stroke Association to provide an in-hospital program for improving care by promoting consistent adherence to the latest scientific treatment guidelines (AHA-GWTG, 2013). GWTG provides the hospital with access to the most up-to-date research and scientific publications, professional education opportunities, clinical tools and resources, patient education resources and performance feedback reporting for continuous quality improvement (AHA-GWTG, 2013). One study looked at the effectiveness of the program and found that patients under the GWTG program had a 55% referral rate compared to those in standard care with a 38% referral rate (Mazzini et al., 2008). Labresh et al. (2004) found similar results with a referral rate that increased to 73% from 34%.

Outcomes Project

The Montana Cardiovascular Health Program and the Montana Association of Cardiovascular and Pulmonary Rehabilitation developed a regional outcomes project to identify a comprehensive, standardized set of CR outcome indicators that can be utilized by both small and large CR programs (McNamara et al., 2009). Outcome indicators measured were selected based off of recommendations from the American Association of Cardiovascular and Pulmonary Rehabilitation and include: quality of life, blood pressure, cholesterol, Duke Activity Status Index, glycated hemoglobin, smoking status, diet, patient satisfaction rate and program completion rate. Outcome measurement has become an integral part of the CR program because this information highlights what the program is doing well but also reveals areas that need to be improved on (McNamara et al., 2009). Quality improvement activities are then used to improve patient care in those areas. McNamara et al. (2009) followed 22 CR facilities in Montana and Wyoming participating in the Outcomes Project for a year collecting data from each program. Over the course of a year 850 patients were seen in CR with an average completion rate of 84%. Along with a 13% decrease in smoking rates, 90% of patients meeting criteria for blood pressure control and 73% meeting goals for LDL levels, overall patient satisfaction was found to be a 48.9/50 based on the questionnaire. McNamara et al. not only demonstrated a program that improved patient care and outcomes but also, a program patients were extremely satisfied with. This patient approval rating helped result in an 84% CR program completion rate.

Conclusion

Cardiovascular disease is the most common cause of clinic visits, hospitalizations and deaths in the United States each year (Clark et al., 2005) affecting an estimated 82.5 million people (AHA Statistics, 2013). Modifiable risk factors such as those attributed to an unhealthy lifestyle can account for more than 90% of cardiovascular risk regardless of sex, age or region one lives (Clark et al., 2005). Participating in moderate physical activity and eating a healthy diet can significantly reduce the premature development and progression of this disease (Witt et al., 2004; Morrin et al., 2000; Hambrecht et al., 2004). Although the American College of Cardiology and the AHA recommend diagnoses of recent MI, unstable angina, stable angina, percutaneous coronary intervention or coronary artery bypass graft as class I indications for participation in a CR program (Listerman et al., 2011), only 10-60% of eligible patients get referred (Cortes et al., 2006). Studies investigating different referral strategies utilized by hospitals and physicians found automatic referrals can significantly increase CR referrals rates. Liaison strategies can also increase enrollment rates but ideally a combination of the strategies may be the best option (Ghisi et al., 2013). The GWTG Program and the Outcomes Project have also proven to be effective programs to increase referral rates and CR adherence (Mazzini et al., 2008; LaBresh et al., 2004; McNamara et al., 2009).

Future Directions

Even with the combination of automatic and liaison strategies participation rates are still not meeting the national target of 85%. Creative strategies for change have been recommended to optimize CR utilization (Dalal et al., 2003; Scane et al., 2011). Home-based physical activity CR programs are becoming a suitable alternative for low to moderate risk individuals who have suffered a cardiac event (Dalal et al., 2003; Dalal et al., 2006; Scane et al., 2011; Carlson et al., 2000; Taylor et al., 2006; Jolly et al., 2005). Long-term adherence of participants within an intervention is challenging (Freene et al., 2011). Various barriers exist including work, travel distance, family obligations, psychological reasons and loss of attention that affects participation rates (Dunlay et al., 2009; Cortes et al., 2006; Scane et al., 2011). Home-based programs can be particularly beneficial for rural areas to eliminate the travel barrier for individuals. In some cases an individual may have to travel two or more hours to get to a CR facility. Not only is this an inconvenience for their lifestyle but could also interfere with work schedules. Including the participant's choice of home-based or hospital-based program along with the suitability of the program has been shown to increase the adherence rate to these physical activity intervention programs (Freene et al., 2011; Dalal et al., 2006; Scane et al., 2011). Dalal et al. (2003) found when given the choice between a hospital-based or home-based program, adherence rates were much higher in the home-based groups (87% vs. 48%) after a 12-15 month follow-up. Home-based programs have also shown similar results in secondary prevention outcomes as a traditional CR program (Dalal et al., 2003; Dalal et al., 2006; Scane et al., 2011; Carlson et al., 2000; Taylor et al., 2006; Jolly et al., 2005).

Carlson et al. (2000) designed a modified protocol to emphasize independent exercise by improving a patient's confidence level. The traditional CR program and the modified program were conducted in an identical fashion for the first four weeks. Both groups were monitored during exercise with standard electrocardiogram (ECG) monitoring and partook in education classes on exercising principles, cardiac risk factors, nutrition, pharmacologic therapy and identifying target outcomes. After the fourth week participants in the traditional program continued with the earlier protocol while participants in the modified program discontinued the use of ECG monitors. In substitution for ECG monitors the modified program individuals were given heart rate monitors and shown how to regulate exercise intensity based on heart rate. The members in the modified program were also encouraged to reduce the number of sessions attended at the CR facility each week and increase the number of sessions exercising on their own. The purpose of weaning the individuals in the modified group from exercising at the facility was to help them overcome the barriers and fears of independent exercise. At the end of the study outcome measures were similar between the two groups but significantly more participants continued to adhere to the modified program than to the traditional program. As an added bonus to the modified program designed by Carlson et al. the cost of the modified protocol was 50% less than that of the traditional program.

Taking a home-based protocol and implementing it into an established CR program could offer more opportunities for patients with barriers that make it harder to adhere to a traditional program. Benefits of CR are dependent on program participation and long-term adherence to exercise and other cardiovascular disease risk-reducing behaviors. Flexibility of and independence building of these home-based physical activity programs could help achieve the long-term adherence to exercise health professionals desire for these patients.

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