Rhode Island College

Digital Commons @ RIC

Master's Theses, Dissertations, Graduate
Research and Major Papers Overview

Master's Theses, Dissertations, Graduate
Research and Major Papers

5-29-2020

Registered Nurses' Knowledge of Cardiac Rehab: A QI Project

Karen Reyes

Follow this and additional works at: <https://digitalcommons.ric.edu/etd>

Part of the [Nursing Commons](#)

Recommended Citation

Reyes, Karen, "Registered Nurses' Knowledge of Cardiac Rehab: A QI Project" (2020). *Master's Theses, Dissertations, Graduate Research and Major Papers Overview*. 364.
<https://digitalcommons.ric.edu/etd/364>

This Major Paper is brought to you for free and open access by the Master's Theses, Dissertations, Graduate Research and Major Papers at Digital Commons @ RIC. It has been accepted for inclusion in Master's Theses, Dissertations, Graduate Research and Major Papers Overview by an authorized administrator of Digital Commons @ RIC. For more information, please contact digitalcommons@ric.edu.

REGISTERED NURSES' KNOWLEDGE OF CARDIAC REHABILITATION: A
QUALITY IMPROVEMENT PROJECT

by

Karen Reyes

A Major Paper Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Science in Nursing

in

The School of Nursing

Rhode Island College

2020

Abstract

Heart disease is the leading cause of death in the United States (CDC, 2019). Cardiac Rehabilitation (CR) is a multifaceted, secondary prevention program for patients with heart disease and those who have undergone coronary revascularization (Wall et al., 2018). CR, a class IA recommendation for secondary prevention in the American College of Cardiology/American Heart Association (ACC/AHA) guidelines, is strongly indicated with high quality evidence from multiple studies. Data from the ACTION-Get With the Guidelines registry (2014) regarding CR demonstrate that referrals for patients with non-ST segment elevation myocardial infarction (75.9%), ST segment elevation myocardial infarction (84.5%), percutaneous intervention (60%), and heart failure (10.4%) were suboptimal (Thomas et al., 2018). Nurses may play a vital role in CR referral, enrollment, and participation. Kadian et al. (2016) conducted a quantitative study with one group pre-test post-test design of 100 staff nurses to evaluate the effectiveness of an educational program to increase nurses' knowledge regarding CR. The study concluded that an educational program is an effective way to improve nurses' knowledge of CR. The purpose of this quality improvement project, conducted on a 30-bed telemetry unit in a tertiary care teaching hospital, was to assess whether a CR educational program increased nurses' knowledge of CR. A pre-test post-test design was used, and the results demonstrated an overall increase in aggregate post-test (83.5%) scores compared to pre-test (62.4%) scores by 21.1%. Item analysis demonstrated educational gaps in CR referrals and content based on guidelines. This project identified the need for further educational programs to increase nurses' knowledge of CR with the long-range goal to improve patient outcomes.

Acknowledgements

I would like to acknowledge Patricia Calvert, my first reader, for guiding me through every step of this paper. With her patience and continued support I was able to successfully complete this project. I would also like to thank Dr. Melinda Hodne, my second reader and Dr. Kara Misto for their time and patience. Because of them, my questions and concerns were answered. Next, I would like to thank Loren Stabile, the Director of the Lifespan Cardiac Rehab Center, for her time, her kindness, and her resources.

Lastly, I would like to thank my family and friends for their continued love and support. I could not have done it without you.

Table of Contents

Background/Statement of the Problem	1
Literature Review.....	4
Theoretical Framework	27
Method	30
Results	35
Summary and Conclusions	40
Recommendations and Implications for Advanced Nursing Practice	47
References	51
Appendices	56

Registered Nurses' Knowledge of Cardiac Rehabilitation: A Quality Improvement Project

Background/Statement of the Problem

Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality worldwide (CDC, 2019). The increase in CVD is associated with the growing prevalence of obesity, diabetes mellitus, metabolic syndrome, hypertension, tobacco use, sedentary lifestyle, and physical inactivity (Sandersara et al., 2015). Patients require effective education and resources to achieve healthier lifestyles and to manage chronic conditions as 90% of deaths and cardiovascular diseases are related to preventable risk factors (Widmer, 2017). In 2010, costs related to CVD and stroke exceeded \$315 billion and are expected to triple over the next 20 years (Sandersara et al., 2015). The increasing cost of CVD indicates the importance of primary and secondary prevention strategies for this population.

Cardiac rehabilitation (CR) is a multifaceted, secondary prevention program designed to optimize physical, psychological, and psychosocial well-being for patients who are eligible (Thomas et. al, 2018). It provides education on lifestyle modification and pharmacotherapies, assists in managing comorbidities, monitors new or recurrent signs and symptoms of cardiac events, and utilizes evidence-based practice treatments (Thomas et. al, 2018). Treatment plans are individualized for each patient and include nutrition counseling, weight, blood pressure, lipid, and diabetes management, tobacco cessation, psychosocial management, physical activity counseling, and exercise training (Sandesara et. al, 2015).

CR is a class IA recommendation included in the American College of Cardiology/American Heart Association (ACC/AHA) guidelines for secondary prevention after a myocardial infarction or coronary revascularization (Ades et al., 2016).

A class IA recommendation is a strong recommendation in which a treatment or procedure should be prescribed to patients (O’Gara et al., 2013). This level of recommendation has been shown to improve outcomes for the majority of patients. According to the ACC/AHA, those who are eligible for CR include the following: current stable angina, percutaneous intervention with angioplasty or stenting, stable chronic heart failure with reduced left ventricular ejection fraction, myocardial infarction in the previous 12 months, heart valve repair or replacement, pacemaker, implantable cardioverter defibrillator, heart or heart-lung transplantation, and coronary artery bypass graft surgery.

CR outcomes are strongly supported in the literature. In a study of more than 600,000 Medicare beneficiaries hospitalized for heart disease, there was a reduction in mortality rates for those who attended CR compared to those who did not. Participants who attended 25 or more CR sessions experienced lower mortality rates at one year and at five years (Servey & Stephens, 2016). In another study by Hammill et al. (2010), a national sample of 30,161 Medicare beneficiaries were included in the study to evaluate the relationship between the number of attended CR sessions and death as well as myocardial infarction at four years. The study revealed a strong relationship between the number of CR sessions attended and long-term outcomes. Attending the maximum of 36 sessions resulted in lower risks of death and myocardial infarction at four years compared with those who attended fewer sessions (Hammill et al., 2010).

Despite the well-established benefits of CR, a phenomenological study by Nadarajah et al. (2016), revealed only 15-30% of eligible patients participate in phase II CR programs after hospitalization while 30-50% dropped-out before the end of phase II.

Patient, provider, and health system barriers are reasons why CR centers remain widely underutilized (Herber, Smith, White, & Jones, 2017).

Increasing nurses' knowledge of CR may directly or indirectly increase CR referral rates, enrollment rates, and participation rates. Nurses play a vital role in the referral process; therefore, they are uniquely positioned to identify patients that may benefit from a CR program. The purpose of this quality improvement project was to assess whether a cardiac rehab educational program increased nurses' knowledge of CR.

Next, a review of literature will be discussed.

Literature Review

A Literature search was conducted using the following databases: CINAHL, PubMed, Ovid, Cochrane, and Google scholar. Keywords that were searched included cardiac rehabilitation, barriers, participation, nurs*, nurse's role, educat*, eligibility, and referrals. In addition, government journal articles and guidelines from the American Heart Association and the American College of Cardiology were obtained for more information. Literature was searched from 2010 to current, and articles were limited to the English language.

Cardiovascular Disease

“Heart Disease” is an umbrella term that refers to various heart conditions. Cardiovascular disease (CVD), coronary artery disease (CAD), heart rhythm disorders referred to as arrhythmias, mechanical complications of the heart, and heart defects are all examples of heart disease (Sanchis-Gomar, Perez-Quilis, Leischik, & Lucia, 2016). Specifically, CVD is a group of diseases that affect the heart and blood vessels and place individuals at risk for a heart attack or stroke. They include coronary heart disease (CHD), coronary artery disease (CAD), and acute coronary syndrome (ACS) (Sanchis-Gomar et al., 2016). CHD is the narrowing or blockage of the blood vessels that supply the heart. It is the most common type of heart disease responsible for 647, 000 deaths annually in the United States (U.S.) (CDC, 2019).

CHD and myocardial infarction are directly related since the progression of CHD may result in a myocardial infarction. According to an article by O’Gara et al. (2013), incidences of ST-elevation myocardial infarction (STEMI), a type of heart attack, have steadily declined over the years as care for CHD has improved. Conversely, another type

of heart attack referred to as non-ST-elevation myocardial infarction have increased. Despite a decline in STEMI occurrences, it remains 25-40% of myocardial infarction (MI) presentations (O’Gara et al., 2013). According to the CDC, every year, more than 805,000 Americans have a new or recurrent MI. Of this number, 605,000 Americans experience their first heart attack and 200, 000 suffer a second (CDC, 2019).

There are several risk factors that increase a person’s likelihood of developing CAD. They include cigarette smoking, elevated blood pressure, high cholesterol, diabetes, advanced age, abdominal obesity, physical inactivity, and sedentary lifestyle (Norris, 2019). The risk of developing CAD increases when a person has more than one risk factor; therefore, risk factor modification in conjunction with healthy lifestyle education are necessary interventions in order to prevent life-threatening events.

Heart failure, or the failure of the heart muscle to function as a pump, is another type of heart disease affecting more than 6.5 million Americans (Golwala et al., 2015). In the U.S., there are more than 650,000 new cases of heart failure diagnosed annually. Despite pharmacological advancements in HF management, it continues to be a leading cause of hospitalizations especially in the Medicare population (Golwala et al., 2015). An estimated 5.1 million people in the U.S. exhibit clinical manifestations of heart failure such as shortness of breath, weakness, fluid overload, and fatigue with the prevalence expecting to increase (Yancy et al., 2013).

Pathophysiology of Myocardial Infarction

A myocardial infarction (MI) is defined by the lack of blood flow to an area of the heart resulting in myocardial cell death (Peate & Jones, 2014). MI, also known as a heart attack, is often caused by a blood clot that forms inside a coronary artery or in one of its

branches. The clot prevents normal blood flow through the coronary artery jeopardizing the heart muscle's ability to function from the lack of nutrients normally supplied by the coronary artery. When part of the heart muscle is deprived of oxygen, the affected area is known to be 'infarcted' (Peate & Jones, 2014). A STEMI is characterized by myocardial ischemia, electrocardiogram (EKG) changes, and elevated cardiac biomarkers of myocardial necrosis (O'Gara et al., 2013). It is the elevation of the ST segment detected on a 12 lead-EKG, a diagnostic tool used to measure the electrical activity of the heart.

Atherosclerosis, or plaque buildup forms when the endothelial layer, or inner lining of the vessel has been damaged. Agents such as smoking, high cholesterol, mechanical stress such as hypertension, and immune mechanisms all have the potential to cause endothelial injury (Norris, 2019). Once the endothelium is damaged by the inflammatory response to injury, monocytes and lipids adhere to the affected area, and fatty streaks consisting of macrophages, smooth muscle cells, and lipids congregate to form "foam cells" (Norris, 2019). Foam cells contain low density lipoprotein which is referred to as the "bad" cholesterol and contribute to the formation of atherosclerosis. Overtime, atherosclerosis begins to proliferate into the smooth muscle. As it increases, the lumen of the artery begins to occlude as macrophages start to release inflammatory substances that may block the vessel (Norris, 2019). Conversely, the fibrous cap that seals the foam cells may rupture and expose the necrotic core of the plaque, resulting in the coagulation cascade and causing a thrombus to form. This process, infarction, results in reduced blood flow to the affected area of the heart which in turn causes myocardial ischemia (Norris, 2019).

The severity of infarction is dependent on several factors. They include location and extent of occlusion, the amount of cardiac muscle tissue supplied by the affected coronary artery, duration of the occlusion, metabolic needs of the affected tissues, collateral circulation, heart rate, blood pressure, and cardiac rhythm (Norris, 2019). Once the cardiac muscle is injured, a biochemical conversion from aerobic to anaerobic metabolism occurs which results in insufficient energy to maintain normal cardiac function. This process results in loss of contractile function within sixty seconds of onset (Norris, 2019). Cardiac cells also known as myocytes change in structure and lose their function unless blood flow is promptly restored. Irreversible myocardial cell death occurs after 20 to 40 minutes of nutrient deprived cardiac muscle tissue. After a myocardial infarction, both the infarcted and the non-infarcted area undergo ventricular remodeling; a term used to describe the progressive changes in size, shape, and thickness of the cardiac muscle. The area of infarction becomes thin and dilated while the unaffected area becomes thick and hypertrophied as it compensates and takes over the workload of the affected part of the heart (Norris, 2019).

Acute Management of Myocardial Infarction

Clinical practice guidelines serve as a guide for providers to choose the best treatment plans for individual patients. They improve quality of care, reduce cost by focusing on the most effective treatments, and optimize patient outcomes (O’Gara et al., 2013). Beginning in 1980, the American College of Cardiology Foundation (ACCF) and the American Heart Association (AHA) in collaboration, develop, update, and revise clinical practice guidelines and procedures for CVD. Their work also includes ongoing evaluation of new evidence to create recommendations for practice (O’Gara et al., 2013).

There are several class I recommendations for the acute management of a STEMI. Each class of recommendation differs in their level of evidence. Level A is derived from multiple random-control-trials or meta-analyses that have evaluated multiple populations; Level B is derived from a single randomized trial or nonrandomized studies that have evaluated limited populations; Level C is derived from expert opinions, case studies, or standards of care that have evaluated limited populations (O’Gara et al., 2013).

Recommendations: Due to the severity and urgency of a myocardial infarction, every community should have a regional protocol in place that includes an assessment of emergency medical services (EMS) and hospital-based procedures. When a person is suspected of having a myocardial infarction, EMS personnel should immediately perform an EKG on site to confirm the definite life-threatening condition. EMS should directly transport the patient to a facility capable of performing percutaneous coronary intervention (PCI); a procedure that uses a thin, flexible tube to open a blocked artery and restore blood flow (Norris, 2019). According to the ACC/AHA guidelines, PCI is the recommended procedure to restore blood flow to the cardiac muscle cells. The intervention should take place within 12 hours of symptom onset, and the duration of time between a first medical contact and PCI intervention should be no longer than 90 minutes. When a patient is initially transported to a hospital that does not offer PCI and PCI is indicated for treatment, the patient should be promptly transferred to a hospital capable of this procedure. In this situation, the time between a first medical contact and PCI should not exceed 120 minutes (O’Gara et al., 2013).

Recommendations for treating a MI include several pharmacotherapies. Aspirin is the preferred antiplatelet medication used to prevent platelet aggregation and reduce

the chances of rethrombosis (Norris, 2019). Before PCI, patients should receive 162 to 325 mg of aspirin in addition to a loading dose of a P2Y₁₂ receptor inhibitor which is a class of antiplatelets. According to the recommendations, patients should also be placed on an anticoagulant such as unfractionated heparin with additional boluses to maintain therapeutic drug levels as indicated (O’Gara et al., 2013).

The ACC/AHA guidelines outline routine medical therapies indicated for patients who present with a MI. Class I recommendations for such therapies include oral beta blockers to be administered within the first 24 hours of a MI. Beta-adrenergic blockers are antagonists that block beta-receptor-mediated functions of the sympathetic nervous system. This activity reduces myocardial oxygen demand by lowering heart rate, cardiac contractility, and blood pressure (Norris, 2019). Angiotensin-converting enzyme (ACE) inhibitors should also be administered within the first 24 of a MI for patients with HF and an ejection fraction less than 0.40 unless contraindicated (O’Gara et al., 2013). ACE inhibitors increase cardiac output and stroke volume while reducing systemic vascular resistance and pulmonary wedge pressure (Norris, 2019). Initiation of a high-intensity statin is recommended unless contraindicated after patients have been stabilized (O’Gara et al., 2013). Statin therapy decreases the risk of CHD death by lowering blood cholesterol and preventing plaque build-up in the coronary arteries (Norris, 2019). Additional pharmacotherapies utilized in the management of MI include nitrates, which promote coronary artery dilation, calcium channel blockers, which relieves ischemia and reduces blood pressure, oxygen for hypoxic patients defined as an oxygen saturation of less than 90%, and morphine which has favorable effects on work of breathing, anxiety, and ventricular loading (O’Gara et al., 2013).

Pathophysiology of Heart Failure

Heart failure (HF) is characterized by the heart's inability to adequately pump blood to meet the body's needs. This defective mechanism results in insufficient oxygen delivery to the body's tissues (Norris, 2019). HF can be caused by CAD, MI, high blood pressure, dysfunctional heart valves, cardiomyopathy or damage to the heart muscle, inflammation of the heart muscle caused by a virus, congenital heart defects, arrhythmias, and other conditions (Norris, 2019). However, typically it is due to left ventricular myocardial dysfunction. At first, the heart may compensate by undergoing hypertrophy and by increasing the volume of blood that stretches the ventricles prior to contraction also known as preload (Norris, 2019).

The pathophysiology of heart failure can be divided into systolic and diastolic heart failure based on ventricular ejection fraction. In systolic ventricular dysfunction, the heart's muscle is unable to contract properly. This action results in a decrease in ejection fraction and cardiac output. Ejection fraction is the amount of blood pumped out of the ventricles with each contraction and cardiac output is the amount of blood pumped through the heart in one minute (Norris, 2019). A normal ejection fraction is anywhere between 50-70%: An ejection fraction of 40% or less is indicative of systolic heart failure (Norris, 2019).

In diastolic ventricular dysfunction, the ejection fraction is normal however, diastolic ventricular relaxation is impaired. This results in abnormal filling of the ventricle and subsequently a decrease in preload, stroke volume or the amount of blood pumped out of the left ventricle with each beat, and cardiac output (Norris, 2019). Both systolic and diastolic HF can cause symptoms such as dyspnea, fatigue, and fluid

retention. In addition to systolic and diastolic dysfunction, HF can be classified as right-sided HF, left-sided HF, or both referred to as biventricular HF (Norris, 2019). With right-sided HF, blood backs up to the body resulting in systemic venous congestion. Clinical manifestations include jugular venous distention, increased abdominal girth, and fluid buildup in the lower extremities. Left-sided heart failure causes a backed up of fluid to the lungs resulting in pulmonary congestion also known as pulmonary edema (Norris, 2019).

Neurohormonal systems become activated in HF and have three major effects. Initially, there is an increase in the heart's muscle to contract in order to maintain cardiac output (Lodge & Yousef, 2016). When the heart does not pump enough blood to the systemic circulation, the kidneys have decreased blood supply. This process stimulates the renin-angiotensin aldosterone system which is an attempt to maintain ventricular filling pressures by stimulating fluid retention to increase blood volume (Lodge & Yousef, 2016). The ventricles fill with more blood during diastole which also increases preload and the force of contraction. Then, vasoconstriction is stimulated to direct blood towards major organs and reduce non-essential oxygen requirements. Some of the fluid from the venous circulation can leak from the blood vessels into the tissues causing fluid buildup in the lungs and other parts of the body. Unfortunately, with prolonged time, a positive hormonal feedback loop results in further dilation of the ventricles and worsening cardiac function. The compensatory mechanism is exhausted and fails, leading to the development of heart failure (Lodge & Yousef, 2016).

Acute Management of Heart Failure

Just as there are guidelines for the management of MI, there are also guidelines for the management of HF. Patients who present to the hospital with known HF on maintenance treatment with Guideline Determined Medical Therapy (GDMT), should continue their treatment unless hemodynamically unstable or unless contraindicated. (Yancy et al., 2013). As a class I recommendation, beta-blockers should be introduced in stable patients who have mild to moderate symptoms of HF to treat left ventricular systolic dysfunction. Patients with clinical manifestations of volume overload should be treated with intravenous loop diuretics since they promote fluid excretion from the kidneys and maintain cardiac output by reducing preload (Yancy et al., 2013). According to the HF guidelines, patients who chronically take loop diuretics for the maintenance of HF, the initial IV dose should equal or exceed their chronic daily intake. From there, diuretics should be adjusted according to symptom alleviation, fluid volume status, and hemodynamics (Yancy et al., 2013). In the inpatient setting, the management of heart failure should consist of fluid intake and output monitoring, vital signs, body weight measurement taken at the same time every day, and monitoring of clinical manifestations related to systemic perfusion and congestion. In addition, serum electrolytes, urea nitrogen, and creatinine should be measured daily to monitor renal function with continued use of IV diuretics (Yancy et al., 2013).

Treatment goals should be addressed throughout hospitalization, before discharge, and after discharge. To properly manage HF, patients should be placed on GDMT if not already established (Yancy et al., 2013). Health care professionals should discuss causes of HF, barriers to care, and limited support after hospital discharge so that patients are

being well managed and HF exacerbations can be prevented (Yancy et al., 2013).

Clinical manifestations such as volume overload, shortness of breath, and pulmonary edema should aid in the management of HF treatment. Thus, adjustment to treatment should be based on patient outcomes. Additionally, titration and optimization of chronic HF treatment, assessment of electrolyte and kidney function, strategies to manage comorbidities, HF education, self-management, maintenance and adherence to therapy, and emergency strategies should be discussed and reinforced with each patient (Yancy et al., 2013). Considering palliative care or hospice may be indicated for patients who suffer from severe HF (Yancy et al., 2013).

Cardiac Rehabilitation Programs

Cardiac rehabilitation is a medically supervised program that integrates cardiovascular monitoring, behavioral modification, psychological counseling, and education (Widmer, 2017). A multidisciplinary team of physicians, nurses, nutritionists, cardiologists, advanced practice nurses, and psychologists work together to provide holistic CR services. Typically, services are provided three times a week for a duration of three months. The program aims to guide patients toward a healthier lifestyle by focusing on physical activity and exercise training, healthy eating and dietary counseling, weight loss, smoking cessation, medication adherence, management of concurrent comorbidities, and psychosocial support (Widmer, 2017). Ultimately, patients should feel empowered to utilize the tools and resources they have learned in order to effectively manage their chronic conditions independently.

There are four phases of CR. Phase I, the acute phase, is initiated in the hospital after the occurrence of a cardiac event or procedure. The duration of phase I is typically

three to five days depending on patient status, diagnosis, and progress (Grossman, 2016). The goal in phase I CR is ambulation and oxygen independence as tolerated. Phase II is a 12-week outpatient program supervised by a physician. It includes participation in a CR program three times a week for a total of 36 sessions. A usual class session consists of a warm-up, a 40- minute exercise class, and upper and lower body exercises followed by a cool-down segment (Grossman, 2016). Blood pressures are taken before, during and after each exercise session. Exercise tolerance is monitored by EKG during activity and prescribed exercises are individualized based on comorbidities (Grossman, 2016). Phase III consists of higher intensity physical activity (Nadarajah et. al, 2016). In phase III, patients have sustained activities and behaviors in order to reduce the risk of future coronary events, delay the progression of underlying disease, and reduce morbidity and mortality (Nadarajah et. al, 2016). Phase IV is the unsupervised maintenance stage where patients continue to utilize what they were taught during the previous phases of CR.

Cardiac Rehabilitation Outcomes

Anderson et al. (2016) conducted a systematic review and meta-analysis to reevaluate the outcomes of exercise-based CR in CHD patients. The outcomes in the study included morbidity, mortality, quality of life, and cost-effectiveness. The study included randomized control trials (RCTs) that compared exercise-based CR to a control group. The systematic review and meta-analysis included a total of 63 RCTs, 14,486 participants and a median follow-up of 12 months. The following outcomes were applied for inclusion criteria: Total of cardiovascular mortality, fatal or nonfatal MI, revascularizations (CABG or PCI), hospitalizations, quality of life, validated instruments

used for assessment, and cost-effectiveness. Each study was assessed for bias using the Cochrane Collaborator's core risk of bias items (Anderson et al., 2016).

The sample included individuals who had a MI or those who had a procedure for revascularization. The participants who had chest pain or CHD confirmed by angiography were also included. Sex and age were not part of the inclusion criteria which increased the number of total participants. The results revealed that CV mortality and hospital readmission were significantly reduced with exercise-based CR compared with the control group. Contrarily, participation in CR had no impact on all-cause mortality, fatal or nonfatal MI, CABG, or PCI. However, the results did demonstrate improved quality of life after completion of an exercise-based CR program compared with the control group. The results also revealed the possibility that exercise-based CR may drive down the cost of health care by reducing hospital readmissions (Anderson et al., 2016).

Another study by Ades et al. (2016) states that CR participation reduces total mortality at one year and three years by 13% to 24%. Additionally, hospital readmissions have demonstrated a 31% decrease over one year, and an overall increase in physical capacity and quality of life (Ades et al., 2016). Despite the positive outcomes that emerge from CR participation, CR participation rates only range from 19%-34% nationally (Ades et al., 2016).

Guidelines/ Performance and Quality Measures

In 2016, the ACC/AHA Task Force gathered a writing committee to develop and update clinical performance and quality measures for CR. Six performance measures and three quality measures were developed to facilitate CR referrals for eligible individuals.

Performance measures identify gaps in quality of care and are based on Class I clinical practice guidelines (Thomas et al., 2018).

Performance measure (PM) -1, CR Referral from an Inpatient Setting; developed in order to refer all eligible patients to an outpatient CR program prior to hospital discharge. PM-3, CR Referral from an Outpatient Setting; advises health care providers to refer all outpatients eligible for CR who have not attended or participated in a program. PM-2, Exercise Training Referral for Heart Failure from Inpatient Setting and PM- 4, Exercise Training Referral for Heart Failure from Outpatient Setting; both were developed given the supporting evidence that exercise training is a Class I recommendation for patients who have HF with reduced ejection fraction as it improves functional status, exercise duration, and quality of life. PM- 5a, CR Enrollment-Claims Based; designed to increase CR enrollment and participation. This performance measure allows health care organizations to use claim-based data with or without the use of information from registries or electronic health records to assess enrollment status. PM- 5b, CR Enrollment-Registry/Electronic Health Records Based; developed so healthcare organizations can measure enrollment status using electronic health records or registry data with or without the use of claims-based data. According to the writing committee, implementation of these measures by healthcare providers and various healthcare systems will overall increase outcomes of patient care by preventing future cardiovascular events and by giving patients the tools they need to lead healthier lifestyles (Thomas et al., 2018). The ACC/AHA 2018 Clinical Performance and Quality Measures for Cardiac Rehabilitation are illustrated in Table 1, below.

Table 1

ACC/AHA 2018 Clinical Performance and Quality Measures for Cardiac Rehabilitation

No.	Measure Title	Care Setting	Attribution	Measure Domain
Performance Measures				
PM-1	CR Patient Referral From an Inpatient Setting	Inpatient	Facility Level	Communication and Care Coordination
PM-2	Exercise Training Referral for HF From Inpatient Setting	Inpatient	Facility Level	Communication and Care Coordination
PM-3	CR Patient Referral From an Outpatient Setting	Outpatient	Facility or Provider Level	Communication and Care Coordination
PM-4	Exercise Training Referral for HF From Outpatient Setting	Outpatient	Facility or Provider Level	Communication and Care Coordination
PM-5a	CR Enrollment—Claims Based	Outpatient	Provider Level	Effective Clinical Care
PM-5b	CR Enrollment—Registry/Electronic Health Records Based	Inpatient	Provider Level	Effective Clinical Care
Quality Measures				
QM-1	CR Time to Enrollment	Outpatient	Facility or Provider Level	Effective Clinical Care
QM-2	CR Adherence (≥ 36 sessions)	Outpatient	Facility or Provider Level	Effective Clinical Care
QM-3	CR Communication: Patient Enrollment, Adherence, and Clinical Outcomes	Outpatient	Facility or Provider Level	Communication and Care Coordination

Thomas et al. (2018) states that quality measures are important for practice however, they are not established from Class I clinical practice guidelines, as they lack questions of feasibility, or validity. Once evidence has been validated to support a quality measure, only then can it become a performance measure (Thomas et al., 2018).

Quality Measure (QM) -1, CR time to enrollment; assumes that early enrollment to CR improves overall enrollment, participation, and may be associated with better patient outcomes (Thomas et al., 2018). QM-2, CR Adherence (greater or equal to 36 sessions); postulates that an attendance of 36 or more CR sessions is associated with a decrease in mortality and recurrent MI at four years compared with those who attend fewer CR sessions. This measure indicates that optimal outcomes are achieved after the completion of an entire CR program. QM-3, CR Communication: Patient Enrollment; Adherence; and Clinical Outcomes; developed with the assumption that coordination of

care and communication among health care providers increases patient satisfaction, improves quality of care, and improves patient outcomes (Thomas et al., 2019).

In accordance with performance measure number two and four, regarding exercise training for HF patients, the Centers for Medicare & Medicaid Services as well as other insurances carriers approved HF with reduced ejection fraction as a covered diagnosis for CR in February of 2014 (Thomas et al., 2018). To further support HF as an approved indication for CR, the “2013 ACC/AHA Guideline for the Management of Heart Failure” established exercise training as a class I level of recommendation for heart failure patients whereas CR is a class IIa level of recommendation for heart failure patients (Ades et al., 2016). Exercise training is proven to decrease mortality and increase quality of life, physical endurance, and functional capacity in HF patients (Thomas et al., 2018).

Cardiac Rehabilitation Change Package

The efforts to increase CR participation are ongoing. The CDC in collaboration with the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) developed the Million Hearts Cardiac Rehabilitation Change Package; a national initiative with the overarching goal to prevent one million acute cardiovascular events by 2022, and to increase nationwide CR participation rates by 70% (Wall et al., 2018).

The Cardiac Rehabilitation Change Package (CRCP) includes process improvements that can be implemented by health care organizations to improve CR utilization (wall et al., 2018). It was developed in order to guide CR programs, health care organizations, quality improvement teams, and health care professionals to adopt or

standardize policies and procedures that improve quality of care for those who are eligible. The CRCP includes four domains; System, Referrals, Enrollment and Participation, and Adherence. These four categories are not meant to be implemented concurrently as each institution has different needs (wall et al., 2018).

The first domain is system change. System change offers ways for health care organizations to establish policies and procedures that increase CR utilization (Wall et al., 2018). Strategies include making CR a health system priority, establishing a quality of care champion or leader, educating the care team on CR to ensure agreement on system changes, and using CR referral, enrollment, and participation as indicators of quality care (Wall et al., 2018).

Referral is the second domain and provides ways to increase CR referral rates. Some of the strategies to increase referrals includes using standardize processes, electronic referrals, and health system data. Options for utilizing hospital standardized processes includes developing CR referrals in electronic health record (EHR) order sets for eligible patients, including CR referrals in discharge checklists and discharge forms, developing a standardized process for informing a CR program of a referred patient, and developing a standardized process for eligible patients to refer themselves to a CR program (Wall et al., 2018).

Other ways to standardize CR referrals are listed as the following: Creating and informing patients of a standardized referral process or policy; Implementing standardized paper or fax referrals to CR from an inpatient and outpatient setting; Using inpatient and outpatient EHR tools to apply automatic referrals to CR for patients who are eligible (Wall et al., 2018).

Using health systems data to facilitate CR referrals is another concept to promote change. For example, utilizing the 2018 ACC/AHA performance measures and providing a web page with CR referral metrics, goals, and performance outcomes to improve CR referrals. According to the CRCP, initiating a registry to track and manage patients referred to a CR program and identifying eligible patients who have not been referred are additional strategies to increase referrals (Wall et al., 2018).

The third domain in the CRCP is enrollment and participation. There are several ways health care organizations can implement action plans to increase CR enrollment and participation. This can be accomplished by educating patients about the benefits of a CR program, by using data from participation metrics to drive improvement in enrollment and participation, by decreasing cost barriers for CR services, by adjusting CR programs to accommodate patient needs, by encouraging home-based CR in conjunction with facility-based CR programs to better accommodate patients, (specifically, those who have limited access to a hospital-based CR center), and by using provider follow-ups to support enrollment and participation (Wall et al., 2018).

Adherence is the last change concept in the CRCP. This domain demonstrates the need to identify and address patient variables that predict program drop out to avoid non-adherence. Interventions may include identifying populations that are at low risk for participating in CR programs and improving patient engagement through knowledge, education, and motivation. This may also include offering additional support for the populations that are predicted to drop out. Health care professionals can also utilize motivational and financial incentives for adhering to goals and session attendance, develop automated reminders and facilitate communication through text messages, and

connect patients who are enrolled in CR with a former graduate of a CR program for additional support (Wall et al., 2018).

Barriers to Participation

There are several reasons why CR centers are underutilized. Patients, providers, health care systems, and program factors all impact the degree of CR participation. Program suitability, intensity of exercise required, and the purpose of a CR program are often misunderstood (Herber et al., 2017). As long as misconceptions persist, participation rates will continue to decline. Barriers to CR participation include; CR scheduling, specialized equipment, the program's receptiveness to individual patient needs, social environment of the program, location, cost, convenience, fear of exercise, caregiver/work responsibilities, comorbidities, socio-demographic, family support, and psychological influences (Mcintosh et al., 2017). Additionally, subpopulations including women, ethnic minorities, and individuals with inadequate health insurance are less likely to participate in CR (Thomas et al., 2018).

A study from the Mayo Clinic found that CR programs were greatly underutilized by women, different racial minorities, and the elderly population after an acute coronary syndrome (ACS) event (Widmer, 2017). Poor attendance and adherence resulted in undesired outcomes such as increased morbidity and mortality in these underrepresented populations. Furthermore, the analysis of Medicare claims data showed only 13.9% of Medicare beneficiaries enrolled in CR after an ACS event, and 31% enrolled after CABG; data that supports the underutilization of CR (Widmer, 2017).

A study by Golwala et al. (2015) sought to determine the proportional use of CR, temporal trends, and factors linked to CR referral at discharge in acute decompensated

HF patients by using the GWTG-HF database. The study sample included 105,619 patients who were eligible for CR in 338 U.S. hospitals. The results demonstrate only 10.4% of 105,619 patients with HF received a CR referral at discharge. A multivariable analysis revealed patients who received a CR referral were younger (median age: 70), mostly men, had fewer comorbidities, received in-hospital procedures such as coronary angioplasty, PCI with stent, and CABG, and had greater use of evidence-based practice treatments such as ACE-inhibitors and aldosterone antagonists (10.4%). In contrast, patients who had a history of hypertension, transient ischemic attack/cerebrovascular accident, chronic obstructive pulmonary disease, anemia, a higher ejection fraction, and increased systolic blood pressure were less likely to receive a CR referral (89.6%) (Golwala et al., 2015). A positive finding revealed an increasing trend in the number of HF patients referred to CR by 40% over the past decade (4% in 9 years). Despite this positive trend, the proportion of HF patients referred to CR remains small when compared to MI patients in a study by Beatty et al. (9% in 5 years) (Golwala et al., 2015).

The Acute Coronary Treatment and Interventions Outcomes Network (ACTION) Get with The Guidelines registry provided data on current measures for ST-elevation and non-ST-elevation myocardial infarction. Seventy-nine percent of NSTEMI patients and 84.5% of STEMI patients received a referral to CR (Thomas et al., 2018). Surprisingly, only 60% of PCI patients are referred to CR (Thomas et al., 2018). These findings indicate a need for increasing CR referrals for patients with various cardiac diseases and procedures. Thomas and colleagues stated that if CR participation rates increased to

70%, it would be estimated that 25,000 deaths and 180,000 hospitalizations could be prevented each year.

Nurse' Role in Cardiac Rehabilitation Referral

Nurses may play a vital role in CR referral, enrollment, and participation. With increased knowledge of CR, nurses can improve patient outcomes by providing accurate information and encouragement of patients. Kadian et al. (2016) conducted a quantitative study with one group pre-test post-test design of 100 staff nurses to evaluate the effectiveness of a planned teaching program on nurses' knowledge regarding CR. The study also sought to determine the relationship between sociodemographic variables and post-test scores among the staff nurses. Demographic data included age, work experience in a cardiac unit, professional qualification, and attendance to a formal CR educational program. Structured questionnaires were used to obtain data regarding CR and included goals, types, components, phases, and steps of CR (Kadian et al., 2016).

Descriptive and inferential statistics using the SPSS version 0.16 were used to analyze the data. The results demonstrated a difference between mean pretest and post test score of 6.48. On the post-test, 78% of staff nurses had excellent knowledge and 22% had good knowledge. When analyzing the relationship between post-test scores and demographic variables, there was an association with age, professional qualification, work experience, and attendance to a formal CR educational program. However, no single demographic factor was significant. The findings revealed that a planned teaching program for staff nurses regarding CR increased nurses' knowledge of CR (Kadian et al, 2016).

Another study by Grossman (2016), conducted a randomized experimental design to determine the best intervention for increasing CR enrollment in post MI patients who underwent PCI with stent placement. A convenience sample of 104 medically insured, post MI/stent patients who resided within a 10-mile radius of the CR center were included in the study. Participants were randomized using a one, two, three count on the Management and Information Systems Department list of all eligible patients. Seventy (67.3%) patients were male, 34 (32.7%) were female, 101(97.1%) were Caucasians, two (1.9%) were Hispanics, and one (1.0%) was Asian. Participates in group one received the first intervention; a face-to-face 30-minute inpatient interview at the patients bed-side, and a treatment session with a CR registered nurse. This was considered basic standard of care and was ordered by the standing physician (Grossman, 2016). The treatment included a 250 ft supervised walk depending on the patient's functional capabilities. Additionally, the patients received a CR program informational package on heart attacks, as well as a DVD and written information provided by the stent manufacturer (Grossman, 2016).

Participants in group two received the second intervention which included a letter sent to the patient's attending physician at three weeks post hospital discharge. The purpose of the letter was to notify the physician of the patient's opportunity to enroll in a CR program in hopes that the physician will also encourage and motivate eligible patients to attend. The third intervention for participants in group three was a telephone call from the CR manager to the patient within three weeks after discharge. The intent of this intervention was to encourage patients to enroll in an outpatient CR program by means of scheduling an entrance interview. Finally, the fourth intervention included all of the

patients who were discharged early from the hospital before a consult or treatment was possible. The intervention included a letter mailed from the CR department to eligible patients encouraging patients to enroll by scheduling a CR entrance interview. In addition, the CR department supplied an informational package on coronary stents sent from the Boston, Specific, Inc (Grossman et al., 2016).

A two-way chi-square analysis was used to evaluate which nursing interventions increased CR enrollment. Overall, 28.8% of eligible patients enrolled in CR while 71.2% did not. The results of the study indicate that patients in group one who received an interview, consultation, and treatment in the hospital, had the highest enrollment to a CR program (Grossman, 2016). The participants in group one experienced the most face-to-face interaction which may have resulted in greater enrollment compared with the patients in group two, three, and four who experienced indirect interventions. In group one, 81.2% of participants enrolled whereas 18.8% of participants did not enroll. Additionally, there was a correlation between enrollment rates and the initial CR entrance interview. Patients who had an initial CR interview (88.2%) were more likely to enroll than those who did not enroll despite having an initial interview (11.8%) (Grossman, 2016).

A primary goal of the AHA's scientific advisory is to define the roles of pertinent healthcare professionals to improve CR referrals and participation (Arena et al., 2012). Nurses, nurse practitioners, physical therapists, registered dietitians, physicians, exercise physiologists, and physician assistants are all recommended to engage in the effort to promote CR to patients who are eligible and to facilitate the referral and enrollment process (Arena et al., 2012).

Registered nurses play a pivotal role in educating patients about the benefits of CR. They are frequently involved in the discharge process allowing the opportunity to facilitate referrals to outpatient CR. Educating and encouraging patients to participate in CR are important initial steps during hospital discharge. Additionally, nurses are able to identify ideal moments to discuss CR with eligible patients. According to Arena et al. (2012), nurses should educate patients on the following: The reason for obtaining a CR referral, the components of an outpatient CR program, how components pertain to individual patients, the well-supported benefits of CR, how CR provides a safe exercise environment, and how attending outpatient CR builds an array of resources for the future. Although these responsibilities are not specific to the nursing profession, nurses offer a unique set of skills that make them valuable to the healthcare team. Consistent communication on the importance of outpatient CR from other healthcare professionals will hopefully increase patients' perceived value of CR (Arena et al., 2012). With the help and support from nurses and their ability to bridge gaps between acute care and outpatient CR, patients have the opportunity to achieve better health outcomes.

In summary, current research highlights the importance of increasing CR referrals due to the substantial outcomes and the proven benefits that are associated with CR participation. As previously stated, Kadian et al. (2016) concluded that a planned teaching program was an effective method to increase nurses' knowledge of CR. Educating nurses on CR will allow for knowledge expansion and greater insight to effectively educate patients. The purpose of this quality improvement project was to assess whether a cardiac rehab educational program increased nurses' knowledge of CR. Next, the theoretical frameworks for this project will be discussed.

Theoretical Framework

The two theoretical frameworks chosen for this study are The Logic Model and Donabedian's Model to evaluate quality of care. The Logic Model, designed by the Kellogg Foundation is a systematic display that illustrates the relationship between the resources needed to operate a program, the activities planned, and the changes or results the researcher hopes to achieve (W.K Kellogg Foundation, 2004). The Logic Model outlines the procedures thought to bring about change and how the procedures relate to the outcomes the program is expected to achieve. This method was used evaluate whether a CR educational program increased registered nurses' knowledge of CR (W.K Kellogg Foundation, 2004).

The logic model includes key elements that are used to facilitate goal attainment. They include, resources/inputs, activities, outputs, outcomes, and impacts. The planned work describes the resources needed to initiate a program and the activities or actions that require the use of the resources. Resources may include human, financial, organizational, and community tools available for the program. Program activities are defined by what the researcher does with the resources to initiate changes or results. The intended result includes outputs, outcomes, and impact which are all a part of the program's desired outcomes. Outputs are the direct product of program activities, outcomes are the changes detected in participants' behavior, knowledge, skills, and level of functioning, and the impact is the central change noted within an organization or system that is manifested as the result of the program activities (W.K Kellogg Foundation, 2004).

Figure 1. The logic Model. W. K. Kellogg Foundation, 2004

In the 1988 work of Avedis Donabedian notes that historically, quality of care was considered something that could not be measured. Donabedian hypothesized that quality of care could, in fact can be measured, and developed the Donabedian Model, a conceptual framework that evaluates quality of care. By identifying who is being evaluated, what activities are being assessed, how activities are implemented, and what the activities are meant to accomplish, people are able to look for measures that provide pertinent information about quality. Donabedian incorporated three components for evaluating quality of care - structure, process, and outcome (Donabedian, 1988).

Structure reflects the attributes of the setting in which care takes place and include material resources, human resources, and organizational systems. Facilities, equipment, and money are examples of material resources. Human resources consist of the number and qualifications of human resources and staff organization. Peer review and

reimbursement methods are examples of organizational systems. Process reflects the action of delivering and receiving care. It involves patients searching for care and adhering to recommendations as well as providers recommending or implementing treatments. Outcomes refer to the impact care has on the health status of patients. For example, changes in patient behaviors and improvement in knowledge. It is the final result of the implemented process and determines whether goals have been achieved (Donabedian, 1988). Donabedian believed that a good structure increases the likelihood of a good process, which in turn increases the likelihood of good outcomes. Donabedian's model supported the purpose of this quality improvement project by evaluating the CR educational intervention delivered to registered nurses, with the intention to evaluate patient outcomes and CR knowledge based on nurses knowledge of CR.

Next, the methodology for this study will be presented.

Method

Purpose

The purpose of this quality improvement project was to assess whether a cardiac rehab educational program increased nurses' knowledge of CR.

Design

This quality improvement project included a pre-test, educational intervention, and post-test design to assess whether a CR educational program increased nurses' knowledge of CR. The pre-test determined baseline knowledge of CR and the post-test evaluated knowledge gained after participation in the educational program.

Site

The project was conducted on 4 West (4W), at The Miriam Hospital. The Miriam Hospital is a 247-bed, non-for-profit, tertiary care teaching hospital located in Providence, Rhode Island. 4W is a 30-bed telemetry unit that cares for patients with medical-surgical and cardiac conditions.

Sample

A convenience sample of registered nurses (RNs) providing care to patients on 4W (N=32) was included in the study. Inclusion criteria consisted of all nurses who have a current full time, part time, or per diem position on 4W. Exclusion criteria included all non-nursing staff members, float pool staff members, travel nurses, and leadership on the unit.

Approval

Approval for project implementation was obtained from the clinical manager on 4W, the chief nursing officer at the Miriam Hospital, and from the Lifespan and Rhode Island College Institutional Review Board (IRB).

Procedures

The Logic Model served as the roadmap for this quality improvement project. It incorporated resources, activities, output, outcomes, and impact that facilitated the research process (W.K. Kellogg Foundation, 2004). The different components of the Logic Model related to the CR educational program will be discussed next.

Input. The resources that were utilized for this quality improvement project included CR educational materials, registered nurses that participated in the study, the organization where the program was conducted, the organization's leadership approval for the intervention, and the investigator who delivered the program. The content of the educational program was influenced by the director of the lifespan CR center, the ACC/AHA Clinical Performance and Quality Measures for Cardiac Rehabilitation, and the CRCP. Valid data from research in the literature review was also incorporated in the educational program, pre-test and post-test.

Activities. After IRB determination of not research, recruitment for the educational program began. The recruitment process included an informational email to RNs on 4 West three weeks prior to the educational sessions. Fliers with the same information were posted in the nurses' break room two weeks prior to the start of the educational sessions. Unit leadership encouraged nurses' participation by announcing the project during morning and afternoon huddle. Additionally, leadership overlooked

patients on the unit during educational sessions to allow for RN participation. Nurses were informed about the purpose of the study and its procedures again at the time of project participation. Candy and light refreshments were provided as an incentive for nurses to participate in the program. Participation was voluntary, and registered nurses were able to withdraw from the project at any given time.

The educational program included the definition of CR, eligibility criteria, the different phases of CR, barriers to CR, goals of CR, and referral strategies. An emphasis was placed on CR referrals due to the suboptimal referral rates on 4W. The referrals on 4W from the last six months were only 14, indicating the need to improve CR referrals. The pre-test and post-test (Appendix C) aligned with the educational content. The total program length of 35 minutes ensured data collection was realistic and achievable with the understanding that the nursing environment is demanding. The educational presentation was 15 minutes long, in addition to ten minutes before and after the presentation to complete the pre-test and post-test. In order to obtain an optimal number of participants, the investigator offered the program on five separate days over the course of four weeks and included different shifts so that day, evening, and night nurses had the opportunity to participate.

The program took place in the break room on 4 West. The pre-test was completed prior to the educational program, and the post-test was completed at the end of each educational session. Before the pre-test was administered, the researcher briefly explained the program's procedures. The administration of the pretest evaluated participants' baseline knowledge. After the pre-test was completed and collected, the 15-minute CR educational content was presented. The post-test was administered after the

educational presentation and included the same questions on the pre-test. No identifiers were requested. All questionnaires were collected by the researcher at the end of each educational session and stored in a locked office. A CR informational flyer for registered nurses was distributed after the last day of presentations. Flyers were also made available in the nurses' break room on 4W.

Output. Output represents the direct product of program activities. The program activities were represented by scores on the post-test compared to the pre-test. The outcomes were changes in participants knowledge after the pre-tests and the post-tests were compared. The pre-tests and post-tests aggregate and item scores were summarized using descriptive analysis. Additionally, the mean score for both pre-tests and post-tests were calculated. Comparison of the pre-tests and post-tests scores were used to determine the educational program effectiveness. Enhanced knowledge of CR after the educational intervention was the desired outcome for this quality improvement project.

Impact. The overall desired impact was that nurses' knowledge of CR would increase as evidenced by improved post-test scores. Nurses throughout the hospital caring patients eligible for CR should have increased knowledge to educate patients about the benefits of a CR program and advocate for patients in need of a referral.

Measurement. The 10-question pre-test and post-test measured the effectiveness of the educational program. Due to the lack of existing CR knowledge assessments for registered nurses, the pre-test and post-test were influenced by the educational program, evidence-based practice guidelines and the director of the Lifespan Cardiac Rehab Program, content expert. The questions on the pre-test and post-test reflected information

regarding the definition of cardiac rehab, eligibility criteria, referrals, goals of a cardiac rehab program, the Cardiac Rehab Change Package, and statistics on participation rates.

Dissemination Plan

The results were disseminated to unit leadership and the staff nurses on 4W. Other units in the hospital such as the coronary care unit, 4East, which is 4West's sister unit, and the catheterization lab may benefit from this educational program. Cardiac patients are being cared for throughout the hospital therefore, other areas in the hospital may also benefit from this educational program. Additionally, the findings of this quality improvement project were presented at Rhode Island College research symposium on May 5, 2020.

Next, the results will be discussed.

Results

A total number of 17 nurses and one certified nursing assistant attended five educational sessions. The nursing assistant was not included in the study results. All of the nurses who attended the educational program met inclusion criteria and completed both the pre-test and the post-test. Seventeen of a possible 32 nurses completed the pretest, educational session, and the post-test ($n=17$; 53.1%). The pre-test and the post-test consisted of 10 multiple choice questions, each with a single correct response. Questions answered with more than one response were marked incorrect. None of the questions were left unanswered. The average score on the pre-test was 62.4% and the post-test average score was 83.5%. The results demonstrated a 21.1% increase in the overall number of correct responses on the post-test compared to the pre-test.

The number and percentage of participants answering each question correctly on the pre-test and post-test are shown in Figure 2, below. On both the pre/post-tests, all participants knew that a CR program is a “medically supervised program that consists of monitored cardiovascular conditioning, behavior modification, counseling, and education” (question one) and that it is estimated that CR participation rates of 70% could prevent 25,000 deaths and 180,000 hospitalizations (question nine). All other questions saw a modest to significant increase in correct answers after the education program.

Two questions revealed important CR knowledge gaps prior to the education program. Question number eight, “When should a post myocardial infarction patient start phase II cardiac rehab?” demonstrated that most nurses were not aware that phase II of cardiac rehab began two weeks after hospital discharge. Only two nurses answered question 8 (11.8%) correctly on the pretest compared to 13 correct responses (76.5%) on

the post-test (+64.7%). Similarly, true/false question five, “The goal of the Million Hearts Cardiac Rehabilitation Collaborative is to set a national goal of 40% participation in cardiac rehab, and to prevent one million acute cardiovascular events by 2022”. On the pre-test, 15 nurses answered that the Million Hearts national goal of 40% CR participation was the correct answer. Only two nurses answered false on the pre-test which was the correct response. The post-test demonstrated improvement in item score as 10 nurses answered question five correctly on the post-test demonstrating a modest increase in correct answers of 47%. Seven participants still answered the question incorrectly.

In addition, most nurses were not aware that the Cardiac Rehabilitation Change Package is a set of process improvement measures that quality improvement teams can implement to increase CR participation rates (question six). Only four (23.5%) nurses answered the question correctly on the pre-test, improving to 13 (76.5%) correct on the post-test, a 53% increase.

Improved scores were also noted on questions two, three and four. Question two, “What are the conditions that qualify patients for cardiac rehab?” demonstrated that 8/17 nurses knew heart failure with reduced ejection fraction, coronary artery bypass graft, and myocardial infarction are indications for CR. The item analysis revealed question two scores improved from 47.1% correct on the pre-test to 58.8% on the post-test with an overall increase of 11.7%. Although the instructions for question two stated “Choose the best answer”, two nurses chose more than one response on the pre-test and the answer was marked incorrect.

Question	Pre-Test Number/percent correct	Post-Test Number/percent correct
1 What is Cardiac Rehabilitation (CR)?	17 (100%)	17 (100%)
2 What conditions qualify for CR?	8 (47.1%)	10 (58.8%)
3 Who is responsible for referring patient to CR?	14 (82.4%)	16 (94.1%)
4 Why are CR programs underutilized?	13 (76.5%)	15 (88.2%)
5 The goal of Million Hearts CR Collaborative is 40% participation (T/F)	2 (11.8%)	10 (58.8%)
6 What is the CR Change Package (CRCP)?	4 (23.5%)	13 (76.5%)
7 The ultimate goal of CR program is?	14 (82.4%)	15 (88.2%)
8 When should a post MI patient start phase II CR?	2 (11.8%)	13 (76.5%)
9 If CR participation rates increase to 70%, 25,000 deaths, 180,000 hospitalizations could be prevented (T/F)	17 (100%)	17 (100%)
10 How can nurses facilitate CR referrals?	15 (88.2%)	16 (94.1%)

Figure 2. Comparing individual test question scores on the pre-tests vs. post-tests

Question three asked who is responsible for referring patients to cardiac rehab. The majority of nurses knew that cardiologists, physicians, and primary care providers can order CR referrals. Fourteen nurses answered this question correctly (82.4%) on the pre-test, and 16 nurses answered correctly (94.1%) on the post-test, demonstrating an increase in knowledge by 11.7%. Question four, “Why are cardiac rehab programs so underutilized?” demonstrated that more than half of the nurses knew that lack of patient interest, lack of CR referrals, and lack of transportation are all reasons why CR programs are underutilized. Item analysis revealed question four scores improved from 76.5% correct on the pre-test to 88.2% correct on the post-test (+11.7%). After the educational program, two nurses (11.8%) still thought CR programs are underutilized solely due to the lack of CR referrals.

The least improvement in post-test scores were seen in questions seven and ten. Question seven demonstrated that the majority of nurses knew the goals of CR is to prevent secondary complications and to give patients the tools they need to manage their conditions independently upon program completion. Item analysis revealed an increase

of +5.8% when the pre-test (82.4%) was compared to the post-test (88.2%). Only two nurses answered question seven incorrectly on the post-test (11.8%) and speculated that education on healthy eating, physical activity, disease management, and smoking cessation within a 25-week CR program is the ultimate goal of a CR program. Question 10 asked how nurses can facilitate cardiac rehab referrals. Fifteen nurses answered correctly (88.2%) on the pretest and 16 nurses answered correctly (94.1%) on the post-test. The results demonstrate an slight increase in post-test scores by 5.9%.

Improved post-test scores on the majority of questions demonstrated that this educational program was effective in improving nurses' knowledge on cardiac rehab (Figure 3). After the pre-tests and post-tests scores were compared, the percent of correct responses for each question either improved after the educational intervention or remained unchanged. None of the questions on the post-test revealed a lower percentage of correct responses when compared to the pre-test. The most improvement in test scores were seen in question six regarding when patients should be referred to CR, and in question eight, regarding the CRCP. An educational program that emphasizes referrals, the CRCP, eligibility criteria, and goals of CR may be beneficial in the future.

Figure 3. Pre-Test Post-Test Results

Next, the summary and conclusions will be discussed.

Summary and Conclusions

The 2017 AHA Heart Disease and Stroke Statistics report acknowledges the growing number of patients who would benefit from CR each year. They include the 625,000 patients who were discharged after being hospitalized for an acute coronary syndrome, the 954,000 patients who underwent PCI, the 500,000 patients who were discharged after receiving a new heart failure diagnosis, and the 397,000 who underwent coronary artery bypass graft surgery (Thomas et al., 2018). CR referrals are suboptimal attributed to poor communication between the interdisciplinary team, patients, and CR centers; lack of a centralized protocol for referrals; provider unfamiliarity with CR; limited access, competing commitments, and provider bias (Sandersara et al., 2015). Other barriers include transportation availability, social-economic factors, family support, financial issues, CR system issues, and physician and patient attitudes toward cardiac rehab (Mcintosh et al., 2017).

Cardiac rehab is multifaceted, secondary prevention program for eligible patients that offers holistic services in efforts to prevent future cardiac events. It empowers patients to utilize special techniques and resources so they can lead a healthier lifestyle and manage their conditions independently (Thomas et al., 2018). Numerous studies demonstrate that cardiac rehab decreases the likelihood of recurrent cardiac events and reduces mortality. In addition, they improve quality of life and facilitate return to work more quickly (Thomas et al., 2018). A Cochrane Systematic Review and Meta-Analysis by Anderson et al. (2016), concluded that exercise-based CR reduces cardiovascular mortality and hospital admissions compared to the control subjects who did not receive exercise-based cardiac rehab. Additionally, studies have found that CR participation is

associated with a 20% to 30% decrease in hospital readmissions in the first year after a cardiac event (Thomas et al., 2018).

The issue of underutilized CR programs has been studied extensively. Guidelines established by the ACC/AHA Clinical Performance and Quality Measure for Cardiac Rehabilitation have been revised and updated. The cardiac rehab measures are designed to increase CR referrals for eligible patients and to facilitate delivery of CR services through multidisciplinary CR programs (Thomas et al., 2018). In addition to the new cardiac rehab measure set, the CDC in collaboration with the American Association of Cardiovascular and Pulmonary Rehabilitation developed the CRCRP with the goal of assisting CR programs, hospital quality improvement teams, and health professionals to adopt systems and strategies that improve the quality of care for patients that are eligible for CR (Wall et al., 2018). The CRCRP encourages health care professionals to utilize the action plans and resources to increase CR enrollment, participation, adherence and referral rates, as well as implement changes that make CR a priority (Wall et al., 2018).

After discussion with the Director of the Lifespan Cardiac Rehab Center, a need for increasing inpatients CR referrals was identified. Patient education is an essential role for nurses and therefore they can be influential in the referral process. This quality improvement project consisted of a CR pre-test, educational program, and post-test developed for the nurses who work on 4 West, a telemetry and medical-surgical unit at The Miriam Hospital. Educational programs have been shown to help increase nurses' knowledge of CR (Kadian et al., 2016).

By advocating for CR referrals and delivering pertinent information to patients, families, and other health care professionals, nurses can improve referral, enrollment, and

participation rates. Nurses who have more knowledge of CR are well equipped to effectively educate patients on the benefits of CR and motivate them to enroll. Additionally, nurses spend the most time with patients and therefore are able to identify any unmet CR needs.

The 4W, Miriam Hospital CR education program addressed the goals of CR, referral process, eligibility criteria, the CRCP, structure and components of a CR program, as well as questions regarding optimal participation rates. The effectiveness of the educational program was measured using a pre-test and post-test design. Mean test scores and individual questions were analyzed to determine if educational program increased nurses' knowledge of CR. The test questions, derived from the CRCP, the ACC/AHA 2018 guidelines, and pertinent literature were reviewed by a content expert, the Director of the Lifespan Cardiac Rehabilitation Center. The educational program was delivered on five separate days, taking no longer than 30 minutes to complete.

Seventeen out of a possible 32 (53%) nurses completed the pre-test, educational program, and post-test. The mean score on the pre-test and post-test increased from 62.4% to 83.5% respectively, with an overall increase in post-test scores of 21.1%, which demonstrated increased knowledge of CR following the intervention. All of the questions revealed improved post-test scores after the educational program, with the exception of questions one and nine which were answered correctly by all participants.

Question eight, which asked when patients should start outpatient cardiac rehab after discharge, showed the most improvement after the educational intervention with a 64.7% increase in scores after the pre-test and the post-test were compared. Other gaps in CR knowledge regarding the Cardiac Rehab Change Package (question six) and the

national participation goal of the Million Hearts CR Collaborative (question five) also showed improvement. Four nurses answered question six correctly on the pretest compared to 13 correct responses on the post-test. Question five T/F, “The goal of the Million Hearts Cardiac Rehabilitation Collaborative is to set a national goal of 40% participation in CR and to prevent one million acute cardiovascular events by 2022”, demonstrated improved knowledge as evidenced by increase post-test score by 47%.

Question two asked about eligibility criteria for CR. Two nurses chose more than one answer despite the instructions starting “Choose the best answer”. Both nurses chose the correct answer C- Heart failure with reduced EF <35%, coronary artery bypass graft, and myocardial infarction, while also including incorrect answers. One nurse chose A- unstable angina, peripheral vascular disease, and deep vein thrombosis, B- Coronary artery bypass graft, elective percutaneous intervention, dilated cardiomyopathy, and C- Heart failure with reduced EF <35%, coronary artery bypass graft, and myocardial infarction. The other nurse chose answers B, C, and D- NSTEMI, aortic valve replacement, and unstable angina. While two of the 17 nurses chose multiple answers on the pre-test for question two, there was a demonstrated improvement in post-test results since all of the nurses chose one response, and the percentage of correct responses increased from 47.1% on the pre-test to 58.8% on the post-test.

Questions three and ten inquired about referrals and how nurses can facilitate referrals. Question three “Who is responsible for referring patients to cardiac rehab” demonstrated that 14 (82.4%) out of 17 (100%) nurses knew cardiologists, physicians, and primary care providers can order a CR referral for eligible patients. The post-test revealed 16 (94.1%) out of 17 (100%) nurses answered question three correctly, which

demonstrated the educational program was effective. Question 10 asked how nurses can facilitate CR referrals. The majority of nurses answered this question correctly on the pre-test (88.2%) and the pos-test (94.1%). The correct answer was D – Both A (educating patients about the benefits of CR) and C (by advocating for patients who are eligible to be referred). Although nurses do not have the authority to order CR referrals, they are the professionals who spend the most time with patients and recognize the need for CR services. Therefore, it is crucial that nurses recommend CR referrals to ordering providers to improve patient outcomes for eligible patients.

The purpose of this quality improvement project was to assess whether a cardiac rehab educational program increased nurses' knowledge of cardiac rehab. This project concluded that overall baseline knowledge on cardiac rehab increased after the educational intervention, validating a need for the CR educational programs for nurses. Likewise, Kadian et al. (2016) referred to a study by Girish and Preeti (2015) and found that an educational intervention was an effective strategy to increase nurses' knowledge of CR. The 4W CR educational program proved to be an effective teaching strategy to improve nurses' knowledge of CR.

Limitations

The educational sessions were offered on five separate days over the course of four weeks and at different times in order to accommodate day, evening, and night nurses. An emergency on the study unit caused one of the sessions to be rescheduled. Acuity and unit activity are difficult to predict and may have impacted participation rates. Although the educational program was delivered at different times and days, the timing of any educational program may have not been optimal. The educational program was

offered during the week and weekends, however offering educational program more often during the week may have increased participation rates.

Leadership on the unit were supportive in gathering nurses to participate and overlooking patients throughout the duration of the educational program. During off hours, when leadership was not available, charge nurses and the unit secretary were supportive by sending a page to all nurses to attend an educational session in the nurses' break room. Despite these efforts to increase participation, some nurses were distracted by alerts on their patients and left without starting the program. Others were distracted by messages and alerts about their patients via the inpatient mobile devices which may have impacted their ability to take in information. Finally, one nurse joined the session half-way through the educational program, which may have influenced her pre-test answers.

Due to the small sample, the validity of the results is questionable. A larger sample of nurses (>53%) would increase confidence in the positive impact of the CR program. Future quality improvement projects, similar to this project, are needed to build on these outcomes. Lacking a validated questionnaire influences the validity of the questionnaire that was developed. In fact, question eight "When should a post-myocardial infarction patient start phase II CR?" failed to clarify the stability of this population. The question should have asked "When should a stable post-myocardial infarction patient start phase II CR?" since unstable patients may get referred between two-four weeks depending on their stability. Although referral of stable MI patients was discussed in the educational program, this question may have easily caused confusion.

Despite the limitations of this project, this quality improvement project demonstrated that nurses had improved knowledge regarding CR after the educational intervention. Future studies should include CR educational programs and a validated CR questionnaire for nurses and providers caring for cardiac patients to improve competency in this aspect of care.

Next, the recommendations and implications for advanced nursing practice will be discussed.

Recommendations and Implications for Advanced Nursing Practice

The literature identifies the need to provide nurses with CR education. Nurses should have a clear understanding of CR and its goals, components, phases, team members, eligibility criteria, referrals, and most importantly its benefits. The Advanced practice Registered Nurse (APRN) is well-positioned to identify knowledge gaps and drive quality improvement programs designed to increase patient referral and participation in CR programs.

APRNs can influence nurses to encourage patients to attend CR. The APRN is uniquely positioned to develop educational programs for nurses that target knowledge gaps about resources from the ACC/AHA guidelines, the CRCP, and the beneficial outcomes that are strongly supported in the literature. The APRN can design an inpatient CR package with written materials and in different languages to be distributed to eligible patients. Additionally, the APRN can encourage other health care professionals to distribute informational packets and review them with patients. The study by Arena et al. (2012) supports that other health care professionals including physical therapists and registered dietitians should be accountable for educating patients on CR. This will raise awareness and increase the importance of CR with hope that patients make CR a priority for themselves.

The findings of this quality improvement project demonstrate that registered nurses had increased knowledge after the CR educational intervention. A similar study can be implemented to assess the attitudes and practice of nurses regarding CR. This will allow the APRN to gain more insight of the common misconceptions nurses may have of CR. Additionally, this study can be replicated with a larger sample which would increase

the overall generalizable findings. Identified gaps in nurses' knowledge of CR can be validated over time.

Lack of referrals and lack of physician awareness are two important barriers to CR participation with the ability to obtain significant impact. The APRN can develop an educational program for ordering providers and raise awareness during meetings or collaborative care rounds. The literature alludes to how physicians often have misconceptions and bias of CR which negatively impacts patient outcomes. Education provided should assist in altering the perception that outpatient CR is less important than pharmacological or interventional therapy (Arena et al., 2012). In addition, the strength of referral is noted in the literature. Physicians who rely on the established evidence and support CR outcomes are more likely to motivate patients to enroll. Therefore, education is the initial step in supporting CR utilization.

The APRN can collaborate with information technology personnel and medical directors to develop automated practice reminder for physicians to refer patients to CR. These practice reminders may highlight the patient diagnoses that meet CR criteria. This may be beneficial and ensure that all eligible patients are receiving a CR referral prior to hospital discharge.

The APRN must be familiar with best practices with the ability to apply research into clinical practice to improve patient outcomes and educate others. Disseminating practice guidelines from the ACC/AHA cardiac rehab measure set and the CRCP will allow for greater awareness within the health care team. Most inpatient units participate in collaborative care rounds where individual patients and their treatment plans are

discussed. This is an optimal time for the APRN to inquire about a CR referral for eligible patients and refer to the guidelines for additional support.

The APRN can utilize and drive other health-care professionals to adopt the 2018 ACC/AHA Clinical Performance and Quality Measures for CR. The implementation of this measure set by health professionals, healthcare systems, health insurance companies, and CR centers, will improve health care outcomes for eligible patients (Thomas et al., 2018). Furthermore, the APRN is able to identify the needs of an institution or unit, establish a goal, support change, and implement evidence-based strategies that work towards achieving the overall goal. This can be accomplished by implementing the CR performance measures. These measures can help providers monitor referral rates, utilize tools to improve enrollment, and assess quality. Additionally, with support from the APRN, the multidisciplinary team can develop a comprehensive protocol to facilitate CR referrals through planned interventions and successful implementation (Thomas et al., 2018).

When a problem is identified within a unit or institution, the APRN in collaboration with other team members, can implement interventions from the CRCP to address issues at hand. Together, they can also develop a comprehensive protocol for nurses that facilitate CR referrals. The APRN can collaborate with CR professionals, physicians, administrators, and important stakeholders to discuss the aspects of CR utilization in most need of improvement.

Nurses on 4W expressed that they would like to be informed when a CR liaison from the outpatient facility initiates the initial inpatient interview. Specifically, several nurses showed interest in participating in patient consults to better understand the

different phases of CR and the transition from the hospital to the outpatient CR program. The APRN can facilitate effective communication between the outpatient CR center and the inpatient team in order to provide patients with safe, unfragmented care.

Many institutions have implemented an automatic referral process to increase CR referrals (Tiller et al., 2013). The APRN can advocate for the development of a nurse-driven automatic bedside referral process to ensure that all eligible patients receive a CR referral. The study by Tiller et al. (2013) identified an increase in CR referrals from 26.7% to 79% after the implementation of a nurse-driven automatic bedside referral process which increased both referrals and CR participations. Hospitalized patients who are referred to CR before discharge are more likely to enroll in CR programs (Tiller et al., 2013). Nurses at The Miriam Hospital can achieve the same outcomes with a nurse-driven protocol with support from the APRN. With this data, APRNs can advocate for a similar system in order to improve CR referral and participation rates.

The purpose of this quality improvement project was to assess whether nurses' knowledge of CR increased after a CR educational program. This project helped to identify that there is a need for continued CR education for registered nurses. To achieve the best patient outcomes, the multidisciplinary team should share common goals when caring for patients eligible for CR. With the help and support from health care professionals, patients can invest in their health by making informed decisions that will certainly benefit them throughout their lifetime.

References

- Ades, P. A., Keteyian, S. J., Wright, J. S., Hamm, L. F., Lui, K., Newlin, K., ... Thomas, R. J. (2017). Increasing Cardiac Rehabilitation Participation From 20% to 70%: A Road Map From the Million Hearts Cardiac Rehabilitation Collaborative. *Mayo Clinic Proceedings*, 92(2), 234–242. doi: 10.1016/j.mayocp.2016.10.014
- Anderson, L., Oldridge, N., Thompson, D. R., Zwisler, A.-D., Rees, K., Martin, N., & Taylor, R. S. (2016). Exercise-Based Cardiac Rehabilitation for Coronary Heart Disease: Cochrane Systematic Review and Meta-Analysis. *Journal of the American College of Cardiology (JACC)*, 67(1), 1–12. <https://doi-org.ric.idm.oclc.org/10.1016/j.jacc.2015.10.044>
- Arena R, Williams M, Forman DE, Cahalin LP, Coke L, Myers J, ... Humphrey. (2012). Increasing referral and participation rates to outpatient cardiac rehabilitation: the valuable role of healthcare professionals in the inpatient and home health settings: a science advisory from the American Heart Association. *Circulation*, 125(10), 1321–1329. <https://doi-org.ric.idm.oclc.org/10.1161/CIR.0b013e318246b1e5>
- Centers for Disease Control and Prevention. (2019, December 2). Heart Disease Facts. Retrieved from <https://www.cdc.gov/heartdisease/facts.htm>
- Centers for Disease Control and Prevention. (2020, April 22). Million Hearts® Cardiac Rehabilitation. Retrieved from <https://millionhearts.hhs.gov/tools-protocols/tools/cardiac-rehabilitation.html>
- Donabedian, A. (1988). The Quality of Care. *Jama*, 260(12), 1743. doi:10.1001/jama.1988.03410120089033

Hammill BG, Curtis LH, Schulman KA, Whellan DJ, Hammill, B. G., Curtis, L. H., ...

Whellan, D. J. (2010). Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly Medicare beneficiaries. *Circulation*, 121(1), 63–70. <https://doi-org.ric.idm.oclc.org/10.1161/CIRCULATIONAHA.109.876383>

Golwala, H., Pandey, A., Ju, C., Butler, J., Yancy, C., Bhatt, D. L., ... Fonarow, G. C.

(2015). Temporal Trends and Factors Associated with Cardiac Rehabilitation Referral Among Patients Hospitalized with Heart Failure: Findings From Get With The Guidelines-Heart Failure Registry. *Journal of the American College of Cardiology (JACC)*, 66(8), 917–926. <https://doi-org.ric.idm.oclc.org/10.1016/j.jacc.2015.06.1089>

Grossman, J. A. C. (2016). Cardiac Rehabilitation Enrollment and the Impact of Systematic Nursing Interventions for Postmyocardial Infarction and Stent Patients. *Clinical Nursing Research*, 25(4), 378–390. <https://doi-org.ric.idm.oclc.org/10.1177/1054773815620777>

Herber, O. R., Smith, K., White, M., & Jones, M. C. (2017). ‘Just not for me’ - contributing factors to nonattendance/noncompletion at phase III cardiac rehabilitation in acute coronary syndrome patients: A qualitative enquiry. *Journal of Clinical Nursing*, 26(21-22), 3529-3542. doi:10.1111/jocn.13722

Kadian R, Hooda S, Khandelwal S. A study to evaluate the effectiveness of planned teaching program on knowledge of staff nurses regarding cardiac rehabilitation working in Pt. B D Sharma PGIMS Rohtak, Haryana. *Int J Res Rev*. 2016; 3(8):36-42

- Kellogg, W. K. (2004). Using logic models to bring together planning, evaluation, and action: Logic mode development guide. Michigan: WK Kellogg Foundation.
Retrieved from <http://www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf>
- Lodge, F. M., & Yousef, Z. (2016). The pathophysiology of heart failure. *British Journal of Primary Care Nursing: Cardiovascular Disease, Diabetes & Kidney Care*, S12–S16. Retrieved from
<http://search.ebscohost.com.ric.idm.oclc.org/login.aspx?direct=true&db=rzh&AN=131930174&site=ehost-live>
- Mcintosh, N., Fix, G. M., Allsup, K., Charns, M., Mcdannold, S., Manning, K., & Forman, D. E. (2017). A Qualitative Study of Participation in Cardiac Rehabilitation Programs in an Integrated Health Care System. *Military Medicine*, 182(9). doi:10.7205/milmed-d-17-00053
- Nadarajah, S. R., Buchholz, S. W., Wiegand, D. L., & Berger, A. (2016). The lived experience of individuals in cardiac rehabilitation who have a positive outlook on their cardiac recovery: A phenomenological inquiry. *European Journal of Cardiovascular Nursing*, 16(3), 230-239. doi:10.1177/1474515116651977
- Norris, T. L. (2019). *Porth's pathophysiology: Concepts of altered health states*. Philadelphia: Wolters Kluwer.
- O’Gara PT, Kushner FG, Ascheim DD, Casey DE Jr, Chung MK, de Lemos JA, ... Tommaso JE. (2013). 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on

- Practice Guidelines. *Circulation*, 127(4), 529–555. <https://doi-org.ric.idm.oclc.org/10.1161/CIR.0b013e3182742c84>
- Peate, I., & Jones, N. (2014). Pathophysiology series 2: acute myocardial infarction. *British Journal of Healthcare Assistants*, 8(5), 214–219. Retrieved from <http://search.ebscohost.com.ric.idm.oclc.org/login.aspx?direct=true&db=rzh&AN=103949602&site=ehost-live>
- Sanchis-Gomar, F., Perez-Quilis, C., Leischik, R., & Lucia, A. (2016). Epidemiology of coronary heart disease and acute coronary syndrome. *Annals of translational medicine*, 4(13), 256. doi:10.21037/atm.2016.06.33
- Sandesara, P. B., Lambert, C. T., Gordon, N. F., Fletcher, G. F., Franklin, B. A., Wenger, N. K., & Sperling, L. (2015, February 3). Cardiac rehabilitation and risk reduction: time to "rebrand and reinvigorate". Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/25634839>
- Servey, J. T., & Stephens, M. (2016). Cardiac Rehabilitation: Improving Function and Reducing Risk. *American Family Physician*, 94(1), 37–43. Retrieved from <http://search.ebscohost.com.ric.idm.oclc.org/login.aspx?direct=true&db=rzh&AN=116351682&site=ehost-live>
- Thomas, R. J., Balady, G., Banka, G., Beckie, T. M., Chiu, J., Gokak, S., . . . Wang, T. Y. (2018). 2018 ACC/AHA Clinical Performance and Quality Measures for Cardiac Rehabilitation: A Report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. *Circulation: Cardiovascular Quality and Outcomes*, 11(4). doi:10.1161/hcq.0000000000000037

- Tiller, Sueann BN; Leger-Caldwell, Louise BScN; O'Farrell, Patricia BScN; Pipe, Andrew L. CM, MD, LLD(Hon), DSc(Hon);; Mark, Amy E. PhD Cardiac Rehabilitation: BEGINNING AT THE BEDSIDE, Journal of Cardiopulmonary Rehabilitation and Prevention: May/June 2013 - Volume 33 - Issue 3 - p 180-184
doi: 10.1097/HCR.0b013e31827e14da
- Wall, H. K., Stolp, H., Lucido, B., & Graff, K. (n.d.). Million Hearts Cardiac Rehabilitation Change Package. Retrieved from
https://millionhearts.hhs.gov/files/Cardiac_Rehab_Change_Pkg.pdf
- Widmer, R. J., MD. (n.d.). Cardiac Rehabilitation in 2017: Factors That Determine Its Benefit. Retrieved from <https://www.acc.org/latest-in-cardiology/articles/2017/07/14/08/27/cardiac-rehabilitation-in-2017>
- Yancy, C. W., Jessup, M., Bozkurt, B., Butler, J., Casey Jr, D. E., Drazner, M. H., ... Sam, F. (2013). 2013 ACCF/AHA Guideline for the Management of Heart Failure: Executive Summary: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*, 128(16), 1810–1852. [https://doi-
org.ric.idm.oclc.org/10.1161/CIR.0b013e31829e8807](https://doi-
org.ric.idm.oclc.org/10.1161/CIR.0b013e31829e8807)

Appendix A

Informational Letter

Registered Nurses' Knowledge of Cardiac Rehabilitation: A Quality Improvement Project

4 West Nurses,

Karen Reyes, a Nurse Practitioner Student in the Masters Program at Rhode Island College, along with the Principal Investigator, Kara Misto, is completing a quality improvement project on 4W as part of her Master's program. The purpose of this quality improvement project is to assess whether a cardiac rehab educational program increases nurses' knowledge of CR. In order to complete this quality improvement project, you are being asked to participate. Participation is voluntary. If you agree to participate, it will involve the completion of an anonymous pre-test, a 15-minute education session, and the completion of an anonymous post-test which is identical to the pre-test. The goal of this project is to improve nurses' knowledge of cardiac rehab so they can educate patients on the benefits of a cardiac rehab program and advocate for those in need of a referral.

The pre/posttest will consist of 10 cardiac rehab questions. The test questions will measure cardiac rehab knowledge and should not cause any level of discomfort. Participation in the pre/posttest is voluntary and you may withdraw at any given time. No personal information or identifiers will be collected.

If you have any questions or concerns regarding the project, you may contact me at (401) 419-3012 or kreyes_4323@email.ric.edu. You may also contact Patricia Calvert, the major advisor of this project at (401) 456-6323 or pcalvert@ric.edu or Dr. Kara Misto at (401) 456-8013 or kmisto@ric.edu. I look forward to working the nurses on the 4W and hope you will consider participation in this quality improvement project.

Thank you,

Karen Reyes

Appendix B

Cardiac Rehabilitation What we need to know

Karen Reyes
Rhode Island College

Objectives

The Learner will be able to:

- Define cardiac rehabilitation.
- List the core components of a cardiac rehab program.
- Identify patients who are eligible for cardiac rehab.
- Describe the phases of cardiac rehab.
- List several barriers to cardiac rehab.
- Discuss the Cardiac Rehab Change Package.
- Describe the goals of Cardiac Rehab.

What is Cardiac Rehab (CR)?

- Cardiac rehabilitation is a medically supervised program that integrates cardiovascular monitoring, behavioral modification, psychological counseling, and education.
- The aim is to reduce the risk factors associated with heart disease.
- AHA/ACC Guidelines: Class I level of recommendation for secondary prevention.
- **MISSION** :To restore and maintain an individual's optimal physiological, psychological, social and vocational status.

Core Components of CR

- Each component requires an assessment, intervention(s), and expected outcomes as it pertains to the patient.
- Each patient's treatment plan is individualized
- **Need a multidisciplinary team of:**
 - Physicians, Registered Nurses, Exercise Physiologists, Physical Therapists, Clinical Psychologists, Social Workers, Pharmacists, Dieticians.

Who is eligible for Cardiac Rehab?

- Myocardial Infarction
- Coronary Artery Bypass Surgery
- Heart Valve Repair or Replacement
- Percutaneous intervention with Coronary Angioplasty or Coronary Stenting
- Heart Transplant
- Stable Angina
- Heart Failure with reduced left ventricular ejection fraction

Improve functional capacity

Identify, modify, and manage risk factors to reduce disability, morbidity & mortality

Alleviate/lessen activity related symptoms

Educate patients regarding the management of heart disease & prevention strategies

Improve quality of life

Goals of Cardiac Rehab

Phases of Cardiac Rehab

- Telemetry Monitored
- Individualized Exercise Prescription
 - Functional capacity from entrance stress test
 - Orthopedic Restrictions and limitations
 - Functional & occupational goals
- Cardiovascular monitoring
 - Frequency, Duration, Mode, Progression, and Intensity
- Varying levels of intensity
- Resistive training
 - Muscle fatigue at 12-15 reps
 - 1-2 sets for the major muscle groups
- Exercise benefits: Improves Strength & Endurance
 - Helps manage blood pressure, glucose, body weight, lipids, stress, anxiety, and depression.

Patient Education and Counseling

- Delivering education in ways that meet learning needs.
 - Barrier: Meeting patient's individual learning needs based on age, cultural differences, educational levels, learning styles.
- Educational Goals:
 - Risk Factor education & intervention
 - Symptom recognition and management
 - Medication usage
 - Provide patients with the tools, knowledge and motivation to successfully battle the progression of CVD.
- Overall, we want to provide a creative, enjoyable and interactive environment to assist patients with making behavioral changes.

Why is Cardiac Rehab underutilized ?

- 70 % of eligible patients being treated for cardiac disease do NOT receive CR referral
- Lack of referrals
- Barrier's to participation
- Patient Barriers:
 - Strength of referrals,
 - Lack of knowledge,
 - Biases/ personal opinions.
- Provider Barriers
 - Transportation, distance to travel
 - Family commitments
 - Conflict with work
 - Co-pay,
 - Gender differences, lower referral & participation rates in women.

Cardiac Rehab Outcomes

Decreased severity of angina & need for anti-angina medications

Decreased hospitalizations

Reduced risk of fatal myocardial infarction

Decreased cost of physician office visits & hospitalizations

Decreased ER visits

Decreased all- cause mortality

Cost effectiveness: Studies, adjusted for quality of life, show savings of \$4,950 - \$9,200 per year of life saved

Research Evidence supporting Benefits of Cardiac Rehab

Physiological

- ↑Exercise tolerance
- ↑Muscle Strength
- ↓Symptoms of angina
- ↓Myocardial Ischemia
- ↓Morbidity / Mortality

Psychosocial

- ↑ Return to Work
- ↓ Depression
- ↓ Anxiety
- ↑ Psychological Well being
- ↑ Quality of Life

Improved Health Habits

- Dietary Habits
- Exercise habits
- Smoking habits
- Body weight
- Lipid profile

- A listing of process improvements that CR champions can implement as they seek optimal CR utilization. It is composed of change concepts, change ideas, tools and resources.
- Each change concept and idea is paired with tools and resources suggested by experts in the field who have successfully used them.
- The purpose of the CRCP is to help quality improvement teams from hospitals and CR programs put systems and strategies in place that target improved care for eligible patients.
- The CRCP is broken down into four main focus areas: Systems Change, Referrals, Enrollment and Participation, and Adherence.

Appendix C

Cardiac Rehabilitation

This program will determine whether nurses' knowledge of cardiac rehab will increase after delivering a 15-minute educational program on cardiac rehab. Participation is voluntary, and information will be kept confidential. Please do not write any identifiable information. Participants are meant to be anonymous.

Multiple Choice Questions: Please choose the best answer for questions 1-10.

1. What is cardiac rehabilitation?

- ☐ An exercise program delivered in a gym for cardiac patients.
- ☐ A medically supervised program that consists of monitored cardiovascular conditioning, behavior modification, counseling & education.
- ☐ A secondary prevention program solely based on exercise endurance and nutrition education.
- ☐ An exercise program that consists of high-intensity interval training and weight lifting.

2. What are the conditions that qualify for Cardiac Rehab? Choose the **best** answer.

- ☐ Unstable angina, peripheral vascular disease, and deep vein thrombosis.
- ☐ Coronary artery bypass graft, elective percutaneous intervention, dilated cardiomyopathy.
- ☐ Heart failure with EF <35%, coronary artery bypass graft, acute myocardial infarction.
- ☐ NSTEMI, aortic valve replacement, and unstable angina.

3. Who is responsible for referring patients to cardiac rehab?

- ☐ Cardiologist
- ☐ Primary care providers
- ☐ Nurses
- ☐ All of the above

4. Why are CR programs so underutilized?

- ☐ Lack of patient interest.
- ☐ Lack of CR referrals.
- ☐ Lack of transportation for patients to a cardiac rehab center.
- ☐ All of the above.

5. Answer true or false. The goal of the Million Hearts Cardiac Rehabilitation Collaborative is to set a national goal of 40% participation in cardiac rehab and to prevent one million acute cardiovascular events by 2022.

☐ True
☐ False

6. What is the Cardiac Rehab Change Package?

☐ A phone application used to determine which patients are eligible for CR.
☐ A listing of process improvements that CR staff and hospital quality improvement Teams can implement to increase CR participation rates.
☐ A CR program guide that instructs how CR programs should managed and operated.
☐ An action plan consisting of two focus (enrollment and adherence) that organizations may use to increase CR utilization.

7. The ultimate goal of a CR program is to:

☐ Increase exercise endurance.
☐ Prevent secondary complications and give patients the tools/skill they need to manage their condition(s) independently upon completion of a CR program.
☐ Increase physical activity and acquire healthy eating habits during CR.
☐ Educate on healthy eating, physical activity, disease management, smoking cessation within a 25-week CR program.

8. When should a post myocardial infarction patient start phase II cardiac rehab?

☐ Immediately after hospital discharge
☐ One week after discharge
☐ 4 weeks after discharge
☐ 2 weeks after discharge

9. If CR participation rates increased to a least 70%, it is estimated at 25,000 deaths and 180,000 hospitalizations could be prevented.

☐ True
☐ False

10. How can nurses facilitate CR referrals?

- ☐ Educating patients about the benefits of CR.
- ☐ Placing a CR referral as part of an order set.
- ☐ Advocating for patients who are eligible for CR to be referred to a program.
- ☐ Both A and C