

THE UTILIZATION AND PATIENT DEMOGRAPHICS OF PATIENTS
ATTENDING AN EARLY OUTPATIENT CARDIAC
REHABILITATION PROGRAM

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ABSTRACT

THESIS: The Utilization and Patient Demographics of Patients Attending an Early Outpatient Cardiac Rehabilitation Program

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Purpose: Cardiac rehabilitation (CR) programs have been shown to promote numerous health benefits among patients with cardiovascular disease (CVD), but little is known about the characteristics of CR programs. **Methods:** A survey was developed and utilized to collect data on Early Outpatient Cardiac Rehabilitation programs (EOCR) in the USA. An email with a link to the survey was sent by the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) to their members. Program directors/administrators were recruited to provide information about their program in operation during 2009 in the United States. The CR survey contained 13 questions, some with multiple answers, regarding the utilization and patient demographics of an Early Outpatient Cardiac Rehabilitation (Phase II) program. **Results:** Responses were received from 138 programs in 44 states. Of the responses, 19,689 patients completed at least one EOCR exercise session. Of the responses, 68% of patients were men and 32% of patients were women. Patients enrolled in EOCR programs had a primary diagnosis of CABG 4,803 (30%); AVR/MVR 1,401(9%); MI 3,583 (22%); PCI/Stent 4,961 (31%); stable angina 965 (6%); heart/lung transplant 53 (0.33%); other 385 (2%). 8.4% complete 0-6

sessions of EOCR; 12% complete 7-12 sessions; 22% complete 13-18 sessions; and 58% complete 19-36 sessions. 35% of patients enrolled in EOCR programs are discharged early. 84% of programs offer an outpatient maintenance CR program. 96% of EOCR programs offer education classes; 89% offer resistance equipment; 72% are AACVPR certified; 62% also offer pulmonary rehabilitation; 23% utilize outcome measurements; 62% are in rural locations; and the average patient-to-staff ratio is 4.2:1. **Conclusions:** CR programs are used by a minority of eligible patients. There is marked variation in the structure and content of EOCR programs. Alternative strategies to improve standardization and outcomes should be implemented. **Key Words:** CARDIAC REHABILITATION, SECONDARY PREVENTION, OUTCOMES

CHAPTER I

INTRODUCTION

An estimated 1 in 3 American adults have 1 or more types of cardiovascular disease (CVD) ¹. Mortality data show that CVD is responsible for more than 1 out of every 3 deaths in the United States ². Data from NHANES 2005 to 2008, estimates 16.3 million people in the United States have coronary heart disease (CHD), greater than 935,000 people suffered myocardial infarction (MI), and 571,402 people died of CHD ². The high prevalence of CHD and its important contribution to disability underscore the importance of efforts to improve clinical outcomes and prevent recurrent CHD events ^{2,3}. There are substantial risks for secondary ischemic coronary events following an initial event, but secondary prevention efforts, including cardiac rehabilitation (CR), have beneficial effects on both early and late mortality and morbidity ¹.

Secondary prevention focuses on risk reduction in patients with established CHD who are at high risk for recurrent cardiac events and death from cardiac causes ⁴. Exercise is only one component of such a program; nutritional counseling, behavioral interventions, and drug therapy have equally important roles ⁴. Post coronary event

patients who participate in exercise rehabilitation benefit from lower mortality rates and improved physical and psychological function ^{1,3,5}.

Hospitalizations for coronary diagnoses frequently provide patients with inpatient CR, including supervised early mobilization and education on controlling risk factors and physical activities after discharge ⁶. However, as hospital length of stay for MI has decreased, outpatient CR has become increasingly important ⁶. As such, cardiac rehabilitation/secondary prevention programs provide an important and efficient venue in which to deliver effective secondary preventive care ³.

Despite the well-established benefits of exercise and nutritional counseling, physicians are generally not well trained, and do not have the time to provide effective behavioral modification assistance (i.e. nutritional advice, guidance about weight management, smoking cessation, stress, a prescription for exercise, etc.) ⁴. The provision of all these services at CR centers, with the use of well-established algorithms to set goals for risk reduction and in coordination with the primary care physician or specialist, is efficient and effective. Patients with CHD who have experienced an MI or have undergone coronary artery bypass graft (CABG) surgery are prime candidates for CR services ³. In 2006 through successful outcomes, programs have broadened candidacy to include patients who have undergone percutaneous coronary interventions (PCI); are heart transplantation candidates or recipients; have undergone valve replacement or repair; or have stable angina. Those with chronic heart failure, peripheral arterial disease with claudication, or other forms of CVD would benefit from CR but are not currently reimbursed ³.

Various determinants of CR participation have been previously identified and include: 1. patient-related factors, such as social support, family responsibilities, personal preferences, financial pressures, return to work, availability, ease of transportation, and severity of disease; 2. physician-related factors, such as the strength of the physician's recommendation to patients for CR enrollment and the physician's perceptions regarding the benefits of CR for the patient; and 3. program-related factors, such as program costs, the desirability of class schedules and facilities, and program location/accessibility ⁷.

In a review by Jackson et al. ⁸ it was found that the participation rate of women was only about half that of men. The main predictor of referral to a CR program was the physician's endorsement of the effectiveness of CR ⁸. Patients were more likely to participate in CR when they were actively referred, educated, married, possessed high self efficacy, and when the programs were easily accessible ⁸. Patients with a primary diagnosis of either MI, PCI, stable angina, or CABG have traditionally been referred more often to CR programs ⁸. Jackson et al. found that the strongest predictors of non-participation were traveling distance to CR programs and lack of insurance coverage ⁸. Current evidence states that men are more likely to be referred to and complete CR than their women counterparts ⁹. It has been found that those with a diagnosis of PCI or stable angina are twice as likely to dropout than those recovering from a MI or CABG ¹⁰. Recent research has found lower CR use rates in women, nonwhites, and older patients ³, ¹¹. Suaya et al., also found that CR use rates were > 4-fold higher in north central states (Nebraska, Iowa, North and South Dakota, Minnesota, and Wisconsin) than in southern states ³.

Despite benefits found in the last 3 decades CR remains underutilized³. Meta-analyses of controlled studies have found 15%-28% reductions in all-cause mortality and 26%-31% reductions in cardiac mortality³. In addition, studies have documented substantial reductions in morbidity and decreases in cardiac risk factors³. The American Heart Association (AHA) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) recognize that all cardiac rehabilitation/secondary prevention programs should contain specific core components that aim to optimize cardiovascular risk reduction, foster healthy behaviors and compliance with these behaviors, reduce disability, and promote an active lifestyle in patients with CVD¹². Physical activity, a primary component of CR, both prevents and helps treat many established atherosclerotic risk factors, including elevated blood pressure, insulin resistance and glucose intolerance, elevated triglyceride concentrations, low high-density lipoprotein cholesterol (HDL-C) concentrations, and obesity⁶.

Despite the known benefits of CR and the widespread endorsement of its use, CR is vastly underutilized, with < 30% of eligible patients participating in a CR program¹³. Early outpatient CR is a physician referred program that delivers preventative and rehabilitative services to patients in the outpatient setting early after a CHD event, generally within the first 3-6 months after the event but continuing for as much as 1 year after the event¹³.

In addition, there is a lack of “visibility” and recognition by the public of the importance of CR services. Specific measures focused on clinical outcomes were not included in the latest cardiac core components. To date, little is known about

characteristics of patients who attend these programs and what components CR Programs offer to patients.

Statement of Problem:

CR is effective in prolonging survival and reducing disability in patients with CHD¹. However, national use patterns and predictors of CR use have not been evaluated thoroughly. The ability to quantify the quality of cardiovascular care depends on the transformation of recommendations for high-quality care into the outcomes of that care¹⁴. As payers and regulatory agencies increasingly seek to quantify healthcare quality, the implications of the measurement process on CR are likely to grow¹⁴. This information would be invaluable to patients looking to join a CR program, or clinicians evaluating where to refer their patients. This would also be beneficial for health professionals, health care institutions, third party payers, and regulatory agencies that support CR programs.

Purpose of the Study:

The purposes of the present study were to: 1.) define patient demographics of those attending Early Outpatient Cardiac Rehabilitation programs; 2.) determine completion rates, staff characteristics, program characteristics, and the geographical location of Early Outpatient Cardiac Rehabilitation programs in the United States.

Delimitations:

This research was delimited to the following factors:

- The participants surveyed were the directors of the cardiac rehabilitation sites.

- 1,399 cardiac rehabilitation programs registered with AACVPR, located in the United States.
- A questionnaire containing 13 questions was sent to Indiana program directors in October for the pilot study.
- The directors were emailed a cover letter containing the link to the online questionnaire containing 13 questions, and a four-week return time was requested.
- The analysis consisted of 138 cardiac rehabilitation programs.

Limitations:

- The survey did not allow for explanations to questions, therefore the answer marked may not exhibit a clear understanding of the question.
- A non-response bias may have been present.

Assumptions:

- All participants completed the survey honestly and correctly.
- All participants who answered the survey were the directors of the programs.
- All participants read and understood the instructions for filling out the survey.

Definition of Terms:

Cardiovascular Disease: A term that includes having any of the following; coronary artery disease (CAD), atherosclerosis, ischemic heart disease, strokes, hypertension, peripheral arterial disease (PAD) and congestive heart failure.

Cardiac Rehabilitation: 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 processes, thereby reducing morbidity and mortality ¹.

Coronary Artery Disease: A disease caused by the thickening of the coronary artery walls. It can occlude blood flow to the heart causing irreversible damage.

Acute Myocardial Infarction: The death of myocardial tissue resulting from prolonged ischemia.

Coronary Artery Bypass Graft: A blood vessel is surgically grafted to a coronary artery, bypassing an area that is narrowed as a result of advanced atherosclerosis.

Morbidity: The rate of incidence of a particular disease.

Mortality: The number of deaths in a given time or place.

Percutaneous Coronary Intervention: Therapeutic procedure used to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease.

Secondary Prevention: An attempt to diagnose and treat an existing disease in its early stages before it results in significant morbidity.

Inpatient Cardiac Rehabilitation (Phase I): A monitored inpatient program used to provide physical activity and education on medications and recognition of signs and symptoms.

Early Outpatient Cardiac Rehabilitation (Phase II): A monitored outpatient program used to aid in the recovery from CAD that provides additional psychosocial, coping, exercise, and educational support to help someone regain the ability to perform activities of daily living (ADL's).

CHAPTER II

LITERATURE REVIEW

Heart Disease Statistics and Prevalence

Cardiovascular disease (CVD) includes coronary heart disease (CHD) which encompasses stable angina, coronary insufficiency, myocardial infarction (MI), sudden or non-sudden death resulting from coronary disease, congestive heart failure (CHF), stroke, transient ischemic attack (TIA), and intermittent claudication ¹⁵. The terms CHD and CAD are often used interchangeably when describing disease of the arteries of the heart.

CVD is the currently the leading cause of death in men and women and has been since 1900, excluding the year 1918 ². An estimated 82,600,000 Americans have one or more types of CVD ². On the basis of 2007 mortality rate data, nearly 2,200 Americans die of CVD each day, an average of 1 death every 39 seconds ². The 2007 overall death rate from CVD was 251.2 per 1,000 ². More than 150,000 Americans killed by CVD in 2007 were less than 65 years of age ². In 2007, nearly 33% of deaths due to CVD occurred before the age of 75 years, which is well before the average life expectancy of 77.9 years ². In 2010, it is estimated that 795,000 Americans will have their first coronary attack, and approximately 470,000 will have a recurrent attack ². The total direct and indirect cost of CVD in the United States for 2007 is an estimated \$286 billion ².

Risk Factors Associated with Heart Disease

CR is considered a multifactorial process because it is designed to cover the many content areas that are parallel to the risk factors associated with heart disease. In order for CR to be successful, it is crucial to look at the risk factors involved in CVD and how knowledge about the United States CR programs can reduce the risk factors.

There are both modifiable and non-modifiable risk factors associated with the development of CVD. Modifiable risk factors can be managed by modifying lifestyle behaviors. Modifiable risk factors include: smoking/ tobacco use, high blood cholesterol and other lipids, hypertension, physical inactivity, diabetes mellitus, stress, overweight and obesity ¹⁶. Non- modifiable risk factors are ones that individuals cannot control but can be managed by lifestyle changes and medical guidance. Non- modifiable risk factors include: increasing age, gender, and heredity/race. The more risk factors an individual has, the greater their chance of developing CVD.

Approved Cardiac Rehabilitation Diagnoses

Patients with CHD who have experienced a MI or have undergone CABG surgery are prime candidates for CR services ³. In 2006 candidacy was broadened to include patients who have undergone PCI; are heart transplantation candidates or recipients; have stable angina; or valve replacement/repair. Those with stable chronic heart failure, peripheral arterial disease with claudication, or other forms of CVD would be benefited by CR but are not reimbursable ³.

Procedures include traditional open-chest CABGs and valve replacement or repair as well as newer minimally invasive procedures that involve small incisions¹⁷. The location or number of arterial blockages may call for the more invasive procedure, CABG. CABGs typically uses a section of saphenous vein or an internal mammary artery as a conduit to circumvent significant atherosclerotic lesions in major epicardial coronary arteries¹⁷. The traditional CABG procedure involves opening the chest with a sternum-splitting incision and stopping the heart, using a cardiopulmonary bypass pump to sustain circulation¹⁸.

Cardiac catheterization laboratory interventions include PCI with or without stent placement, and atherectomy. Catheter-based interventions utilize a thin, flexible tube that is threaded through an artery from the groin or arm and into the occluded arteries¹⁸. The catheter may then be used to perform PCI such as angioplasty, in which a small balloon is positioned over a lesion and expanded to push the vessel wall out¹⁸. PCI patients are included in the referral to CR because they are generally out of the hospital within 12 to 24 hours of the procedure.

Surgical interventions for valvular dysfunction consist of annuloplasty or valve replacement¹⁷. Annuloplasty tightens the annulus of a valve in an effort to restore the competence of that valve¹⁷. Prosthetic heart valves are divided into two main categories: bioprostheses and mechanical prostheses. Pacemakers and implantable cardiac defibrillators (ICD) are small devices implanted in the body to monitor and regulate the electrical activity of the heart. ICDs are devices that detect abnormal heart rhythms and

deliver an electrical shock if a dangerous rhythm is detected. Cardiac transplants are performed worldwide in patients with end-stage heart failure.

The number of patients undergoing procedures to optimize coronary blood flow or to correct damaged valves continues to grow. From 1997 to 2007, the total number of inpatient cardiovascular operations and procedures increased 27%, from 5,382,000 to 6,846,000 annually². Discharge rates (per 10,000 population) for PCI increased 58%, from 37.2 in 1990–1992 to 59.2 in 2002–2004^{2, 16}. Discharge rates for CABG increased from 34.1 in 1990–1992 to 38.6 in 1996–1998, and then declined to 25.2 in 2002–2004^{2, 16}. The National Center for Health Statistics estimates that in 2007, in the United States, 232,000 patients underwent a total of 408,000 CABG².

The almost 1 million survivors of MI and the 7 million patients with stable angina are candidates for CR, as are the 309,000 patients who undergo CABG surgery and the 362,000 patients who undergo PCI each year¹⁹. The need for CR has not changed since these recommendations were written in 1995. Data published since 1995 have only confirmed earlier findings and in fact provided justification for broader inclusion criteria for CR.

Cardiac Rehabilitation Background

The basis for CR began to take shape in the 1950s, with the major focus on the restoration of functional capacity¹⁷. Restoration of functional capacity was critically important because of the prolonged bed rest required for patients hospitalized with MI¹⁷. CR programs are designed to decrease morbidity and mortality and improve a variety of

clinical and behavioral outcomes, including quality of life. In the 1960s, inpatient CR programs began delivering passive range-of-motion exercises to patients still confined to their beds in coronary care units ¹⁷. Days later, on step-down units, patients were cautiously walked in their rooms, still connected to heart monitors ¹⁷. In the 1970s, outpatient CR services were initiated 8 to 12 weeks post-event ²⁰. During the 1980s maintenance programs became more prevalent in response to the growing volume outpatient graduates and their desire to stay in a medically supervised environment ¹⁷.

In response to evidence-based practice in the 1990s, CR programs began to remodel their structure and have now become substantially streamlined. CR providers quickly identify individual patient-care priorities and address them within the continuum of care ¹⁷. Fulfillment of the secondary prevention mission of CR requires the delivery of risk factor intervention programs, education and counseling, and exercise training ¹⁷. The combination of these interventions has been shown to produce optimal reduction of cardiac risk ¹⁹.

Most CR programs are designed to offer 3 or 4 phases:

Phase 1: Inpatient

Phase 1 CR begins in the hospital, generally within 48 hours of CABG or a MI, or within 24 hours of an admission for angina or PCI ²¹. The primary purposes of inpatient CR include: 1. activity progression; 2. education; 3. psychosocial support; and 4. discharge planning and referral ²¹.

Phase 2: Early Outpatient CR

Patients are encouraged to begin phase 2 CR as soon as possible post-discharge, largely because of the clinical assessment, cardiac teaching, and emotional support they will receive ²¹. Phase 2 CR includes continuous ECG monitoring by telemetry. Education is provided as an important component of the phase 2 program. Patients typically remain in this phase for 6-36 sessions. The need for continuous ECG monitoring, and for what duration, remains controversial, and is often influenced by insurance reimbursement ²¹. A primary goal of phase 2 CR is to improve functional capacity, focusing primarily on endurance and flexibility.

According to the Centers for Medicare/Medicaid services (CMS), services provided in connection with a CR exercise program may be considered reasonable and necessary for up to 36 sessions. CR program sessions are limited to a maximum of 2 1-hour sessions per day for up to 36 sessions over up to 36 weeks. Patients generally receive 2-3 sessions per week for 12-18 weeks. The length that patients stay in an early outpatient CR program depends on their age, diagnosis, and insurance coverage.

Phase 3/4: Outpatient CR

This phase of CR has historically been referred to as “maintenance rehab” for patients who have completed phase 2 and wish to remain in a medically supervised setting. With the decline in insurance reimbursement, however, many patients do not participate in phase 2, and instead directly enter the phase 3 program ²¹.

Core Components of Cardiac Rehabilitation/Secondary Prevention Programs

Cardiac rehabilitation/secondary prevention programs are advised to provide specific core components of care to optimize cardiovascular risk reduction, reduce disability, and promote healthy behaviors. A clinical practice guideline for CR was published in 1995 and subsequently endorsed by a number of professional associations and the Centers for Medicare and Medicaid Services (CMS). These guidelines are based on the core components of CR and direct that the following components be included in a program³,²².

1. *Physician prescribed exercise: Exercise training and other therapeutic exercise including aerobic and strength training.*
2. *Cardiac risk factor modification: Includes education, counseling, and behavioral intervention; related to the individual's care and tailored to the individual's needs. It may include a combination of one or more of the following:
- Physical Activity, Nutrition, Lipid management, Blood pressure management, Smoking cessation, Weight management, Diabetes management, Psychosocial management*
3. *Psychosocial Assessment: Evaluation of the individual's mental and emotional functioning as it relates to the individual's rehabilitation or cardiac condition.*
4. *Outcomes Assessment: Evaluation of the patient's progress as it relates to the individual's rehabilitation goals and program.*

Cardiac rehabilitation/secondary prevention programs are advised to provide specific core components of care to optimize cardiovascular risk reduction, reduce disability, and promote healthy behaviors, including long-term adherence to these behaviors^{14, 17, 22}. CR programs need to establish a standardized method of data collection and maintain effective communication with other healthcare providers who also provide care for the referred patient^{14, 22}.

Cardiac Rehabilitation/ Secondary Prevention and Effectiveness

CVD can be prevented by modifying lifestyle behaviors before or after the disease has developed²³. Results from numerous studies suggest that CR services help promote significant health benefits, including improvements in functional capacity, psychological well-being, and some CHD risk factors⁹. In 1995, the Agency for Health Care Policy and Research funded a broad scientific review of outcome data associated with the interventions provided by CR programs. Secondary prevention programs, such as CR, were developed to prevent individuals from having future events and/or complications²⁴. Wegner et al. demonstrated that participation in CR programs resulted in a 20-25% reduction in mortality from CVD¹⁹. Pooled data from randomized trials in post-MI patients have documented a 20% decrease in cardiac and overall mortality over a 2-3 year follow-up period²⁵.

Hedback, et al.²⁶, reported a 10 year post-operation observational study of 49 consecutive Swedish patients (39 men and 10 women, mean age = 57 ± 7.4 years) who underwent elective CABG and were offered a CR program twice a week for 3 months

consisting of education in risk-factor control, a physical training program, and regular post-CABG clinic follow-up. The control group (78 men and 20 women, mean age = 57.3 \pm 7.3 years) consisted of two well-matched CABG patients for each study patient, who were offered usual care but no access to a CR program. Results showed that, after 10 years, patients in the study group experienced longer mean time to a first adverse cardiac event compared to controls, 82 months and 66 months, respectively. The percent of patients who developed a cardiac event (cardiovascular death, nonfatal MI, CABG or PCI) was significantly less in the study group compared to controls (18.4% versus 34.7%). Additionally, the number of hospital readmissions (2.1 versus 3.5 per patient) and length of admissions (11 versus 26 days per patient) was significantly lower in the study group. Hedback and colleagues concluded that comprehensive CR post-CABG improved long-term prognosis and reduced the need for hospital care ²⁶.

A study by Onishi et al. ²⁷ investigated the long-term effect of Phase III CR in elderly patients with stable CAD. They evaluated 111 elderly male CAD patients, including 37 subjects participating in supervised CR for 6 months and 74 age-matched controls. The patients were followed until the occurrence of death or one of the following cardiovascular events: cardiovascular death, acute coronary syndrome, refractory angina requiring revascularization, admission for congestive heart failure, or stroke. All-cause mortality was lower in the CR than the control group (14% vs 28%) ²⁷. The incidence of cardiovascular events was significantly lower in the CR group than the control groups (30% vs 62%) ²⁷. Overall, the authors concluded that Phase III CR has the beneficial effect of reducing cardiovascular events even in elderly patients with stable CAD.

Stewart, et al.²⁸, reviewed the evidence for comprehensive exercise-based CR and reported that “the exercise component of CR is useful for reversing the symptoms associated with deconditioning”. Women with mitral valve prostheses improved their peak metabolic equivalent capacity by 19% and their physical working capacity by 25% after undergoing an 8-week program, whereas control subjects did not improve. After aortic valve replacement, exercise training increased peak aerobic capacity and decreased rate pressure product and the rating of perceived exertion at a fixed workload. The increase in aerobic capacity in the exercise group was 38% higher than that in the control group at 6 months and was 37% higher after 12 months.

Belardinelli, et al.²⁹, reported a randomized controlled trial of 118 consecutive patients with CAD (mean age = 57 ± 10 years) who underwent PCI or stenting on one (69%) or two (31%) coronary arteries. Patients were randomized into either a training group (49 men and 10 women, mean age = 53 ± 11 years) who exercised 3 times a week for 6 months at 60% of peak VO_2 , or a control group (50 men and 9 women, mean age = 59 ± 10 years) who were recommended to perform daily mild physical activities but to avoid physical training. Results showed that only trained patients had significant improvements in peak VO_2 (26% increase) and quality-of-life (27% increase) versus controls. The angiographic restenosis rate was unaffected by exercise training and was not significantly different after either PCI or stenting. During the follow-up (33 ± 7 months), trained patients had a significantly lower event rate (e.g., new MI, angioplasty or CABG) than controls (11.9 vs. 32%) and a lower rate of hospital readmission (19 vs. 46%).

Although the studies on CR and transplant patients are small, there is sufficient evidence that CR improves physiologic hemodynamic responses and helps to preserve or reverse bone and muscle loss²⁸. Dealing with the continued medical consequences of cardiac transplantation is challenging, and the multidisciplinary nature of cardiac rehabilitation, including exercise, education, nutrition, and behavioral interventions, is ideally suited to these patients²⁸.

Compelling scientific evidence, including data from recent studies in patients with CVD, demonstrates that a comprehensive risk factor intervention can extend overall survival, improve quality of life, decrease need for an interventional procedure, and reduce the incidence of subsequent MIs²³. It has been concluded that patients who are active in CR have decreased overall mortality, cardiovascular mortality and lower rates of sudden death, as compared with those who do not complete CR.

Cardiac Rehabilitation Education

CVD represents a high percentage of morbidity and mortality of American adults. Behavior changes are clearly needed in pre- and post-infarction patients to reduce the incidence of CHD and recurring heart problems. Cardiac education programs aid in increasing the knowledge base of patients and their families about CAD. Currently, it is not known how many CR education programs exist. It has been demonstrated that cardiac education programs have a significant impact on blood pressure, mortality, exercise, and diet along with other areas³⁰. Educational interventions are necessary in CR for several reasons; patient's acceptance of the disease condition, patient's knowledge of disease

pathophysiology and prognosis, and patient's awareness of modifiable risk factors³¹. The knowledge gained through CR educations teaches patients enhanced self-care and lays a foundation for modifying lifestyle behaviors⁷.

Each patient who enters CR is a candidate for participation in the educational intervention. Educational interventions should be aimed at reducing cardiac risk (through a low-fat diet, blood pressure management, lipid management, smoking cessation, diabetes management, and stress management)¹⁷. Patients are also taught about managing cardiac emergencies (such as angina, possible heart attack, or pain or discomfort during exercise); understanding the disease process (atherosclerosis, high BP, diabetes); maintaining psychosocial health (addressing sexual function, social relationships, depression, anger, hostility); and adapting to limitations imposed by the disease process (changing roles in the family, jobs at work, hobbies and recreational activities)¹⁷. There is, however, limited data to substantiate long-term beneficial effects on psychological outcome by these interventions³².

Ott et al.³³ assessed changes in quality of life using the Sickness Impact Profile (SIP) for 258 patients after MI in a randomized study. A control group consisted of patients receiving conventional medical and nursing management beginning shortly after the MI. An exercise-only group included patients who were given an exercise program in the hospital and an exercise prescription supervised at weekly out-patient visits. The exercise prescription was progressive and individualized but only loosely monitored. An exercise and teaching-counseling group was made up of patients who were given the same exercise recommendations as the exercise-only group but, in addition, were given a

teaching-counseling program about risk factors and emotional adjustment after hospital discharge during 8 weekly clinic appointments. The sessions covered a broad range of topics considered pertinent to the patient with cardiac disease. Family and friends were encouraged to attend, and individual problems were pursued on a personal basis during appointments with a nurse. Follow-up evaluations were done on all patients at a centrally located clinic 3 and 6 months after hospital discharge. There were no significant differences at baseline among the 3 randomized groups. The final SIP scores of the exercise-only and control groups were similar. Modest, but statistically significant, differences in the exercise and teaching-counseling group were noted in comparison with control subjects. Psychosocial scales were significantly improved at 3 months and several individual SIP items were significantly better at both 3 and 6 months after hospitalization. No differences were found in rates of return to work.

In some randomized, controlled studies, special teaching or counseling programs have produced modest improvements in psychosocial outcome compared to usual care after MI³². Other studies, however, have shown no benefit³². The evidence that teaching, counseling, or both, are helpful in CR programs after MI is not conclusive.

Cardiac Rehabilitation Resistance Training

The long-standing perception that resistive exercise is harmful to cardiac patients is not supported by the scientific literature¹⁷. Prescribed and supervised resistance training (RT) enhances muscular strength and endurance, functional capacity and independence, and quality of life while reducing disability in persons with and without CVD³⁴. Both endurance and strength training can elicit substantial increases in physical

fitness³⁵. Endurance training induces greater improvements in aerobic capacity and associated cardiopulmonary and metabolic variables and more effectively modifies CVD risk factors³⁴. RT enhances muscular strength, endurance, and muscle mass to a greater extent³⁴.

Studies reported improvements in muscular strength and endurance, with similar increases in overall strength among patients with CVD in a rehabilitation setting³⁴. Currently, it is not known how many CR programs offer RT to their patients. The absence of angina symptoms, ischemic ST-segment depression, abnormal hemodynamics, complex ventricular dysrhythmias, and cardiovascular complications suggests that strength testing and training are safe for clinically stable men and women with CVD who are actively participating in a supervised rehabilitation program³⁴.

Data that RT reduces CVD risk are equivocal³⁴. However, in people who have a level of fitness that compromises their daily physical functioning, both endurance and RT may contribute to an improved health-related quality of life³⁴. Studies of patients with CVD have examined the value of RT when added to a program of aerobic exercise, similar to CR programs. These studies found that RT is well tolerated and is associated with improvements in quality of life, strength, and endurance³⁴. However, given the extensive evidence of the benefits of aerobic exercise training on the modulation of cardiovascular risk factors, RT should be viewed as a complement to rather than a replacement for aerobic exercise³⁴.

Completion/Drop-Out Rates

Estimates of patient adherence to the completion of CR range from 40-60% and are comparable with adherence rates for other cardiovascular risk-reduction interventions^{36,37}. In a study done by Sanderson et al.³⁶, the majority (58%) of the < 30% referred patients completed the prescribed CR sessions. Among those patients who did not complete CR, 63% of the reasons were categorized as non-medical (personal or work related) and 37% as medical (health related). There was no difference in prescribed sessions between the two dropout groups. Of those who dropped out due to non-medical reasons, only 37% of the prescribed sessions were completed, which was significantly less than the medical dropout patients, who attended 50% of the prescribed sessions before dropping out³⁶. A comparison of differences in the baseline characteristics between the two groups of non-completers showed that the medical dropout patients were older (62.4 vs. 55.5 yrs.), had a high risk stratification (60% vs. 36%), low physical activity levels (82% vs. 67%), and a shorter 6-minute walk test distance (980.6 ft. vs. 1160.4 ft.) than the nonmedical dropout group. The non-medical dropout group had higher rates of employed (56% vs. 17%) and obese patients (63% vs. 43%) when compared to the medical dropout group.

The rate of compliance with an exercise regimen for cardiac rehabilitation is approximately 50% at one year^{37,38}, as compared with compliance rates of 64% for antihypertensive medication and 82% for lipid-lowering agents⁴. Several interventions have been shown to optimize compliance with an exercise regimen. In one study, a rehabilitation program that included a gradual transition from supervised, center-based

exercise sessions to sessions performed at home with self-monitoring resulted in a compliance rate of 92% at 6 months, as compared with a rate of 76% for a program that did not include such a transition ³⁹. A high dropout rate and poor attendance patterns for CR have been attributed to factors related to clinical, psychological, health behavior, and demographic patient characteristics.

Outpatient Maintenance Cardiac Rehabilitation

CR has numerous benefits, including reduction of mortality and cardiovascular events, in patients with CVD. However, the long-term effect of phase III CR in elderly patients with stable CAD is still unknown. Phase III is a supervised exercise program whereby individuals learn to self-manage their overall cardiovascular health. Participants of Phase III CR have risk factors for heart disease, have known CAD, or have other heart related problems, which require some level of supervision/monitoring. An individual can enroll in this program after completing Early Outpatient CR (EOCR) if the patient has recently had a MI or CABG surgery. Individuals can also be referred by their primary care physician or cardiologist/surgeon at any time to begin this phase. It is not necessary to have completed inpatient CR and EOCR. Most insurance companies do not cover Phase III CR. Participants in most outpatient maintenance programs are able to stay indefinitely in a medically supervised environment.

In a study by Seki et al. ⁴⁰, the impact of phase III CR on health-related quality of life in elderly patients with CAD was assessed. Thirty-eight elderly males (>65 years of age) with CAD were stratified as the intervention group (n=20) and the control group (n=18). Patients of the study participated in CR for 6 months, and the control group

received standard care. At baseline, scores of the Medical Outcome Study Short-Form 36 Health Status Survey (SF-36), State-trait anxiety inventory questionnaire (STAI) and Self-rating Depression Scale (SDS) were not different in either group. After 6 months, in the intervention group, scores of bodily pain, general health, vitality and mental health of SF-36 improved significantly⁴⁰. State anxiety scores also improved significantly, but SDS depression scores were not improved⁴⁰. In the control group, none of these parameters significantly changed⁴⁰. The phase III CR program significantly improved some aspects of quality of life and anxiety⁴⁰. Based on these results a phase III comprehensive program for elderly patients with CAD is recommended. The authors suggest that elderly patients with CAD should be routinely referred to and encouraged to pursue phase III CR after a major cardiac event⁴⁰.

Barriers to Cardiac Rehabilitation

CR may be the best way to help initiate healthy lifestyle adaptations necessary to meet current PA recommendations for CR patients⁴¹. It has been found that patients who complete EOCR are more likely to adapt healthy lifestyle modifications (i.e. regular exercise and a balanced diet)⁴².

Despite the known benefits of CR and the widespread endorsement of its use, CR is vastly underutilized, with < 30% of eligible patients participating in a CR program¹³. Wenger et al.¹⁹ found that only 11-38% of patients needing CR services receive them. Results from another nationally conducted survey conclude that only a minority of MI, PCI, and CABG survivors enrolled in CR programs (11%, 10% and 23%, respectively)⁹.

A recent analysis of national Medicare claims data also indicated that CR use as suboptimal as 19% of Medicare patients enrolled in CR following a MI or CABG surgery³. According to a study done by Brown et al.⁴³, of the 72,817 individuals discharged from 156 Get With The Guidelines participating hospitals following a MI, PCI, or CABG surgery from January 2000 to September 2007, only 56% were referred to CR at hospital discharge. This ranged from 53% for patients admitted with a MI, to 58% for those undergoing PCI, to 74% for those undergoing CABG surgery⁴³.

Various determinants of CR participation have been previously identified and include: 1. patient-related factors, such as social support, family responsibilities, personal preferences, financial pressures, return to work, availability, ease of transportation, and severity of disease; 2. physician-related factors, such as the strength of the physician's recommendation to patients for CR enrollment and the physician's perceptions regarding the benefits of CR for the patient; and 3. program-related factors, such as program costs, the desirability of class schedules and facilities, and program location/availability⁷.

In a literature review performed by Daly et al. further detailed the barriers associated with participation in CR⁴⁴. In their review, they found consistent findings that suggest being elderly, female, less educated, having angina, and being less physically active are significant factors associated with low participation rates in CR. Recent investigations of cognitive factors associated with CR engagement and adherence have found that patients' beliefs about their illness, beliefs about CR, feelings of self-efficacy, mood, and coping style are also potential important variables⁷. Jackson et al. conducted a review that examined the factors associated with CR referral, participation, and post

discharge behavioral change⁸. They concluded that physician endorsement was the principle predictor of referral and patient participation in CR.

Patient adherence rates determine the success of any long-term secondary prevention program⁷. Research has shown that the greatest health benefits of these programs are associated with ongoing adherence to CR through 12 weeks of exercise or longer⁷. Those patients who do not engage with CR and those who drop out prior to completion are therefore likely to be at greater risk of experiencing further cardiac events than those who attend all prescribed CR classes⁷. Those who do not participate in CR often have greater degrees of functional impairment and are the ones in need of and most likely to benefit from CR⁴⁵.

In a review by Jackson et al. it was found that the participation rate of women was only about half that of men⁸. The main predictor of referral to a CR program was the physician's endorsement of the effectiveness of CR⁸. Patients were more likely to participate in CR when they were actively referred, educated, married, possessed high self efficacy, and when the programs were easily accessible⁸. Jackson et al. found that the strongest predictors of non-participation were traveling distance to CR programs and lack of insurance coverage⁸. Currently we know that men are more likely to be referred to and complete CR than their women counterparts^{8,9}. Enrollment is particularly low for post-MI and post-CABG women as compared with men: 7% vs. 13%, and 20% vs. 25%, respectively⁹. It has been found that those with a diagnosis of PCI or angina are twice as likely to dropout than those recovering from a MI or CABG¹⁰. A study by Suaya et al.,

found lower use rates in women (14% vs. 22% for men), nonwhites (8% vs. 20% in whites), and older patients³. Suaya et al. also found that CR use rates were > 4-fold higher in north central states (Nebraska, Iowa, North and South Dakota, Minnesota, and Wisconsin) than in southern states³.

Formats other than the traditional hour-long sessions occurring 3 times a week have been developed to provide secondary prevention services. These alternative formats include; nurse case-management systems using telephone calls as the primary intervention, modalities in which diet and psychosocial therapy are heavily emphasized, home exercise programs, and computer/internet-based services. The home exercise program involves the patient's exercise session being monitored through transtelephonic transmission of electrocardiograms. The lack of an easily accessible CR center is potentially a major determining factor regarding the participation of eligible patients⁴⁶. Curnier et al., hypothesized that the development of home-based CR programs could overcome the problem of program non-availability⁴⁶. Unfortunately, these interventions are generally not reimbursable under current guidelines from the Centers for Medicare/Medicaid Services¹⁷. Reimbursement for these alternative programs would give clinicians the flexibility to provide services that are individually tailored to specific patient needs and the opportunity to provide services to people who are unable to participate in onsite programs.

Physician Referral

Patients entering EOCR should have a referral from their cardiologist, hospitalist, primary care physician, etc. The referral includes diagnosis and other relevant history and indicates the need for EOCR services. The physician referral is required for insurance reimbursement²¹. Medicare will reimburse physician supervised monitored CR services for the following diagnoses: acute MI within the preceding 12 months; or CABG; or stable angina pectoris; or heart valve repair/replacement; or PCI or coronary stenting; or heart or heart-lung transplant. Insurance reimbursement for other providers varies considerably; pre-authorization is usually required.

Prescribing CR alongside cardiovascular medications recommended in clinical practice guidelines is not standard practice; this is evident by the data from the United States, Canada, United Kingdom demonstrating that 70 to 80% of eligible patients being treated for cardiac disease do not receive CR after hospital discharge^{3,47}. While the reasons are multifactorial, arguably one of the chief reasons for low CR utilization is the low referral rate. Recently, automatic referral interventions have been implemented to overcome this barrier. Recent findings show that automatic referral strategies resulted in referral rates of 34% to 85%, and enrollment rates of 19% to 78%⁴⁷.

Gender Differences in Cardiac Rehabilitation

Although death rates from CVD have declined in recent years, CVD continues to be the leading cause of death for women in the United States⁴⁸. In women aged 40 to 59 years, the prevalence of CVD is 40%; this increases to more than 73% in women aged 60 to 79 years^{16,48}. Women, on average, are 10 years older than men when they initially

present with symptomatic CVD⁹. In addition to the age difference, women differ from men by clinical presentation, by the frequency of cardiac risk factors, by the frequency of psychological dysfunction, by the likelihood of disability and poor physical function, and by the likelihood of participating in CR¹⁷. CR programs, considered secondary prevention programs, aim to improve functional capacity and quality of life, reduce cardiac risk factors, and prevent future events among individuals with CVD⁴⁸. In a study of 267,427 Medicare beneficiaries, of whom 44% were women, claims were analyzed to determine the use of CR after hospitalization for acute MI or CABG. Suaya et al.³ found that only 14% of patients after acute MI and 31% of patients after CABG attended CR. The overall use of CR in women was 14%^{3,48}.

In a review by McCarthy et al., that consisted of 19 primary studies, the authors identified provider-level barriers, system-level factors, and individual-level variables associated with participation in CR by women⁴⁸. To participate in CR a patient must have a referral from a health care provider because eligibility criteria must be evaluated. However, lack of a physician referral was the most frequently described barrier to CR for women, and was discussed in 12 of the 19 studies included in the review⁴⁸. In a study done by Allen et al., only 19% of the women who qualified for CR attended⁴⁹. Of the 253 women studied in the Allen et al. study, 51% reported no knowledge of CR. In a study by Halm et al.⁵⁰ that consisted of 87 subjects, the authors investigated the relationship between eligibility and subsequent referral to EOCR in both men and women. The sample consisted of 87 patients (46 women and 41 men) who were admitted with a medical diagnosis of stable angina, MI, CABG, or valve replacement surgery⁵⁰.

Halm et al.⁵⁰ reported that men were more likely to receive a referral to CR than women, 67% vs 48% respectively.

Heid et al. compared CR referral and enrollment rates of men and women eligible for CR⁵¹. Of the 202 subjects, there were 118 men and 84 women all of which had been admitted with CVD. Heid et al. found that there was no statistical difference in CR referral between men and women, 44% and 41% respectively⁵¹. Despite there being no statistical difference between genders, of the patients referred, 37% of women enrolled compared with 69% of men⁵¹. Barriers to enrollment included concern for expense, conflicting schedules, transportation, and poor health⁵¹.

Findings suggest that there are multilevel barriers including disparities in the referral process by providers, financial and access barriers, and perceptions about personal health and CR that influence participation in CR by women⁴⁸.

Optimal Staff to Patient Ratio

CR professionals must maintain state-of-the-art programs that are responsive to evolving science while confronting the daily challenges of limitations in reimbursement, shortened hospital stays, an aging population, and costly medical services¹⁹. Effective administration requires knowledge of clinical practice guidelines, personnel management, budget, policy and procedure formation and implementation, productivity, utilization, insurance and managed-care contracting, and quality and performance-improvement issues^{17,52}. According to AACVPR guidelines, EOCR programs should have a maximum patient-to-staff ratio of 5 to 1. A second staff person should be available in case of

emergency. Maintenance CR programs that do not involve continuous ECG monitoring should have a maximum patient-to-staff ratio of 15 to 1¹⁷. Even lower patient-staff ratios and intensified monitoring may be necessary if a greater proportion of the participants are intermediate-risk patients¹⁷. When high-risk patients participate in structured exercise sessions, a supervising physician should be immediately available¹⁷.

Although basic administrative, medical-consultation, case-management, and emergency functions can be offered by as few as one qualified provider, adding a variety of specialists to the secondary prevention team can enhance treatment services⁵². The professions most frequently represented in the essential staff positions include specially trained registered nurses, exercise physiologists, vocational rehabilitation specialists, physical therapists, occupational therapists, pharmacists, and physicians¹⁷. To optimize results, cardiac staff nurses or other health care professionals may share responsibility with the CR specialists for activity progression and patient teaching¹⁷.

Each CR program professional should possess a common core of professional and clinical competencies regardless of academic discipline^{17,52}. AACVPR breaks down the credentials into minimum qualifications and preferred qualifications. Minimally CR staff members should have a bachelor's degree in a health field such as exercise science, or licensure in the jurisdiction¹⁷. They should have experience or specialty training in CR and secondary prevention^{17,52}. As well as, basic knowledge of exercise physiology, nutrition, risk-factor and behavior modification strategies, counseling techniques, and uses of educational programs and technologies as applied to CR services¹⁷. Preferred qualifications include, successful completion of ACLS and certification by a professional

organization that documents core competencies^{17, 52}. Programs should also have at least one person who has successfully completed an ACLS course.

Cardiac Rehabilitation Community Setting

As previously discussed, CR participation has been disappointingly low in patients after MI. This is thought to be due both to a geographic lack of available programs and low physician referral rates⁴⁶. For a therapy that generally occurs 3 times weekly over a 2- to 3- month period of time, the lack of an easily accessible CR center is potentially a major determining factor regarding the participation of eligible candidates. Curnier et al. identified a total of 2621 CR programs in the year 2000⁴⁶. The mean population density for CR in the United States was one program per 102,015 inhabitants. Authors found a significant correlation between the program number per state and the state population. However, this does not give a clear description of whether CR is readily available to state inhabitants.

A partial solution to the geographic non-availability of CR programs, both in rural and urban settings, could involve the development of home-based CR programs, which, to a degree, overcome the problem of program non-availability⁴⁶. Formats other than the traditional hour-long sessions occurring 3 times a week have been developed to provide secondary prevention services. They include, nurse case-management systems using telephone calls as the primary intervention modality, interventions in which intensive diet therapy and psychosocial counseling and support are heavily emphasized, home exercise programs in which exercise is monitored through transtelephonic transmission of

electrocardiograms, and computer-guided programs that supplement of serve as an alternative for facility-based secondary prevention efforts ¹⁷.

Social differences, such as those sometimes found in comparisons of race and ethnicity, and rural and urban environments have been associated with differences in CVD risk profiles and behavioral change ^{53, 54}. Differences between rural and urban residents such as level of education; health locus of control (LOC); medical or health knowledge; and environmental indicators all influence the perception of importance of and the willingness to comply with lifestyle recommendations ⁵³. McConnell et al., aimed to provide a descriptive analysis of specific differences between rural and urban residents ⁵³. In addition, they investigated the interaction between these differences and those who reduced CVD risk in response to telemedicine versus those who did not. Subjects who had no overt CVD were recruited from urban and rural medically underserved communities. Those enrolled included 205 rural and 153 urban residents. Sixty percent of rural and 63% of urban residents decreased their CVD risk. Triglycerides (200.9 mg/dL vs. 146.7 mg/dL), risk perception (23.5 vs. 22.8), and outcome expectations (2.8 vs. 2.6) were greater for the rural group vs. the urban group who decreased their CVD risk ⁵³. There are environmental factors that may influence lifestyle behavior that are specific to an urban or rural setting. For urban residents, there are the factors of safety, traffic, sidewalks, facilities and equipment availability, and pollution that may impact the individual willingness to participating in healthy behaviors such as increasing physical activity. Successful behavioral strategies are dependent on the

healthcare providers developing an understanding of specific environmental and behavioral barriers to success⁵³.

AACVPR

The American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) was Founded in 1985, AACVPR is dedicated to their mission of reducing morbidity, mortality and disability from cardiovascular and pulmonary disease through education, prevention, rehabilitation, research and disease management. Central to the core mission is improvement in quality of life for patients and their families. Since 1998, the AACVPR has certified programs in order to recognize programs that were meeting the standards put forth in the published Guidelines for Cardiac and Pulmonary Rehabilitation. AACVPR sponsors a Cardiac and Pulmonary Rehabilitation Program Certification process, the only peer-reviewed accreditation process designed to review individual facilities for adherence to standards and guidelines developed and published by the AACVPR and other professional societies. According to the AACVPR website, there are currently 1,399 certified programs available in the USA.

The purpose of AACVPR program certification is to review programs against published standards and guidelines, provide an objective assessment of adherence to updated clinical standards and guidelines, and provide patients with a benchmark to compare cardiovascular and pulmonary rehabilitation programs for quality care.

Outcome Measures/ORION

Quantifying and improving the quality of healthcare are a priority for healthcare organizations¹⁴. Although outcomes measurement for accountability often is mandated by external organizations, such as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the Centers for Medicare/Medicaid Services (CMS), the primary function of such measurement is to serve as an internal force for evaluating, understanding, and improving the quality of patient care. Outcomes are the tools to prove or validate program performance and the benefits patients receive from program participation²⁵. In addition, outcome measurement and reporting demonstrates accountability for the quality of patient care²⁵. Across the nation, many programs are collecting outcome data in an effort to demonstrate and report program effectiveness.

In 1992, AACVPR established an outcome committee in response to a need to document the benefits from rehabilitation efforts directed at patients with cardiovascular and pulmonary disease¹⁴. Program staff were advised to track outcomes consistently within their clinical practice, with the minimum expectation of including at least one behavioral, one clinical, and one health domain measure in their outcomes evaluation¹⁴.

At a minimum, health, clinical, and behavioral outcomes should be measured at entry and discharge from rehabilitation programs. Quality of life outcome measures before and after CR should include the assessment of physical function, psychological well-being, and social functioning²⁵. Some measures of clinical outcomes in CR are functional capacity, smoking, lipids, and blood pressure. The outcome of a number of behavioral-based interventions is important to assess before and after CR because of their

impact on primary health outcomes and clinical outcomes²⁵. Some of the behavioral interventions that may be used to improve outcomes in CR are; compliance with medical regimen, diet, exercise, smoking cessation, and relaxation/coping skills.

Programs such as Orion were developed to allow cardiac and pulmonary rehabilitation programs to create a benchmark of services provided. Orion allows programs to find out how they stack up against others in their region and against national averages. Outcome data has little meaning without test standardization and the ability to benchmark data with other programs. Outcome measurements are used in clinical CR programs to better justify the resources used by CR programs. Limitations in personnel and resources of the individual program may limit the depth of these measures, a comprehensive rehabilitation programs should measure at least one QOL, one clinical, and one behavioral measure of outcome²⁵.

Summary

The previous literature has demonstrated that CR is effective in prolonging survival and reducing disability in patients with CHD¹. CR has evolved as a therapy from tentative clinicians who prescribed earlier ambulation in their patients after acute MI. However, national use patterns and predictors of CR use have not been evaluated thoroughly. The ability to quantify the quality of cardiovascular care critically depends on the translation of recommendations for high-quality care into the measurement of that care¹⁴. With the current urgency to improve healthcare quality, each step taken to address these challenges in outcomes measurement and quality improvement represents advancement.

CHAPTER III

METHODOLOGY

The purposes of the present study were to: 1.) define patient demographics of those attending EOCR programs; 2.) determine completion rates, staff characteristics, program characteristics, and the geographical location of EOCR programs in the United States.

Procedures

Descriptive research was undertaken in order to assess the current status of CR programs in the United States. The CR survey was pilot-tested in Indiana before being sent to AACVPR for national distribution. AACVPR was targeted to distribute the survey to ensure nation-wide circulation. AACVPR was targeted due to their membership of approximately 3000 health care professionals nation-wide, with the vast majority being cardiovascular and pulmonary rehabilitation program directors and supervisors. Currently, AACVPR has a list of 1,399 EOCR programs in their online directory. Board members of AACVPR agreed to distribute a descriptive email of the study with the survey link imbedded nationwide to their entire directory of cardiac programs, certified and uncertified.

Initial Instate Survey

The CR survey was distributed in Indiana via the past president of Indiana State Cardiovascular Pulmonary Rehabilitation association. The email was sent to program directors or administrators of CR in the state of Indiana. The programs chosen for the preliminary investigation were included in the subsequent research. No changes in questionnaire content and format were made based on the responses received. As a result of the investigation, the investigator became more familiar with the process of distribution and collection of questionnaires and how to tabulate the data.

Data Collection

The survey was sent to directors of CR programs that are members of AACVPR. After the instate study was completed, the survey was sent to the remaining CR programs registered with AACVPR. An email was sent to directors of the programs explaining the design and purpose of the study, and instructions for filling out the survey were given. The link to the survey was provided within the email sent by AACVPR. A 4-week deadline was assigned for directors/administrators to submit completed surveys.

Subjects

Program directors or administrators of CR facilities in the United States served as the subject population for this study. Individuals were included if they met the following criteria: that he/she is a program director or administrator of CR facility in the United States. A template of the descriptive email message with the link to the survey was sent to AACVPR for approval. Once approved, the message including the survey link was

sent to members of AACVPR. In order to access the survey the program directors and/or administrators need to click the link in the email sent via AACVPR.

Survey

The survey was used to analyze EOCR and outpatient maintenance programs. After the development of the survey the IU-Health Ball Memorial Hospital program director and staff reviewed and made modification to the survey items. After the first phase of the study was completed in Indiana, the survey was sent to the remaining CR programs registered with AACVPR.

Qualified subjects were asked the state where their program resides as a way to identify trends in EOCR programs throughout the country. The survey consisted of two pages and had varying question formations (i.e. yes/no, multiple choice, multiple answer, and fill in the blank).

Instructions for program directors were given on the questionnaire and a criterion was established for educating on a specific content area. The instructions were given to decrease the chance of misinterpretation among the directors. The questionnaire sent to the directors can be found in Appendix A.

The CR survey contained 13 questions, some with multiple answers, regarding the utilization and patient demographics of an EOCR program. Program directors were asked to quantify the total number of cases for each approved diagnosis. Directors were then asked to further breakdown each diagnosis into percentages of the number of completed exercise sessions. Program directors were asked to quantify total patient population of

those who completed at least one EOCR exercise session. Patient population was further broken down into percent male and female. For all diagnoses program directors were asked to provide a percentage of patients who were discharged prior to completion of the eligible number of sessions. The total percentage of patients discharged early was further broken down into possible reasons for early discharge. Possible explanations for early discharge included; financial, transportation, work, non-compliance, and no longer medically necessary.

A number of descriptive questions were also asked about their EOCR program. The survey asked program administrators and/or directors about total pieces of equipment for CR use, and the community they serve. AACVPR certification status was also addressed in the form of a yes or no question along with; Orion use, availability of resistance training equipment, education classes, and whether or not they offer a pulmonary rehabilitation program. Included in the survey was a breakdown of staffing for their CR program, as well as, their patient to staff ratio.

The CR survey also asked whether or not participating program directors have an outpatient maintenance program (Phase III/IV), along with the associated cost of that program. If a maintenance program is offered, the survey asked program directors to further breakdown the population into those who enter the maintenance program upon direct admission, or after completion of an EOCR program.

Treatment of the Data:

All data was anonymously collected from the online survey site, inQsit. Results of the survey were downloaded to an electronic Excel csv file.

Statistical Analyses

Descriptive statistics were calculated (i.e. mean and range) and percentages of the various program characteristics and components.

CHAPTER IV

RESEARCH MANUSCRIPT

Journal Format: Journal of Cardiopulmonary Rehabilitation and Prevention

ABSTRACT

The Utilization and Patient Demographics for Early Outpatient Cardiac Rehabilitation (Phase II) Programs in the United States

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Purpose: Cardiac rehabilitation (CR) programs have been shown to promote numerous health benefits among patients with cardiovascular disease (CVD), but little is known about the characteristics of CR programs. **Methods:** A survey was developed and utilized to collect data on Early Outpatient Cardiac Rehabilitation programs (EOCR) in the USA. An email with a link to the survey was sent by the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) to their members. Program directors/administrators were recruited to provide information about their program in operation during 2009 in the United States. The CR survey contained 13 questions, some with multiple answers, regarding the utilization and patient demographics of an Early Outpatient Cardiac Rehabilitation (Phase II) program. **Results:** Responses were received from 138 programs in 44 states. Of the responses, 19,689 patients completed at least one EOCR exercise session. Of the responses, 68% of patients were men and 32% of patients were women. Patients enrolled in EOCR programs had a primary diagnosis of CABG 4,803 (30%); AVR/MVR 1,401(9%); MI 3,583 (22%); PCI/Stent 4,961 (31%); stable angina 965 (6%); heart/lung transplant 53 (0.33%); other 385 (2%). 8.4% complete 0-6 sessions of EOCR; 12% complete 7-12 sessions; 22% complete 13-18 sessions; and 58% complete 19-36 sessions. 35% of patients enrolled in EOCR programs are discharged early. 84% of programs offer an outpatient maintenance CR program. 96% of EOCR programs offer education classes; 89% offer resistance equipment; 72% are AACVPR certified; 62% also offer pulmonary rehabilitation; 23% utilize outcome measurements; 62% are in rural locations; and the average patient-to-staff ratio is 4.2:1. **Conclusions:** CR programs are used by a minority of eligible patients. There is marked variation in the structure and content of EOCR programs. Alternative strategies to improve standardization and outcomes should be implemented. **Key Words:** CARDIAC REHABILITATION, SECONDARY PREVENTION, OUTCOMES

Introduction

An estimated 1 in 3 American adults have 1 or more types of cardiovascular disease (CVD) ¹. Mortality data show that CVD is responsible for more than 1 out of every 3 deaths in the United States ². Data from NHANES 2005 to 2008, estimates 16.3 million people in the United States have coronary heart disease (CHD), greater than 935,000 people suffered myocardial infarction (MI), and 571,402 people died of CHD ². The high prevalence of CHD and its important contribution to disability underscore the importance of efforts to improve clinical outcomes and prevent recurrent CHD events ^{2,3}. There are substantial risks for secondary ischemic coronary events following an initial event, but secondary prevention efforts, including cardiac rehabilitation (CR), have beneficial effects on both early and late mortality and morbidity ¹.

Secondary prevention focuses on risk reduction in patients with established CHD who are at high risk for recurrent cardiac events and death from cardiac causes ⁴. Exercise is only one component of such a program; nutritional counseling, behavioral interventions, and drug therapy have equally important roles ⁴. Post coronary event patients who participate in exercise rehabilitation benefit from lower mortality rates and improved physical and psychological function ^{1,3,5}.

Despite the well-established benefits of exercise and nutritional counseling, physicians are generally not well trained, and do not have the time to provide effective behavioral modification assistance (i.e. nutritional advice, guidance about weight management, smoking cessation, coping management, and a prescription for exercise) ⁴. The provision of all these services at CR centers, with the use of well-established

algorithms to set goals for risk reduction and in coordination with the primary care physician, is efficient and effective. Patients with CHD who have experienced an MI or have undergone coronary artery bypass graft (CABG) surgery are prime candidates for CR services³. Recently candidacy has been broadened to include patients who have undergone percutaneous coronary interventions (PCI); are heart transplantation candidates or recipients; stable angina; or valve replacement/repair. Those with stable chronic heart failure, peripheral arterial disease with claudication, or other forms of CVD would benefit from CR but are not currently reimbursable diagnoses³.

Various determinants of CR participation have been previously identified and include: 1. patient-related factors, such as social support, family responsibilities, personal preferences, financial pressures, return to work, availability, ease of transportation, and severity of disease; 2. physician-related factors, such as the strength of the physician's recommendation to patients for CR enrollment and the physician's perceptions regarding the benefits of CR for the patient; and 3. program-related factors, such as program costs, the desirability of class schedules and facilities, and program location/availability⁷.

In a review by Jackson et al.⁸ it was found that the participation rate of women was only about half that of men. The main predictor of referral to a CR program was the physician's endorsement of the effectiveness of CR⁸. Patients were more likely to participate in CR when they were actively referred, educated, married, possessed high self efficacy, and when the programs were easily accessible⁸. Patients with a primary diagnosis of either MI, PCI, angina, or CABG have traditionally been referred more often to CR programs⁸. Jackson et al. found that the strongest predictors of non-participation

were traveling distance to CR programs and lack of insurance coverage⁸. Current evidence states that men are more likely to be referred to and complete CR than their female counterparts⁹. It has been found that those with a diagnosis of PCI or angina are twice as likely to dropout than those recovering from a MI or CABG¹⁰. Recent studies have found lower CR use rates in women, nonwhites, and older patients^{3,11}. Suaya et al., also found that CR use rates were > 4-fold higher in north central states (Nebraska, Iowa, North and South Dakota, Minnesota, and Wisconsin) than in southern states³.

Despite the known benefits of CR and the widespread endorsement of its use, CR is vastly underutilized, with < 30% of eligible patients participating in a CR program¹³. Early outpatient CR is a program that delivers preventative and rehabilitative services to patients in the outpatient setting early after a CVD event, generally within the first 3-6 months after the event but continuing for as much as 1 year after the event¹³.

In addition, there is a lack of “visibility” and recognition by the public of the importance of CR services. Specific measures focused on clinical outcomes were not included in the latest cardiac core components. To date, little is known about characteristics of patients who attend these programs and what CR Programs offer to patients.

CR is effective in prolonging survival and reducing disability in patients with CHD¹. However, national use patterns and predictors of CR use have not been evaluated thoroughly. The ability to deliver quality of cardiovascular care critically depends on the translation of recommendations for high-quality care into the outcomes of that care¹⁴. As payers and regulatory agencies increasingly seek to quantify healthcare quality, the

implications of the measurement process on practicing physicians are likely to grow¹⁴. This information would be invaluable to those looking to join a CR program, or clinicians looking to refer their patients to CR. This would also be beneficial for health professionals, health care institutions, third party payers, and regulatory agencies that support CR programs. Therefore, the purposes of the present study were to: 1.) define patient demographics of those attending Early Outpatient Cardiac Rehabilitation (EOCR) programs; 2.) determine completion rates, staff characteristics, program characteristics, and the geographical location of EOCR programs in the United States.

Methods

Procedures

Descriptive research was undertaken in order to assess the current status of CR programs in the United States. The CR survey was pilot-tested in Indiana before being sent to AACVPR for national distribution. AACVPR was targeted to distribute the survey to ensure nation-wide circulation. AACVPR was targeted due to their membership of approximately 3000 health care professionals nation-wide, with the vast majority being cardiovascular and pulmonary rehabilitation program directors and supervisors.

Currently, AACVPR has a list of 1,138 EOCR programs in their online directory. Board members of AACVPR agreed to distribute a descriptive email of the study with the survey link imbedded nationwide to their entire directory of cardiac programs, certified and uncertified.

Initial Instate Survey

The CR survey was distributed in Indiana via the past president of Indiana State Cardiovascular Pulmonary Rehabilitation association. The email was sent to program directors or administrators of CR in the state of Indiana. The programs chosen for the preliminary investigation were included in the subsequent research. No changes in questionnaire content and format were made based on the responses received. As a result of the investigation, the investigator became more familiar with the process of distribution and collection of questionnaires and how to tabulate the data.

Data Collection

An email was sent to AACVPR program administrators/directors explaining the design and purpose of the study, and instructions for filling out the survey were given. The link to the survey was provided within the email sent by AACVPR. A 4-week deadline was assigned for directors/administrators to submit completed surveys.

Subjects

Individuals were included if they met the following criteria: that he/she is a program director or administrator of CR facility in the United States. A template of the descriptive email message with the link to the survey was sent to AACVPR for approval. Once approved, the message including the survey link was sent to members of AACVPR. In order to access the survey the program directors and/or administrators need to click the link in the email sent via AACVPR.

Survey

The survey was used to analyze EOCR and outpatient maintenance CR programs. After the development of the survey, the IU-Health Ball Memorial Hospital program director and staff reviewed and made modification to the survey items. After the first phase of the study was completed in Indiana, the survey was sent to the remaining CR programs registered with AACVPR.

Qualified subjects were asked the state where their program resides as a way to identify trends in EOCR programs throughout the country. The survey consisted of two pages and had varying question formations (i.e. yes/no, multiple choice, multiple answer, and fill in the blank).

Instructions for program directors were given on the questionnaire and criteria were established for educating on a specific content area. The instructions were given to decrease the chance of misinterpretation among the directors.

The CR survey contained 13 questions, some with multiple answers, regarding the utilization and patient demographics of an EOCR program. Program directors were asked to quantify the total number of cases for each approved diagnosis. Directors were then asked to further breakdown each diagnosis into percentages of the number of completed exercise sessions. Program directors were asked to quantify total patient population of those who completed at least one EOCR exercise session. Patient population was further broken down into percent male and female. For all diagnoses, program directors were asked to provide a percentage of patients who were discharged prior to completion of the

eligible number of sessions. The total percentage of patients discharged early was further broken down into possible reasons for early discharge. Possible explanations for early discharge included; financial, transportation, work, non-compliance, and no longer medically necessary.

A number of descriptive questions were also asked about their EOCR program. The survey asked program administrators and/or directors about total pieces of equipment for CR use, and the community they serve. AACVPR certification status was also addressed in the form of a yes or no question along with; Orion use, availability of resistance training equipment, education classes, and whether or not they offer a pulmonary rehabilitation program. Included in the survey was a breakdown of staffing for their CR program, as well as, their patient to staff ratio.

The CR survey also asked whether or not participating program directors have a maintenance program (Phase III/IV), along with the associated cost of that program. If a maintenance program is offered, the survey asked program directors to further breakdown the population into those who enter the maintenance program upon direct admission, or after completion of an EOCR program.

Statistical Analyses

Descriptive statistics were calculated (i.e. mean and range) and percentages of the various program characteristics and components.

Results

Responses were received from 138 programs in 44 states. AACVPR sent the email blast to their members in the United States. There were no responses from Alaska, Arkansas, Hawaii, Nevada, Utah, and Wyoming. Of the responding states, 11% of the questionnaires were returned from the Western states (n=15); 54% from Midwestern states (n=75); and 35% from Eastern states (n=45). In order to classify regions of the country, the researcher decided to use the same ones that were publicized in the 1996 National Pulmonary Rehabilitation Survey⁵⁵. Table 1 shows the geographic distribution of the responding programs. Table 2 shows the response rate for each individual question on the survey.

Program Size

From the 138 responses received, 19,689 patients completed at least one EOCR exercise session in 2009. The number of patients completing at least one EOCR exercise session ranged from 13 to 2006 patients/year. The average number of patients completing at least one EOCR session was 155 patients/program/year.

Patient Characteristics

Results of the present study show that 68% of patients were men and 32% of patients were women. Approximately 83% of patients enrolled in EOCR programs had a primary diagnosis of CABG or PCI/Stent. The remaining patients enrolled in EOCR programs had a primary diagnosis of MI, AVR/MVR, angina, heart/lung transplant, or other. Figure 1 shows the breakdown of the primary diagnoses listed above.

Program Length

For the diagnoses of CABG, MVR/AVR, PTCA, MI, and stable angina; the majority of patients completed 19-36 sessions; followed by 13-18 sessions, 7-12 sessions, and 0-6 sessions (Figures 2-6). For the primary diagnosis of transplant, the majority completed 19-36 sessions, followed by 13-18 sessions, 0-6 sessions, and 7-12 sessions (Figure 7). For patients listed under a primary diagnosis of other, the majority completed 19-36 sessions, followed by 13-18 sessions, 7-12 sessions, and 0-6 sessions (Figure 8).

Reasons for Early Discharge

Based on data provided by program directors/administrators, the average early discharge rate was 35%. The primary reason program directors listed for early discharge was because of financial conflicts. Following financial conflicts was returning to work, non-compliance, EOCR is no longer medically necessary, and transportation issues. The remaining patients fell into the category of other. Figure 9 shows the breakdown of the reasons for early discharge.

Program Content

In 84% of the surveyed programs there was an outpatient maintenance program offered to patients. Of the 115 programs with an outpatient maintenance program, an average of 27% of them has patients who enter the outpatient maintenance program from their EOCR program. An average of 10% of their patient population bypassed the EOCR program and entered into the outpatient maintenance program directly. The present study showed that 46% charge \$30-45/month; 45% charge more than \$45/month; and 9% charge less than \$30/month.

The average amount of equipment was 18 pieces. The range was 2 to 56 pieces of equipment. Eighty-nine percent of programs offer resistance equipment to their patients. Ninety-six percent offer education classes in their EOCR programs. Seventy percent of responding EOCR programs offers their education classes separate from exercise, the remaining 30% of EOCR programs offer education and exercise simultaneously. A total of 72% of responding programs stated that their EOCR program is AACVPR certified. Sixty-two percent of EOCR programs also offer pulmonary rehabilitation in their facility. Twenty-three percent of programs reported that they currently use the outcome measurement tool, Orion.

Program Setting

Sixty-two percent of programs reported that their EOCR program was located in a community they described as rural. The remaining 38% of programs reported their EOCR program was located in an urban community setting.

Program Staffing

The average patient-to-staff ratio was 4.2-1. The staff to patient ratio in the reporting EOCR programs ranged from 1-1 to 16-1.

The health professionals involved as members of the EOCR teams are shown in Table 3. The staffing breakdown is as follows, nurses were part of the rehabilitation team the majority of responding programs, followed by exercise physiologists, respiratory therapists, physical therapists, occupational therapists, interns, and other staff.

Discussion

The primary goals of the present study were to: 1.) define patient demographics of those attending EOCR programs; 2.) determine completion rates, staff characteristics, program characteristics, and the geographical location of EOCR programs in the United States.

Results of the present study showed that CR programs continue to enroll more men than women, despite recent efforts to refer women to CR. This is comparable to other studies done by Halm et al.⁵⁰ and Heid et al.⁵¹. In a study by Halm et al.⁵⁰, the sample consisted of 87 patients (46 women and 41 men) who were admitted with a medical diagnosis of stable angina, MI, CABG, or valve replacement surgery.⁵⁰ Halm et al.⁵⁰ reported that men were more likely to receive a referral to CR than women, 67% vs 48% respectively. Heid et al.⁵¹ found that there was no statistical difference in CR referral between men and women, 44% and 41% respectively. Despite there being no statistical difference between genders, of the patients referred, 37% of women enrolled compared with 69% of men.⁵¹ According to Thomas et al.⁹, of all the patients who enrolled in CR programs during 1990 only 27.3% were estimated to be women. Average enrollment for men per program was 64.2% for the year 1990⁹. Results of this study are consistent with other studies that have demonstrated gender-related disparities in the management of CVD.^{3,9,48} According to Thomas et al.⁹, women were, on average, 3 years older than the men (63.7 years versus 60.6 years). Unfortunately, in the present study age was not addressed in the survey. This may be an area of further research in the future.

Based on data from a previous survey on gender differences in CR programs done in 1996, the percentage of patients enrolled in CR programs has increased. Thomas et al., reported that only 10.8% of MI survivors in the U.S. in 1990 were enrolled in CR programs.⁹ An estimated 10.3% of PCI/Stent patients participated in CR programs.⁹ Thomas et al. reported that estimates for enrollment in CR programs were higher among persons recovering from CABG than among persons recovering from MI or PTCA. However, only 23.4% of the 391,111 post-CABG patients in the U.S. in 1990 enrolled in a CR program.⁹ Patients with a diagnosis of CABG, MI, or PCI/stent comprise the majority of participants in CR programs, although other CVD continue to be accepted. These results done 20 years prior still are representative of the percentages found in the present survey. A recent analysis of national Medicare claims data indicates that CR use is as suboptimal as 19% of Medicare patients who enrolled in CR following a MI or CABG surgery³. A recent CDC/BRFSS phone survey that included 21 states found a CR utilization rate of 34.6%⁵⁶. As evidenced by data from the US, Canada, and the UK demonstrating that 70%-80% of eligible patients being treated for cardiac disease do not receive CR after hospital discharge^{3,47}. So, what is an appropriate goal for CR participation? According to recent research, program directors/administrators should aim for a CR participation rate of 60%⁵⁷. The remaining 40% account for ineligible and behaviorally indisposed individuals. There are promising increases in the percentages found in the current survey. However, it is important to note that while it seems patient numbers have increased, there is still a long way to go before optimal patient enrollment is reached.

There does not appear to be any documented evidence behind the number of CR sessions for patients to complete based on individual diagnosis. CMS provides 80% coverage for CR services for up to 36 sessions. The additional 20% must be covered out of pocket by an individual, or by a secondary insurance. For individuals without CMS, the cost of CR can deter an individual from attending EOCR. Therefore, attendance/amount of sessions to complete may be driven by third party payers. There is additional evidence that the assigned sessions may be based on the individual hospital that is prescribing the exercise protocol. For example, at Indiana University Health Ball Memorial Hospital, the prescribed number of sessions for an individual to complete is based on the patient's AACVPR risk and diagnosis. Participants who meet the low risk stratification criteria will be monitored 6-12 sessions, unless an alternative program is requested by the referring physician or Medical Director. Intermediate risk participants will be monitored for 12-18 sessions at which point it becomes the discretion of the Medical Director and/or referring physician after consultation and review of the individualized treatment plan with the CR team. Continuous monitoring for 18-36 sessions is promoted for the high risk patient in CR. It should be noted that it is not known how other CR programs choose the number of exercise sessions to be completed. The session guidelines above come from the EOCR telemetry monitoring policy at Indiana University Health Ball Memorial Hospital.

The long-term success of any secondary prevention program is directly related to patient compliance. Based on program director's responses, the average early discharge rate was calculated to be 35%. The problem of CR underutilization is multi-factorial in

scope, and barriers have been identified at the patient, provider, program, and health-system levels. According to a paper by Taylor et al., there are a variety of medical, psychological, and sociodemographic reasons that patients do not complete CR. The results of the study by Taylor et al. indicated that around 40% of patients who initially attend CR do not complete the program⁷. This early discharge rate is comparable to the one found in the present study. According to a study done by Sanderson et al. estimates of patient adherence to the completion of CR range from 40%-60%.^{36, 38, 44} Andrew et al. found that three main categories were associated with a high dropout rate: convenience aspects of CR, perceptions of exercise, and family/lifestyle factors.⁵⁸ The total dropout rate in the study done by Andrew et al. was 44.6%. The key to improving completion rates lies in the understanding of the patient enrolled in CR. By knowing what barriers patients are facing, program directors can make changes and improvements to their programs to increase enrollment and completion.

The majority of program director's reported that their CR program was located in a community they described as rural. Geographic disparities as indicated by rurality and greater travel time and distance are a significant barrier to CR referral and enrollment in US settings. However, this does not give a clear description of whether CR is readily available to state inhabitants. There is potential for geographic diversity of program availability within a state. Suaya et al. found that the rate of CR use by state was strongly positively correlated with the number of CR facilities per 10,000 people³. Curnier et al. proposed that state population is the best univariate predictor of CR program number by state⁴⁶. Even though the majority of responding programs noted that their CR programs

were in a rural community; this does not mean that transportation and availability are non-issues of these programs. The majority of programs still reported that the primary reason for early discharge/dropout is financial conflict (28%). Following financial conflicts is returning to work, non-compliance, no longer medically necessary, transportation issues, and other reasons not listed on the survey.

In healthcare, the terms multidisciplinary, interdisciplinary, and interprofessional commonly signify practice where team members collaborate to improve patient outcomes through a combined treatment care plan. According to the present survey, nurses are a large part of the rehabilitation team; followed by exercise physiologists; respiratory therapists; interns; physical therapists; occupational therapists; and other staff. Each team member plays a specialized role in ensuring tailored rehabilitation for clients and as such is required to hold an advanced education degree and be knowledgeable in cardiac care, rehabilitation principles, exercise physiology, and cardiovascular physiology and pathophysiology. The number of staff members and professional specialist vary from one facility to another. This is typically associated with different policies and potential licensing issues in different states. It is important for the program to select the personnel with professional specialties that fit the model and policies of the CR program. Historically, CR personnel were physicians, nurses, and physical therapists⁵⁹. In a study by Lewin et al., participants reported that 5 or more healthcare professions were represented on the rehabilitation team⁶⁰. Nurses were represented in 89% of teams, dieticians in 84%, and exercise physiologists in 85%. Less than half of the participants reported that their team included an occupational therapist 40%, a physician 39%, or a

psychologist 21%.⁶⁰ When interpreting these results it should be noted that these statistics came from a study done in the U.K. A thorough description of current practice in cardiac care would greatly assist in efforts to create and adopt innovative and interprofessional models of care that are tailored to the needs of cardiac patients⁶¹. Since Matheson et al. called for interdisciplinary practice, there has been little examination or reporting of professional interaction and practices and care in cardiac rehabilitation.

Based on data from the present survey, the average patient-to-staff ratio is 4.2-1. According to AACVPR guidelines, early outpatient CR programs should have a maximum patient-to-staff ratio of 5-1¹⁷. Since the patient-to-staff ratio is similar to that of AACVPR a conclusion can be made the majority of programs that responded have employed the 5-1 policy that AACVPR recommends. Even lower patient-to-staff ratios may be necessary if a greater proportion of the patients are intermediate or high risk. It should also be noted that higher patient-to-staff ratios are acceptable in outpatient maintenance programs. AACVPR recommends a patient-to-staff ratio of 15-1.

The majority of survey respondents (84%) report having an outpatient maintenance program. A survey done by Thomas et al.⁹ reports that 71.6% of programs offered both inpatient and long-term outpatient CR. In the present study, of the programs that reported having with an outpatient maintenance program, an average of 27% of patients entered the outpatient maintenance program from an EOCR instead of directly entering outpatient maintenance without going through EOCR. To the author's knowledge there is very limited information on outpatient maintenance programs in the US.

The cost of outpatient maintenance programs ranged from less than \$30/month to greater than \$45/month with most programs charging between \$30-\$45/month or greater than \$45/month. To the author's knowledge there is not published evidence on the cost of outpatient maintenance programs. This is individually decided upon by the CR program. However, it should be noted that outpatient maintenance programs are not covered by CMS. Some secondary insurance companies may offer discounts for joining a fitness center. This is variable and dependent on the insurance company.

The majority, 89% of programs, reported that they had separate resistance training (RT) equipment. To the author's knowledge, other than the present study, it is not known how many CR programs offer RT to their patients. The absence of angina symptoms, ischemic ST-segment depression, abnormal hemodynamics, complex ventricular dysrhythmias, and cardiovascular complications suggests that strength testing and training are safe for clinically stable men and women with CVD who are actively participating in a supervised rehabilitation program³⁴. Further research needs to be done to determine whether the responding programs offer resistance training classes to EOCR or just outpatient maintenance patients. Also, the survey only asked whether or not they had equipment. No data was gathered on what the classified as RT equipment. Some programs may have weight machines and others may only offer resistance bands.

Behavior changes are clearly needed in pre- and post-infarction patients to reduce the incidence of cardiovascular disease and recurring heart problems. Education programs are an essential part of the secondary prevention protocol. These programs aid in increasing the knowledge base of both patients and their family about CAD. Currently,

aside from the present study, it is not known how many educational programs exist in combination with CR programs.

Patients with chronic obstructive pulmonary disease (COPD) make up the majority of patients who are referred to pulmonary rehabilitation programs. However, studies also show that pulmonary rehabilitation may be beneficial in any patient with respiratory symptoms that result in diminished functional capacity or decreased quality of life. This would include patients with not only obstructive lung diseases but also patients with restrictive lung disease such as interstitial lung disease and patients with neuromuscular diseases. Currently, the AACVPR website has a listing of 503 pulmonary rehabilitation programs. There have been no previous studies done on how many of these programs also offer CR. The current study found that 62 % of CR programs also offer pulmonary rehabilitation in their facility. However, it is not known whether or not they offer pulmonary rehabilitation at the same time as CR or if they offer separate class times. Having both programs can be beneficial since many patients suffer from co-morbidities. Suaya et al., reported that 21% of patients in EOCR programs also suffer from chronic pulmonary disease ³.

According to AACVPR's certification website, there are currently 1,399 cardiovascular and pulmonary programs that are certified. According to Curnier et al. a total of 2,621 CR programs were identified in a paper discussing the geographic distribution of CR programs in the US ⁴⁶. To the author's knowledge there was no further breakdown between cardiac and pulmonary programs. However, the current study revealed that 71% of responding programs were AACVPR certified.

Although outcomes measurement for accountability often is mandated by external organizations, such as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the Centers for Medicare/Medicaid Services (CMS), the primary function of such measurement is to serve as an internal force for evaluating, understanding, and improving the quality and best practice guidelines of patient care. Outcomes are also required for programs to become AACVPR certified. Outcomes are the tools to prove or validate program quality and performance and the benefits patients receive from program participation.²⁵ The majority, 77% of programs that responded, report that they do not use the outcome measurement tool, Orion. Currently, on Orion's website, they state that they are the leading software solution for outcome data collection and analysis. Programs such as Orion were developed to allow cardiac and pulmonary rehabilitation programs to create a benchmark of services provided. The Cardiac and Pulmonary edition has the endorsement of 14 state associations and usage in over 1,000 programs in 46 states. Many programs in the US still hand tally their outcomes. AACVPR requires outcomes to maintain program certification, but does not currently offer an outcome program.

CR has been proven effective at prolonging survival and reducing disability in patients with coronary heart disease.¹ The present study was able to descriptively report on the utilization and patient demographics for EOCR programs in the United States. The present study provides valuable information on national use patterns and predictors of CR use. As payers and regulatory agencies increasingly seek to quantify healthcare quality, the implications of the measurement process on practicing physicians are likely to grow.

Information from this study is beneficial for health professionals, health care institutions, third party payers, and regulatory agencies that support CR programs.

West		Midwest		East	
<i>n</i>	Total Response (%)	<i>n</i>	Total Response (%)	<i>n</i>	Total Response (%)
15	10.9	75	54.3	48	34.8
Arizona	3	Illinois	8	Alabama	1
California	2	Indiana	10	Connecticut	1
Colorado	2	Iowa	9	Delaware	1
Idaho	2	Kansas	3	Florida	1
Montana	1	Kentucky	1	Georgia	2
New Mexico	1	Louisiana	1	Maine	4
Oregon	3	Michigan	4	Maryland	1
Washington	1	Minnesota	7	Massachusetts	3
		Missouri	4	New Hampshire	2
		Mississippi	2	New Jersey	3
		Nebraska	3	New York	3
		North Dakota	2	North Carolina	3
		Oklahoma	2	Ohio	6
		South Dakota	3	Pennsylvania	5
		Tennessee	3	Rhode Island	1
		Texas	4	South Carolina	1
		Wisconsin	9	Vermont	2
				Virginia	4
				West Virginia	4

Table 4-1. Geographical Distribution of the Cardiac Rehabilitation Programs Among 44 States From Which Programs Responded.

	Question on Survey	Number of Responses (n)	Percent (%)
1.	Program location	138	100
2.	Number of patients	127	92
3.	Percent male	120	87
4.	Percent female	120	87
5.	Total CABG	106	77
	# Sessions	49	35.5
6.	Total MVR/AVR	106	77
	# Sessions	49	35.5
7.	Total MI	106	77
	# Sessions	49	35.5
8.	Total PTCA/Stent	106	77
	# Sessions	49	35.5
9.	Total Angina	106	77
	# Sessions	49	35.5
10.	Total Transplant	106	77
	# Sessions	49	35.5
11.	Total Other	106	77
	# Sessions	49	35.5
12.	Supervised outpatient maintenance	137	99
	Direct entry to outpatient maintenance	90	65
	Completed EOCR	95	69
13.	Cost of outpatient maintenance program	113	82
14.	Early discharge	75	54
15.	Patient to staff ratio	130	94
16.	Personnel Employed	137	99
17.	Pieces of equipment	135	98
18.	Offer education	137	99
	Separate from exercise	130	94
19.	Offer resistance equipment	137	99
20.	AACVPR certified	137	99
21.	Offer pulmonary rehabilitation	137	99
22.	Utilize Orion	134	97
23.	Community setting	137	99

Table 2. Response Rate of Each Individual Question.

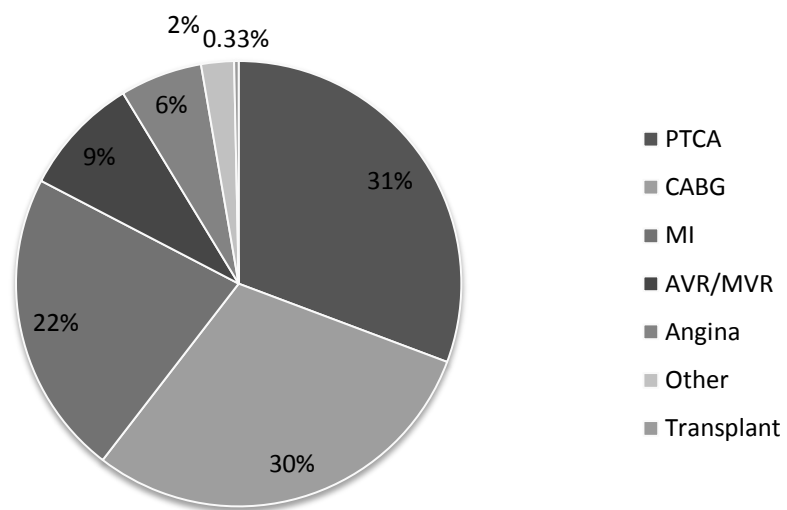


Figure 1. Distribution of Diagnoses in Patients Enrolled in Early Outpatient Cardiac Rehabilitation Programs.

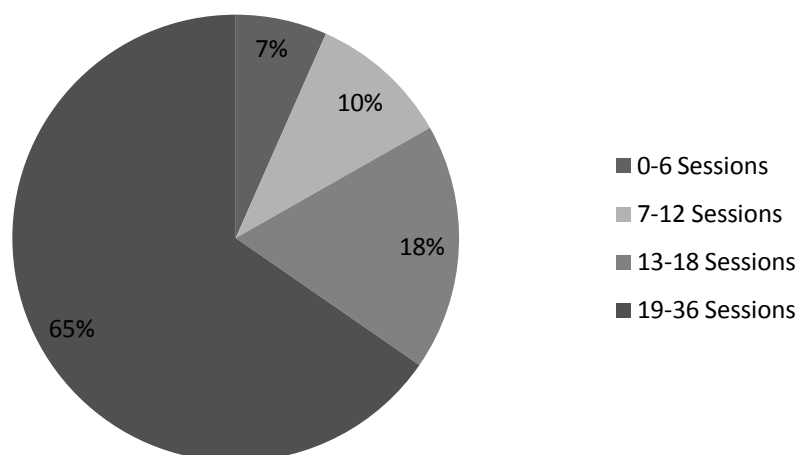


Figure 2. Average Program Length for Patients with a Primary Diagnosis of CABG.

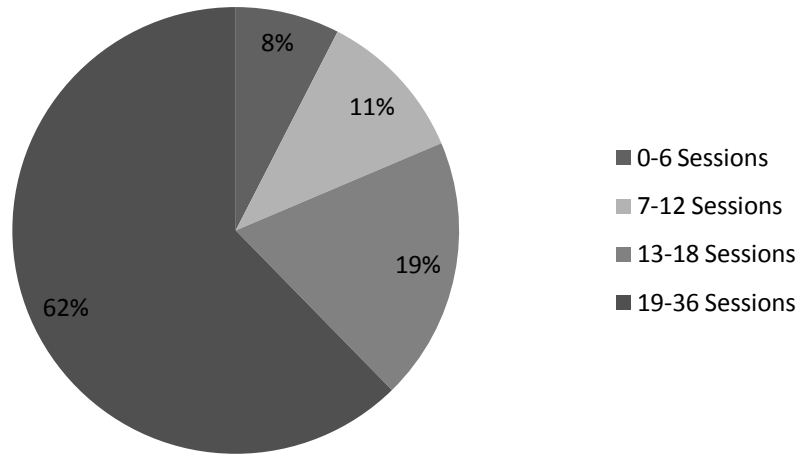


Figure 3. Average Program Length for Patients with a Primary Diagnosis of MVR/AVR.

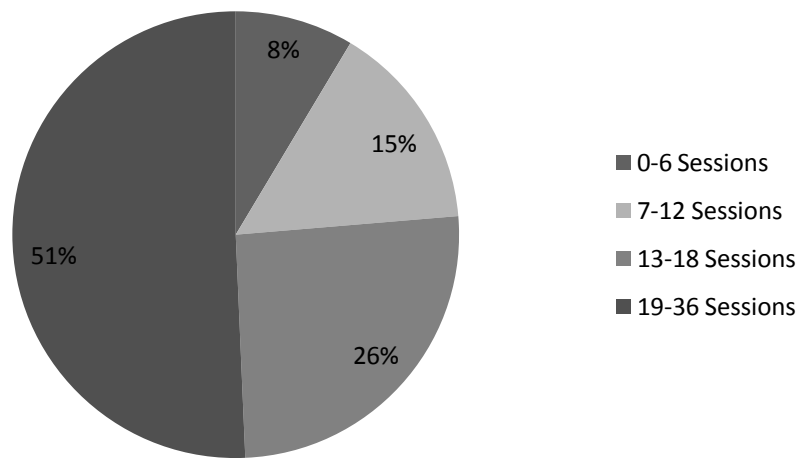


Figure 4. Average Program Length for Patients with a Primary Diagnosis of MI.

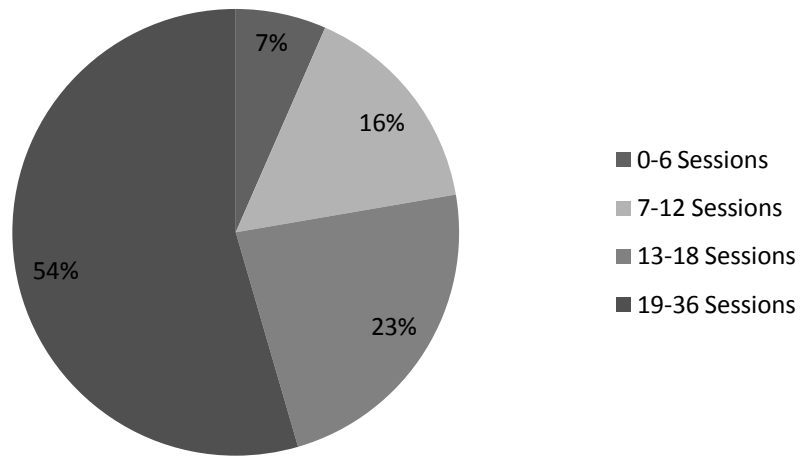


Figure 5. Average Program Length for Patients with a Primary Diagnosis of PCI/Stent.

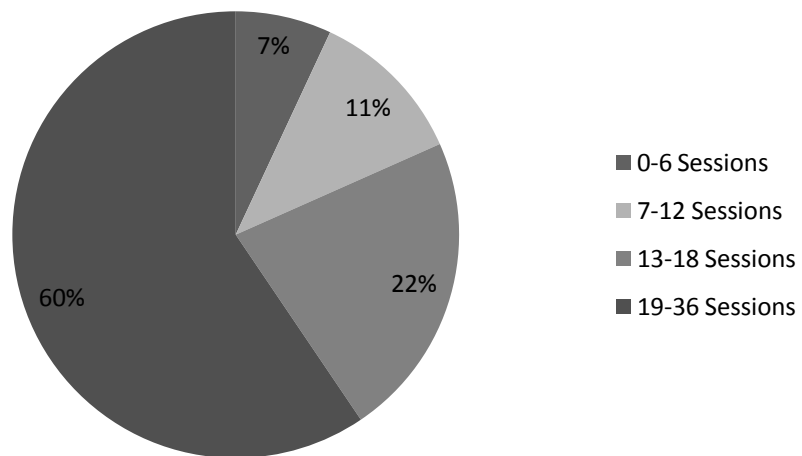


Figure 6. Average Program Length for Patients with a Primary Diagnosis of Angina.

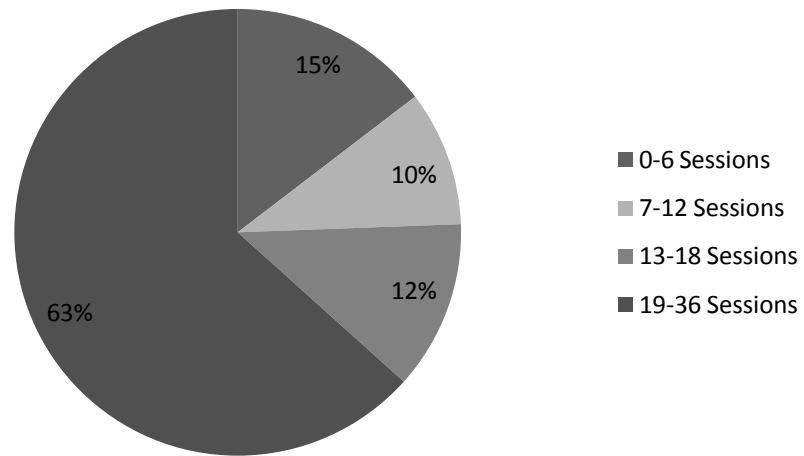


Figure 7. Average Program Length for Patients with a Primary Diagnosis of Transplant.

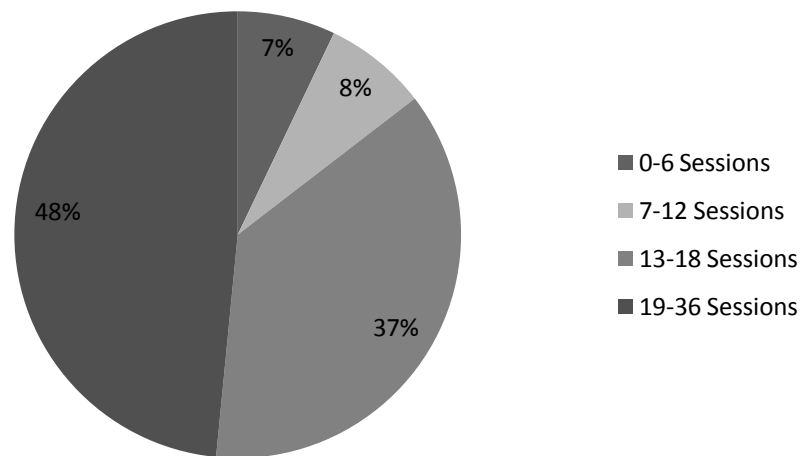


Figure 8. Average Program Length for Patients having a Primary Diagnosis Other than those Listed in the CMC Guidelines.

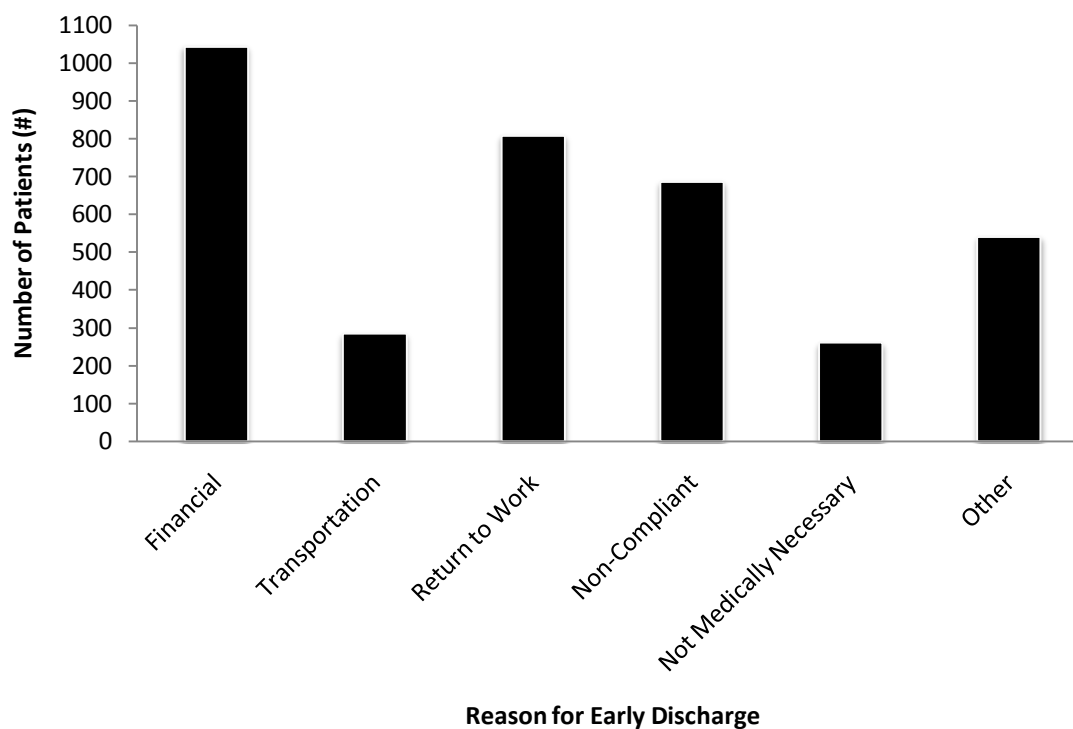


Figure 9. Reasons for 3,364 Patients who were Discharged Prior to Completion of the Early Outpatient Cardiac Rehabilitation Program

Health Professional	n	%
Nurse	119	38
Exercise Physiologist	89	28
Respiratory Therapist	31	10
Physical Therapist	7	2
Occupational Therapist	4	1
Interns	27	9
Other	36	12

Table 3. Health Professionals Represented in the Cardiac Rehabilitation Teams of 137 Responding Programs.

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CHAPTER V

SUMMARY AND CONCLUSIONS

The present study was able to determine the majority of patients enrolled in CR programs in the US have a primary diagnoses of either PCI (31%) or CABG (30%) or MI (22%). Other primary diagnoses were AVR/MVR (9%); angina (6%); transplant (.33%); and those listed as other (2%). A significant finding of the present study was the amount of CR sessions that patients (with a primary diagnosis other than transplant) complete was: 0-6 sessions (8%); 7-12 sessions (12%); 13-18 sessions (22%); and 19-36 sessions (58%). Of the transplant patients entering EOCR programs, 10% complete 7-12 sessions; 12% complete 13-18 sessions; 15% 0-6 sessions; and 63% complete 19-36 sessions. Reasons for this may be attributed to the patient's condition upon entering EOCR. Transplant patients are prescribed medications to decrease their immune system, therefore, many of these patients may be readmitted to the hospital prior to completion of EOCR.

The present study was able to show for the first time, to the author's knowledge, the number of sessions that each diagnosis completes. Regardless of the diagnosis, program directors around the US appear to follow a similar pattern of prescription. Based on evidence from the present study, the majority of patients in CR programs complete 19-36 sessions of CR. Further research needs to determine the protocol that program directors follow when prescribing the number of CR sessions. Currently, it seems that

AACVPR risk stratification may be a consistent source for determining CR program length.

Lastly, the study was able to show characteristics about EOCR programs in the US. The average early discharge rate for responding programs was 35% of those enrolled. The majority of programs that responded stated that they had an outpatient maintenance program, offered education, pulmonary rehabilitation, and were AACVPR certified. There could have been some bias in the sample due to the fact that AACVPR was the entity who distributed the email message with the link attached to the survey. These results are important since most CR programs do not currently use the outcome measurement tool, Orion. This also may explain the low response rate for the survey. Programs that utilize Orion have all the information that was asked in the present survey readily available. Therefore, it may have been more time consuming for programs to respond to the survey in the requested timeframe. Instead of having independent surveys completed on a variable basis it would be more beneficial for a national organization, such as AACVPR, to complete scheduled surveys of CR programs in the US.

This study is of primary importance since many of the variables discussed have not been previously published. The study was limited by a low response rate. Assumptions had to be made in regards to the number of completed sessions. There was a substantial amount of missing information. These programs with missing data were omitted from some analysis by the researcher. For this reason, it should be considered in follow up surveys that the researcher has contact with the survey responders, although this would not allow for anonymity. Assumptions were made or data was removed if the

programs inadequately responded to the question. This was of primary importance in the question about the number of completed sessions by diagnosis.

The report of this survey may aid efforts to standardize CR programs. Therefore, a patient with CAD would receive the same level of care in any EOCR program in the USA. In order to involve more patients in CR programs, providers of such services must find ways to reduce the patient-, physician-, and program-related barriers that limit participation. It is crucial that all associations representing health care providers for cardiac disorders work together to try to achieve standardization for referral to and completion of CR programs, so patients are able to benefit from this valuable resource.

Recommendations for further study

There are opportunities for further research in the area of assessing CR programs in the US. Particularly, how many times a week patients attend and the duration of each CR session. It was found through the present study that the majority of programs offer RT equipment in their CR programs; however, it is not known whether these CR programs offer RT to the EOCR or just to the outpatient maintenance individuals. Along with this, it is not known what the program directors/administrators classify as RT equipment. RT equipment could fall into the category of resistance bands and free weights or actual RT machines.

A second recommendation would be to collect information from CR programs and have contact with those programs. This gives future researchers the ability to follow

up with CR directors/administrator that did not complete a survey to clarify their responses.

A third recommendation would be to add a section to the survey asking how CR program directors/administrators choose the amount of sessions their CR patients attend. It is not currently known whether CR program directors/administrators determine program length based on insurance reimbursement, risk stratification of the patient, or some other mode.

A fourth recommendation would be to determine more characteristics about the patients attending EOCR programs; such as, race, ethnicity, income, and patient's age. In addition, more clarification on barriers to attending EOCR programs would be beneficial for program directors/administrators of CR programs in the US. With this information program directors/administrators could develop alternative programs to decrease barriers. Insurance companies would be able to see the benefits of alternative CR programs and the need for reimbursement of these programs.

In the survey, 9% of responding programs listed that they had staff in their EOCR programs that they categorized as other. A fifth recommendation would be to include other designations in future research for staff, such as, registered dietician, diabetes educators, counselors/social work, and/or having a space where they could fill in any additional staff. Along with this recommendation, it would be beneficial to clarify that the designation of staff doesn't exclude other personnel that are utilized by EOCR programs.

There are risks involved with developing a survey that is more detailed, the more detailed a survey becomes the longer it will take program directors/administrators to complete. Since program directors/administrators are busy and if they don't have instant access to the required information they may chose not to respond at all. Also, if you have contact information for responding programs it is no longer anonymous, which may decrease the response rate. A longer completion period and/or multiple reminders may increase completion of any future surveys.

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Appendix A

CARDIAC REHABILITATION SURVEY

To be completed by program administrators or associate administrators of Cardiac Rehabilitation Programs.
One survey per program.

Ball State University is conducting a research study to determine the utilization and patient demographics for Early Outpatient Cardiac Rehabilitation (Phase II) programs in the United States for the year 2009. Please review the survey prior to filling it out. Thank You.

State where your program is located: _____

1. _____ Total Patients completing at least one Early Outpatient Cardiac Rehabilitation exercise session* in 2009.
_____ % male
_____ % female
2. To the best of your ability, please indicate the number of cases for each diagnosis in the left column. Please only count the primary diagnosis if a patient has multiple diagnoses. Then, Indicate the percentage of completed exercise sessions* for each diagnosis.

	Completed Exercise Sessions*				
	<u>0-6</u>	<u>7-12</u>	<u>13-18</u>	<u>19-36</u>	
Total # cases					
_____ CABG	_____ %	_____ %	_____ %	_____ %	= 100
_____ AVR/MVR	_____ %	_____ %	_____ %	_____ %	= 100%
_____ MI	_____ %	_____ %	_____ %	_____ %	= 100%
_____ PTCA/STENT	_____ %	_____ %	_____ %	_____ %	= 100%
_____ STABLE ANGINA	_____ %	_____ %	_____ %	_____ %	= 100%
_____ TRANSPLANT	_____ %	_____ %	_____ %	_____ %	= 100%
_____ OTHER	_____ %	_____ %	_____ %	_____ %	= 100%

3. Does your program offer supervised Outpatient Maintenance (Phase III) services?
 _____ **YES** _____ **NO** (*Check one response*) **If NO, skip to #4.**

- a. _____% Early Outpatient Cardiac Rehabilitation patients admitted into Outpatient Maintenance Cardiac Rehabilitation services.
- b. _____% Patients admitted directly into Outpatient Maintenance services, bypassing Early Outpatient services, due to non-covered diagnoses or insufficient insurance coverage.

What is the monthly cost of participation in your maintenance (Phase III) program?
 (*Circle one response*)

< \$30 / month \$30-45/ month > \$45/ month

**Sessions are defined as completion of an exercise session, excluding program orientation.*

4. FOR ALL DIAGNOSES:

- a. _____% Early Outpatient Cardiac Rehabilitation patients discharged prior to completion of eligible or number of sessions.

Please indicate the relative contribution for reasons of early discharge.

_____ % Financial reasons
 _____ % Transportation
 _____ % Return to work
 _____ % Non-compliance
 _____ % No longer medically necessary
 _____ % Other
 100 %

Program Demographics

5. _____ : _____ Staff to patient ratio

Staff you employ for Phase II Cardiac Rehabilitation:

(please check all that apply)

_____ Registered Nurses

_____ Physical Therapists

_____ Exercise Physiologists

_____ Respiratory Therapists

_____ Occupational Therapists

_____ Interns

_____ Other

6. _____ Total pieces of aerobic equipment available for patient use in your CR Program.

(For items 7-14, please circle your answer.)

- | | | |
|--|--------------|--------------|
| 7. Does your program offer education classes? | YES | NO |
| If YES , do you offer these classes separate from the exercise session? | YES | NO |
| 8. Does your program offer resistance training equipment? | YES | NO |
| 9. Is your program certified by AACVPR? | YES | NO |
| 10. Does your program offer pulmonary rehabilitation? | YES | NO |
| 11. Does your program utilize ORION? | YES | NO |
| 12. Which setting best characterizes the community served? | Rural | Urban |

Appendix B

Email Message

Subject Line: Participants needed for research on Cardiac Rehab

Study Title: The utilization and patient demographics of patients attending an Early Outpatient Cardiac Rehabilitation Programs.

* Requirements: you need to be a Program Director or Administrator of Cardiac Rehabilitation facility in the United States.

Participation will require 15-30 minutes to complete an online survey by accessing the following web link

<http://inquisitor.bsu.edu/inqsit/inqsit.cgi/kaminsky>

* Click on CARDIAC REHABILITATION SURVEY; then click Continue

Keep in mind you have the opportunity to enter and leave the survey at any time before you hit submit.

* In 2007 the American Association of Cardiovascular and Pulmonary Rehabilitation published a statement on performance measures for Cardiac Rehabilitation Programs. To date, little is known about characteristics of patients who attend these programs and what Cardiac Rehabilitation Programs offer to patients. Thus, this survey was developed to obtain this information from programs within the United States.

** Deadline to complete: February 28, 2011**

* All volunteers can receive a summary of the study results by emailing their request to Dr. Kaminsky.

- To remove yourself from being contacted please send your information to Dr. Kaminsky at the information listed below.

For more information contact:

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