Cardiac Rehabilitation Education Module for Entry-Level Occupational Therapists

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Cardiac Rehabilitation Education Module

for Entry-level

Occupational Therapists

by

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A Scholarly Project

Submitted to the Occupational Therapy Department

of the

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in partial fulfillment of the requirements

for the degree of

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This Scholarly Project Paper, submitted by Bonnie Hoff, OTR/L. in partial fulfillment of the requirement for the Degree of Master's of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

[Signature]
Faculty Advisor

6-18-07
Date
PERMISSION

Title: Cardiac Rehabilitation Education Module for Entry Level Occupational Therapists
Department: Occupational Therapy
Degree: Master's of Occupational Therapy

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ABSTRACT

According to the American Heart Association (2007) statistics, it is estimated that 79,400,000 American adults have one or more types of cardiovascular disease, or one in every three people. It is estimated that 37,500,000 are over the age of 65 years (AHA, 2007). Heart disease and stroke are the first and third leading cause of death for both men and women in America and accounts for 40% for all deaths, according to the Center for Disease Control and Prevention (CDC, 2005). Approximately one individual will die from heart disease every thirty-three seconds (CDC, 2005).

According to the CDC (2005), a key strategy for improving survival rates and decreasing the financial impact of CVD is to provide the public and health care practitioners with education pertaining to risk factor reduction. It is imperative that qualified healthcare professionals, such as occupational therapists, have the information and skills necessary to provide their clients with: 1) the education and training to reduce modifiable risk factors, 2) how to recognize the signs and symptoms of heart disease, 3) to understand the importance of early intervention and 4) to make necessary life-style changes, to achieve these goals (CDC, 2005).

Cardiac rehabilitation (CR) is a holistic treatment intervention, implemented by a multidisciplinary team of professionals. The goal of CR is to reduce the potential for future cardiac events, reduce disability, dysfunction and or mortality following a cardiac event. Occupational therapists can be valuable members of a CR team.
An extensive review to the literature reveals there is limited information available pertaining to the role of occupational therapists on a CR team from an occupational therapists (OT) perspective. The problem is there are no clear standards of practice for occupational therapists (OT) in cardiac rehabilitation. The information that is available is vague, specifically when it pertains to exercise prescription and ever changing cardiac interventional procedures. This can result in OT’s not considering cardiac rehabilitation based on the lack of organized information from an OT perspective and the OT profession as a whole. This results in the loss of valuable insight and therapeutic approaches from occupational therapists for both their potential clients and cardiac rehabilitation healthcare colleagues.

The methods used to investigate and examine these issues included: professional journals, publications, and standards of practice and clinical guidelines by renowned authorities associated with CHD treatment and intervention. In addition, the author of this project has significant clinical experience of 15 years in this area of expertise.

The proposed solution, to the problem, is the development of the Cardiac Rehabilitation Education Module for Entry-level Occupational Therapists. This is a comprehensive education module that encapsulates all the information relevant to CR for an OT who wishes to pursue a role on a multidisciplinary CR team from an OT perspective. The educational module manual covers 13 educational units, designed to be presented over the course of thirteen weeks or one full semester.
CHAPTER I
INTRODUCTION

According to the U.S. Department of Health and Human Services, Center for Disease Control and Prevention (CDC, 2005), heart disease is the number one killer in America accounting for 40% of all deaths (CDC, 2005). However tremendous advancements in medical intervention and treatment of the cardiac patient has resulted in increased survival rates. The risk of heart disease and future cardiac events could be reduced by 90% with the implementation of healthy behaviors that, 1) control high blood pressure, 2) lower cholesterol, 3) abstain from tobacco use, 4) increase physical activity, 5) implement healthy nutritional habits, and 6) manage diabetes (CDC, 2005). Regardless of the information available, heart disease continues to impact the lives of almost one fourth of the American population (CDC). It is not until after the first cardiac event, when patients are referred to cardiac rehabilitation (CR) that the information to reduce the risk of coronary heart disease (CHD), or the progression of heart disease becomes relevant or of importance.

There are numerous excellent resources available, based on research, that provide information as to best practice components of a cardiac rehabilitation programs. This information includes: staffing needs; the benefits of cardiac rehabilitation and; the care of the patient with cardiac disease. However, the literature review provides limited information regarding the unique contributions an occupational therapist can provide on a
multidisciplinary cardiac rehab team or the perspective of cardiac rehabilitation from an occupational therapists point of view.

Occupational therapists (OTs), who currently provide services in cardiac rehabilitation, recognize the valuable contributions occupational therapy has to offer in this specialty area. OTs consistently comments about the need for more occupational therapist in cardiac rehabilitation. As the population ages and the number of patients requiring cardiac rehabilitations services increases so will the need for qualified health care professionals. Occupational therapists are in an excellent position to meet the needs of the cardiac rehabilitation patient and be an integral part of a multidisciplinary cardiac rehabilitation team.

The literature review investigated why there is a limited representation of occupational therapy in cardiac rehabilitation, especially in the midst of other well recognized allied health care professionals included on a multidisciplinary CR team. The literature review revealed that there is limited information available from an occupational therapists perspective pertaining to: 1) the role of occupational therapy on a multidisciplinary cardiac rehab team; 2) awareness among other health care professionals as to the unique contributions occupational therapy has to offer on a CR team; 3) a limited awareness of cardiac rehabilitation within the occupational therapy profession and; 4) limited resources from an comprehensive education model that an OT can refer to when exploring a career in cardiac rehabilitation. These issues led to the desire of an occupational therapist, who works in cardiac rehabilitation, to design and develop an educational resource for occupational therapists to refer to when considering a career in CR.
Educational Module Design

The Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists is a resource that maybe utilized by occupational therapy educators to facilitate student’s interest in cardiac rehabilitation and promote the role of occupational therapy in this practice area. This is a comprehensive education module that encapsulates all the information relevant to CR for an OT who wishes to pursue a role on a multidisciplinary CR team from an OT perspective. The educational module manual has 13 educational units, that are designed to be presented over the course of thirteen weeks or one full semester.

Theoretical Model

Malcolm Knowle's theory of Andragogy is the theoretical basis of the product. Andragogy is defined as the methods or techniques used to teach adults (Dictionary.com, 2007). This theory recognizes the individual’s prior knowledge, skills and accomplishments promoting an adult approach to learning while facilitating an interest to obtain additional knowledge. Since the product was intended to be used by occupational therapists, OTs are the adult learners of this product. Knowles' theory has five assumptions of adult learners which are listed here and defined in more detail in Chapter II:

1. Self-Concept
2. Experience
3. Readiness
4. Orientation
5. Motivation

Conclusion

Occupational therapists are committed to maximizing function, preventing dysfunction and/or disability and improving quality of live through education, intervention
Cardiac rehabilitation programs are an ideal opportunity to exercise this commitment (Reitz, S.M. 1999).

The scholarly project is presented in the following four chapters. Chapter II presents the review of professional literature regarding the: 1) holistic approach to the management of the patient with CVD; 2) identification of standards of practice for occupational therapists in cardiac rehabilitation and; 3) literature that supports the role of occupational therapy in cardiac rehab. Chapter III will present the methodology of how the information from the literature review and clinical experience was used to develop the educational module.

Chapter IV presents the outline and design of the Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists. The educational module itself will be provided, in its entirety in Appendix A. Chapter V provides the conclusion, recommendations and limitations of the scholarly project.
CHAPTER II
REVIEW OF THE LITERATURE

Introduction

Regardless of the amount and variety of information available to the public, the American Heart Association (AHA) reports that cardiovascular disease remains the number one killer of Americans (AHA, 2007). Unfortunately for many individuals, meaningful information pertaining to reducing risk factors and the promotion of health and disease prevention does not become meaningful or important until after the first coronary event and hospitalization.

According to the American Heart Association (2007) statistics, it is estimated that 79,400,000 American adults have one or more types of cardiovascular disease, or one in every three people and that 37,500,000 individuals are over the age of 65 years. (AHA, 2007). Heart disease and stroke are the first and third leading cause of death for both men and women in America and accounts for 40% for all deaths, according to the Center for Disease Control and Prevention (CDC, 2005). Approximately one individual will die from heart disease every thirty-three seconds (CDC, 2005).

Although the incidence of cardiovascular disease (CVD) increases with age, CDC statistics show that the number of sudden deaths among individuals age 15-34 years has increased (CDC, 2005). In addition, cardiovascular disease is the leading cause of premature or permanent disability in the American workforce. In 2005, CVD was
responsible for $152 billion dollars in lost productivity from death or disability and an estimated health care cost that exceeded 242 billion dollars (CDC, 2005).

According to the CDC (2005), a key strategy for improving survival rates and decreasing the financial impact of CVD is to provide the public and health care practitioners with education pertaining to risk factor reduction. It is imperative that qualified healthcare professionals, such as occupational therapists, have the information and skills necessary to provide their clients with: 1) the education and training to reduce modifiable risk factors, 2) how to recognize the signs and symptoms of heart disease, 3) to understand the importance of early intervention and 4) to make necessary life-style changes, to achieve these goals (CDC, 2005).

The literature review revealed a vast amount of excellent information and resources, pertaining to a holistic approach to the management of the patient with CVD, which can easily become overwhelming. The problem is that there are no clear standards of practice for occupational therapists (OT) in cardiac rehabilitation. The information that is available is vague, specifically when it pertains to exercise prescription and ever changing cardiac interventional procedures. This can result in OT’s not considering cardiac rehabilitation due to the lack of organized information from an OT perspective and from the OT profession as a whole. This results in the loss of valuable insight and therapeutic approaches, from occupational therapists that both their potential clients and cardiac rehabilitation healthcare colleagues could benefit from.

It is believed that upon presentation of the needs, there will be significant literature to support the role of occupational therapy in cardiac rehab. In addition, the limited information
currently available will support the need for additional educational materials to be developed to prepare occupational therapists for this specialty area.

**Outpatient Cardiac Rehabilitation Programs**

All major illnesses treated in rehabilitation settings, including CVD have the potential to interfere with the individual’s physical and psychological functioning resulting in dysfunction. Cardiac rehabilitation (CR) is designed to assist patient’s recovery both physically and mentally, from coronary heart disease. The goals are to: 1) reduce disability from a recent event; 2) reduce a current heart condition from progressing and; 3) reduce the risk of another cardiac event (AHA, 2005). CR is an integral part of a health orientated process to help individuals who have survived a cardiac event to achieve their greatest possible level of physical, mental, spiritual, social, and economic functioning (Mitchell, Muggli & Sato, 1999).

Cardiac rehabilitation programs are medically supervised programs consisting of various phases such as: acute hospitalization, outpatient recovery and re-entry to the community. The most frequently addressed performance issues in CR include:

1. A loss of ability to participate in occupational roles following a coronary event;
2. A decrease in endurance;
3. A decrease in strength;
4. Increased fatigue;
5. Pulmonary compromise;
6. Post procedural and/or surgical restrictions;
7. A fear of an additional cardiac event with activity
These issues can be effectively addressed by various members of the cardiac rehabilitation team.

**The Team**

Providing quality care for the CR patient, family and/or caregivers requires effective leadership. Administrative leadership provides direction and assistance for program planning, program and staff growth, integration of policies and procedures to adhere to facility, state, and national practice guides for reimbursement of services rendered and the coordination of program services.

To ensure that qualified professionals provide CR services, specific core competencies were established regardless of discipline, to assure program competence. The following are basic core competencies for professionals that contribute to a multidisciplinary CR team (Roberts, Reel, Crist & Mitchell, 1999, AACVPR, 2004).

**Medical Director**

a) Minimum qualifications

- Cardiologist, Internist or other physician with interest and experience in the CR program; licensed to practice in the jurisdiction and with special competence in cardiovascular care
- Experienced in exercise testing, prescription and counseling
- Successful completion of an American Heart Association Advanced Cardiac Life Support (ACLS) course or experience and knowledge of emergency procedures

b) Preferred qualifications

- Board-certified cardiologist
- Experience in medical supervision of cardiovascular and rehabilitative services.

**Program Director**

a) Minimum qualifications
• Bachelor’s degree in a health field such as exercise science, or licensure in the jurisdiction (e.g. as a registered nurse or physical therapist).
• Experience or specialty training in cardiovascular rehabilitation
• Basic knowledge of exercise physiology, nutrition, risk factor and behavior modification strategies, counseling techniques and uses of educational programs technologies as applied to cardiovascular rehabilitative services
• Successful completion of Basic Life Support (BLS) course

b) Preferred qualifications
• Successful completion of Advanced Cardiac Life Support (ACLS) Course
• Certification by a professional organization that documents the individual’s core competencies.

AACVPR allows for flexibility among the disciplines, which are utilized to make up a multidisciplinary CR team. This flexibility assures access to CR and service for all patients with CVD including those living in rural areas where professional staff may be limited.

However, AACVPR has established core competencies for specific disciplines providing services within a multidisciplinary CR team, which are as follows;

1. Exercise Specialist
   a) Minimum qualifications
      o Certification, experience or training equivalent to that specified for Exercise Specialist by the ACSM
      o Experience in exercise program planning, supervision and counseling with cardiovascular patients.
   b) Preferred qualifications
      o Masters degree in exercise science or related field
      o ACSM Exercise Specialist certification

2. Health educator
   a) Minimum qualifications
      o Bachelor’s degree in a health education or related field
      o Experience in providing individual and group educational programs for patient and family members to reduce coronary heart disease risk factors and promote health self-maintenance
      o Experience in the wide range of available technologies to provide individual health self-monitoring and promote positive health behaviors
   b) Preferred qualifications
      o Certification as a health education specialist
      o Masters degree in health education

3. Occupational Therapist
   a) Minimum qualifications
      o Bachelor’s degree in occupational therapy
o License to practice as an occupational therapist in the jurisdiction, if applicable
o Registered with the American Occupational Therapy Association
o Experience in providing occupational therapy in cardiovascular disease patients or related field

b) Preferred qualifications
   o Graduate degree in occupational therapy or related illnesses.

CR requires a multidisciplinary team approach when providing care and treatment of the patient with CVD. Another important member of the team is the client and his or her family. The patient, family/caregivers and significant others are often overwhelmed by the amount of information they receive in the hospital. This often can result in frustration, anxiety, fear and the potential for non-compliance. To decrease or counteract these feelings, it is important that the patient and family are involved in a supportive program. The outpatient CR program is an excellent opportunity to:

1. assist patients and family in processing what has happened;
2. provide education to reduce the risk of a future cardiac event;
3. prescribe activity progression in a safe and supportive environment and
4. promote compliance with physician orders and medication prescription. In order for this process to be successful for the patient, it needs to begin with the collaboration of highly competent professionals

A holistic approach is imperative to achieve maximal physical and mental functioning in a safe and supportive environment (Robertson, Reel, Crist & Mitchell, 1999). A holistic approach needs to include the client, his or her family and the essential rehabilitation healthcare professions. This includes occupational therapists that can be valuable members of a cardiac rehab team. The educational background that occupational therapists receive in both physical disabilities and mental health provides them with unique skills, to contribute to the proficiency of care of the cardiac patient (Farr, 1996). Occupational therapists are committed to maximizing function, preventing dysfunction and/or disability and improving
quality of live through education, intervention and adaptation. Cardiac rehabilitation programs are an ideal opportunity to exercise this commitment (Reitz, S.M. 1999).

Role of Occupational Therapy

The Accreditation Council for Occupational Therapy Education (ACOTE) states the OT professional is educated as a generalist with a broad exposure to the delivery models system used in settings where occupational therapy is currently practiced and where it is an emerging as a service (ACOTE, 2006). The American Occupational Therapy Association (AOTA) recognizes health and wellness promotion as an established practice area for OT’s and is now embracing the emerging practice area of prevention (aota.org, 2007). The focus on health and wellness prevention is significant in cardiac rehabilitation.

The role of the OT, in the provision of services to cardiopulmonary rehabilitation patients, includes 1) evaluation, 2) intervention, 3) patient education counseling and 4) home program instruction. The goals for OT intervention may include: 1) assist patients to resume their valued life activities; 2) identify and reduce disease-related risk factors by modifying risky behaviors; 3) promote wellness; 4) decrease potential dysfunction both physically and mentally and; 5) to reduce the potential for future coronary events. To accomplish these goals, OT’s use graded activity progression and exercise prescription, while monitoring the physiological responses to activity progression. The focus of occupational therapy services is to reduce the potential for future coronary events.

The roles of a multidisciplinary team have a tendency to overlap with each member bringing their own unique contribution from each individual practice base. The OT has the skills and knowledge to rise to the demands of the roles needed to enhance the service
delivery of the multidisciplinary CR team and meet the needs of the CR patient. However, one needs to be able to prove competence in this area and educate other team members of the value of OT. Occupational therapists need education to provide appropriate, effective therapeutic intervention, education and counseling for patients with CHD. Through additional study, both competence and credibility can be achieved and the occupational therapist can be a highly qualified member of a multidisciplinary cardiac rehabilitation team.

Competency

The occupational therapist possesses the knowledge in medical science, human physiology, anatomy and psychology. This educational background prepares the occupational therapist to provide skilled professional contributions on a CR team. In addition the domain of occupational therapy lies in the knowledge of occupation and how engaging in occupation can be used to affect human performance and the effects of disease and disability. Performance changes are directed to support engagement in meaningful occupations or activity that subsequently affects health, well-being and life satisfaction. (AJOT 2002). This holistic view and approach combined with the occupational therapy educational background leaves the occupational therapist well suited to the holistic approach in the care and treatment of the CR patient.

Cardiac Rehabilitation Educational Module for OT’s

A review of the literature indicates that the current information is limited regarding the value of the occupational therapist’s role on the multidisciplinary CR team or the prevalence of occupational therapists involved in CR (Farr, 1996). The reasons for this limited involvement have been explored and include, but are not limited to:
1. Occupational therapy students have limited education regarding the value of occupational therapy in CR;
2. The roles of occupational therapy frequently overlap with the roles of physical therapists in CR and;
3. Health care professionals often do not recognize or have knowledge of the important unique roles occupational therapists can contribute to a CR team (Farr, 1996).

The proposed solution of this scholarly project is the development of a comprehensive educational module for the entry level OT interested in CR. The *Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists* encapsulates all of the information relevant to an OT assessment, intervention, treatment and outcomes data management related to coronary heart disease. This educational module will be reflective of an OT's clinical perspective of CR and the role of OT on a multidisciplinary team. This module is by no means all-inclusive regarding the amount of information necessary to achieving a specialty certification. It is imperative than one understands that additional education, clinical practice, and certifications are ongoing necessities for the occupational therapist that plans to specialize in CR.

**Design**

This teaching module is designed specifically to focus on the outpatient secondary prevention CR program, also known as ph 11 CR. It will follow all standards of best practice guidelines as established by the American Heart Association (AHA), American College of Sports Medicine (ACSM), American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), American College of American College of Cardiology (ACC), and the American Occupational Therapy Association (AOTA).

This module is designed as an orientation manual to be used by an OT instructor or mentor of an entry level OT, to promote learning the area of cardiac rehabilitation. It is to be
used to orientate the entry level OT to the role of OT and the skills required to provide services on a multi-disciplinary CR team.

The information is in an easy to use informational manual format, with the intention that the OT will be able to refer to this manual as a resource prior to and during clinical practice. It expands upon the information available in the OT literature and provides the entry level OT, with an organized reference from an OT perspective, to:

1. Apply it to clinical practice if one wants to pursue a career in CR,
2. Serve as a resource for students interested in CR and;
3. Promote the role of OT in CR.

The educational module has 13 educational units, which would be best presented over the course of thirteen weeks or one full semester. It is best to present one unit at a time in the small group setting to ensure: 1) not to overwhelm the learner, 2) allow time to process information, discuss new learning and ask questions, 3) allow for hands on labs during appropriate units and 4) allow for on-site opportunities to observe or practice newly learned skills and information.

This teaching module can be integrated into the students learning as an independent learning experience such as Special Topics, Independent Study, and Community Experience or within an applicable occupational therapy curricular course unit. Each student participating in this module should have access to this module as a personal reference.

**Theoretical Framework**

Theoretical models provide support and structure and a foundation for the OT student upon which to develop and implement programs. Malcolm Knowle's theory of Andragogy is the theoretical basis of the product. Andragogy is defined as the methods or techniques used to teach adults (Dictionary.com, 2007). Since the product was intended to be used by
occupational therapists, OTs are the adult learners of this product. In a discussion of Knowles' theory, Ross-Gordon (2003) stated the five assumptions of adult learners. These assumptions will be contrasted with the design of the product for occupational therapists.

6. **Self-Concept:** As a person matures, he or she moves from dependency of learning to self-directness. The education module is intended to provide educational information that occupational therapists can use to prepare themselves for the clinical role in cardiac rehabilitation. This product is a guide based on current literature in the field and should be changed as new information and research arises.

7. **Experience:** Adults draw upon their experiences to aid their learning. This product is meant to give therapists, interested in cardiac rehabilitation, some general information so that they can venture into this area and further their learning while working with this population.

8. **Readiness:** The learning readiness of adults is closely related to the assumption of new social roles. The therapist or student has made a decision to gain more knowledge and clinical informaiton about this population and feels ready to engage in that learning. Their formal occupational therapy education has also prepared them in regard to readiness.

9. **Orientation:** As a person learns new knowledge, he or she wants to apply it immediately in problem solving.

10. **Motivation** (Later added): As a person matures, he or she receives their motivation to learn from internal factors. The interests in this area is his or her primary motivation.

This theory recognizes the individual's prior knowledge, skills and accomplishments promoting an adult approach to learning while facilitating an interest to obtain additional knowledge. Use of this manual combined with above mentioned methods of teaching will assist the entry level OT to achieve each learning unit objective with the ultimate goal of acquiring the knowledge, skills and abilities in preparation for the role of the OT on a multidisciplinary CR team.
Summary

The literature review has presented the benefits of cardiac rehabilitation, the increasing need for cardiac rehabilitation intervention, and the need for a holistic team approach to include occupational therapists. The treatment of patients with cardiac disease is evolving at an amazing pace. New research and procedures have resulted in patients are living longer. With this longevity comes the pursuit of a quality life. The OT can influence this need by applying their unique skill as a member of the CR team.

It is hoped this educational module will provide the OT with information and education that professionals, who are part of the outpatient CR team, have access to. This ensures that the entry level OT will have additional tools to provide services with confidence on a multidisciplinary CR team.

The following is an outline of the educational module to be presented in chapter IV:

Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists

Unit I: Introduction and Purpose of Cardiac Rehabilitation
Unit II: Brief overview of Cardiac Anatomy and Disease Process
Unit III: Medical Procedures
Unit IV: Medications Used in Treatment
Unit V: Monitoring of the Patient in Cardiac Rehabilitation
Unit VI: Cardiac Rehabilitation Patient Evaluation
Unit VII: Treatment Planning and Intervention
Unit VIII: Home Program; Patient Education and Behavior Modification
Unit IX: Psychosocial Issues
Unit X: Special Populations
Unit XI: Documentation
Unit XII: Outcomes
Unit XIII: Managing Emergencies
CHAPTER III
METHODOLOGY

The Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists is designed for use by the entry-level occupational therapist as an educational resource when contemplating a career in cardiac rehabilitation. As an occupational therapist, working in cardiac rehabilitation for 15 years, it became evident that there is a limited number of occupational therapist working in this specialty area. This perception lead to the investigation as to the variables of why there is this discrepancy and what could be done to improve occupational therapy involvement in cardiac rehabilitation.

An extensive literature review was conducted spanning from 1996-2007, to compile data relevant to the following areas: 1) identifying the components of a cardiac rehabilitation program; 2) supporting the inclusion of the occupational therapist on a multidisciplinary cardiac rehabilitation team and; 3) the educational requirements needed to fulfill this role.

The literature review involved the examination of professional healthcare related journals, and the review of books authored by established heath care professional in the field of cardiac rehabilitation. It also included a review of the standards of practice in cardiac rehabilitation from the renowned Mayo Clinic in Rochester, MN and U.S. government health and human services information. In addition, the literature review obtained valuable information from American Occupational Therapy Association, American Heart Association, American Association of Cardiovascular and Pulmonary Rehabilitation, American College of Cardiology, American college of Sports Medicine and the National Heart Lung and Blood
Institute. These excellent resources established a foundation upon which to build this scholarly project and support the unique contributions an occupational therapist brings to the role of the cardiac rehabilitation specialist. The National Heart Lung and Blood Institute also granted permission to use the educational illustrations presented in the body of this project, they by enhancing the learning experience with visual aids.

The information gathered revealed that there is limited literature pertaining to the roles and involvement of occupational therapists in cardiac rehabilitation, therefore occupational therapists are not aware of the unique contributions they have to offer in this area. In addition there is a lack of knowledge among allied healthcare workers as to the valuable role and unique contributions occupational therapist can contribute to the multidisciplinary team.

Based upon a comprehensive literature review the *Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists* was developed. The education model is based upon the following information that is supported by research:

1. Anatomy of the heart and cardiac disease process,
2. Medical procedures used to manage cardiac disease,
3. Interventions used to reduce risk factors and progression of heart disease,
4. The roles of a multidisciplinary cardiac rehab team and
5. Patient education and counseling strategies used to promote behavior modification.

It is understood that by no means is this education model all inclusive of the skill, knowledge and abilities one needs for certification and it is understood that as in all specialty areas, continued education is required and is an ongoing process.
CHAPTER IV

PRODUCT

The purpose of the Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists is to expand upon the outpatient cardiac rehabilitation (CR) information available in the OT literature to provide the entry-level OT with the additional tools to be a confident member of the CR team. The module is presented, in its entirety, in Appendix A. It is a comprehensive education module that encapsulates all the information relevant to CR for an OT who wishes to pursue a role on a multidisciplinary CR team from an OT perspective. The educational module manual covers 13 educational units, designed to be presented over the course of thirteen weeks or one full semester.

This teaching module is designed specifically to focus on the outpatient secondary prevention CR program, also known as Phase I CR. It will follow all standards of best practice guidelines as established by the American Heart Association (AHA), American College of Sports Medicine (ACSM), American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), American College of Cardiology (ACC), and the American Occupational Therapy Association (AOTA). The educational manual is written in an organized manner, user friendly, easy to understand and provides clinical information based on current literature, research, practice guidelines and clinical experience.
This teaching module is by no means all inclusive of providing education to achieve a specialty certification. It is imperative than one understands that additional education; clinical practice and certifications are ongoing necessities for the occupational therapist that plans to specialize in CR.

**Theoretical Framework**

Theoretical models provide support and structure and a foundation for the OT student upon which to develop and implement programs. Malcolm Knowle's theory of Andragogy is the theoretical basis of the product. Andragogy is defined as the methods or techniques used to teach adults (Dictionary.com, 2007). Since the product was intended to be used by occupational therapists, OTs are the adult learners of this product. In a discussion of Knowles' theory, Ross-Gordon (2003) stated the five assumptions of adult learners. These assumptions will be contrasted with the design of the product for occupational therapists as follows:

11. **Self-Concept:** As a person matures, he or she moves from dependency of learning to self-directness. The education module is intended to provide educational information that occupational therapists can use to prepare themselves for the clinical role in cardiac rehabilitation. This product is a guide based on current literature in the field and should be changed as new information and research arises.

12. **Experience:** Adults draw upon their experiences to aid their learning. This product is meant to give therapists, interested in cardiac rehabilitation, some general information so that they can venture into this area and further their learning while working with this population.

13. **Readiness:** The learning readiness of adults is closely related to the assumption of new social roles. The therapist or student has made a decision to gain more knowledge and clinical information about this population and feels ready to engage in that learning. Their formal occupational therapy education has also prepared them in regard to readiness.

14. **Orientation:** As a person learns new knowledge, he or she wants to apply it immediately in problem solving.

15. **Motivation** (Later added): As a person matures, he or she receives their motivation to learn from internal factors. The interests in this area is his or her primary motivation.
This theory recognizes the individual’s prior knowledge, skills and accomplishments promoting an adult approach to learning while facilitating an interest to obtain additional knowledge. Use of this manual combined with above mentioned methods of teaching will assist the entry level OT to achieve each learning unit objective with the ultimate goal of acquiring the knowledge, skills and abilities in preparation for the role of the OT on a multidisciplinary CR team.

Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists

1. Introduction and Purpose of Cardiac Rehabilitation
2. Brief Overview of Cardiac Anatomy and Disease Process
   a. Cardiovascular diseases treated in outpatient CR
   b. Terms used to describe heart disease
   c. Atherosclerosis
   d. Angina
   e. MI
   f. CHF
   g. Sudden death
   h. Valve disease
3. Medical Procedures
   a. Cardiac stress test
   b. Percutaneous interventions
   c. Angiogram
   d. Angioplasty
   e. Stent
   f. Artherectomy
   g. Coronary bypass graft
   h. Valve replacement
   i. Heart transplant
   j. Implantable devices used in the treatment of heart disease Pacemaker
   k. AICD
   l. LVAD
4. Medications Used in Treatment
5. Monitoring of Patients in Cardiac Rehabilitation
   a. Heart Rate
   b. Blood pressure
   c. Oxygen saturation
d. Rate of perceived exertion scale  
e. Angina scale  
f. Dyspnea scale  
g. PVD Scale  
h. Electrocardiography monitoring

6. Cardiac Rehabilitation Patient Evaluation  
   a. Chart review  
   b. Patient interview and history data collection  
   c. Risk stratification  
   d. ADL, IADL evaluation  
   e. Physical examination

7. Treatment Planning and Intervention  
   a. Exercise and the coronary heart diseases connection  
   b. Contraindication to exercise testing  
   c. Exercise prescription  
   d. Principles of endurance and strength training

8. Home Program: Patient education and Behavior Modification  
   a. Basic counseling skills  
   b. Principles of adult learning  
   c. Risk factors  
   d. Interventions to facilitate behavioral change

9. Psychosocial Issues  
   a. Psychosocial evaluation  
   b. Psychosocial Benefits of participation in CR  
   c. Referral of patients for psychosocial intervention

10. Special Populations  
    a. Heart failure  
    b. Older patients  
    c. Women  
    d. Diabetes Mellitus

11. Documentation  
    a. CR documentation guidelines  
    b. Documentation forms  
    c. Documentation examples

12. Outcomes  
    a. AACVPR recommendations  
    b. Data collection tools  
    c. Examples of outcomes

13. Managing Emergencies  
    a. Potential risks of CR patient participation  
    b. Warning signs and symptoms to watch for  
    c. Staff training

The Cardiac Rehabilitation educational module is presented in its entirety in the appendix.
Cardiac Rehabilitation Education Module

for Entry-level

Occupational Therapists
Introduction

Welcome to the Cardiac Rehabilitation Educational Module for Entry-level Occupational Therapists. Cardiac rehabilitation (CR) is a rehabilitative service offered to patients during recovery, following a cardiac event.

Purpose

The purpose of this scholarly project was to provide the entry-level occupational therapist with a reference source when choosing to embark upon a career in cardiac rehabilitation. This project may also serve as an instructional tool for occupational therapy educators when introducing students to cardiac rehabilitation and for students who are interested in further study in the field of cardiac rehabilitation.

The information expands on the outpatient CR information available in the OT literature. This ensures that the entry level OT will have the necessary tools to provide services with confidence on a multidisciplinary CR team. This teaching module is by no means all inclusive of providing education to achieve a specialty certification. It is imperative than one understands that additional education; clinical practice and certifications are ongoing necessities for the occupational therapist that plans to specialize in CR.

Theoretical Base

Theoretical models provide support and structure and a foundation for the OT student upon which to develop and implement programs. Malcolm Knowle's theory of Andragogy is the theoretical basis of the product. Andragogy is defined as the methods or techniques used to teach adults (Dictionary.com, 2007). Since the product was intended to be used by occupational therapists, OTs are the adult learners of this product.
In a discussion of Knowles' theory, Ross-Gordon (2003) stated the five assumptions of adult learners. These assumptions will be contrasted with the design of the product for occupational therapists.

1. **Self-Concept**: As a person matures, he or she moves from dependency of learning to self-directness. The education module is intended to provide educational information that occupational therapists can use to prepare themselves for the clinical role in cardiac rehabilitation. This product is a guide based on current literature in the field and should be changed as new information and research arises.

2. **Experience**: Adults draw upon their experiences to aid their learning. This product is meant to give therapists, interested in cardiac rehabilitation, some general information so that they can venture into this area and further their learning while working with this population.

3. **Readiness**: The learning readiness of adults is closely related to the assumption of new social roles. The therapist or student has made a decision to gain more knowledge and clinical information about this population and feels ready to engage in that learning. Their formal occupational therapy education has also prepared them in regard to readiness.

4. **Orientation**: As a person learns new knowledge, he or she wants to apply it immediately in problem solving.

5. **Motivation** (Later added): As a person matures, he or she receives their motivation to learn from internal factors. The interests in this area is his or her primary motivation.

This theory recognizes the individual’s prior knowledge, skills and accomplishments promoting an adult approach to learning while facilitating an interest to obtain additional knowledge. Use of this manual combined with above mentioned methods of teaching will assist the entry level OT to achieve each learning unit objective with the ultimate goal of acquiring the knowledge, skills and abilities in preparation for the role of the OT on a multidisciplinary CR team.

**Design**

This teaching module is designed specifically to focus on the outpatient secondary prevention CR program, also known as PH11 CR. It will follow all standards of best practice guidelines as established by the American Heart Association (AHA), American
College of Sports Medicine (ACSM), American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), American College of Cardiology (ACC), and the American Occupational Therapy Association (AOTA).

The educational manual is written in an organized manner, user friendly, easy to understand and provides clinical information based on current literature, research, practice guidelines and clinical experience. The module is to be presented in a manual format, with the intention that the OT will be able to refer to this manual as a resource prior to and during clinical practice.

This module is also designed for small group classroom setting, covering each unit separately, using this manual, anatomical models, demonstration, pre/post tests, power point presentation, guest speakers and clinical hands on experience to provide an exciting learning experience for individuals interested in the role of OT on a multidisciplinary CR team.

**OT Academic Program**

This module is also designed as an orientation manual to be used by an OT instructor or mentor of an entry level OT, to promote learning the area of cardiac rehabilitation. This manual is to be used to orientate the entry level OT to the role of OT and the skills required to provide services on a multi-disciplinary CR team.

This teaching module would best be used as an independent learning experience such as Special Topics, Independent Study, and Community Experience or within an applicable course unit. Each student participating in this module should have access to this manual as a personal reference. Students may role-play and practice using the forms
included in the manual to imitate evaluation, treatment planning and implementation, teaching patients about risk factor modification and provide home program instruction.

This teaching module manual would best be used with small groups of individuals who are interested in pursuing a role on a multidisciplinary CR team. The instructor may choose to cover one or several units at a time depending on length and complexity of the unit and length of the class period. The instructor may chose to use diagrams and portions of the manual to prepare a power point presentation to be used while referring to the manual. In addition the instructor may choose to extract questions from the manual to formulate a pre-test and post test to assess learning after each unit has been covered.

Guest speakers familiar with the manual and providing services in CR may also be utilized to assist in the presentation of the educational units. Facilities providing CR services may be contacted and arrangements made to provide hands on clinical experience to provide the opportunity to practice newly learned information and skills in a fun and supportive environment.

The educational module manual covers 13 educational units, which would be best presented over the course of thirteen weeks or one full semester. It is best to present one unit at a time in the small group setting to ensure: 1) not to overwhelm the learner, 2) allow time to process information, discuss new learning and ask questions, 3) allow for hands on labs during appropriate units and 4) allow for on-site opportunities to observe or practice newly learned skills and information. The following 13 units to be presented are outlined as follows.
Outpatient Cardiac Rehabilitation Education Units

Unit I
Introduction and purpose of cardiac rehabilitation

Unit II
Brief overview of Cardiac anatomy and disease process
   a) Cardiovascular diseases treated in outpatient CR
   b) Terms used to describe heart disease
   c) Atherosclerosis
   d) Angina
   e) MI
   f) CHF
   g) Sudden death
   h) Valve disease

Unit III
Medical procedures used to treat cardiovascular diseases
   a) Cardiac stress test
   b) Percutaneous interventions
   c) Angiogram
   d) Angioplasty
   e) Stent
   f) Arterectomy
   g) Coronary bypass graft
   h) Valve replacement
   i) Heart transplant
   j) Implantable devices used in the treatment of heart disease Pacemaker
   k) AICD
   l) LVAD

Unit IV
Medications used in the treatment patients with coronary heart disease

Unit V
Monitoring of the cardiac patient
   a) Heart Rate
   b) Blood pressure
   c) Oxygen saturation
   d) Rate of perceived exertion scale
      Electrocardiography monitoring
      Angina, Dyspnea and PVD scales

Unit VI
Cardiac rehabilitation patient evaluation
   a) Chart review
b) Patient interview and history data collection
c) Risk stratification
d) ADL, IADL evaluation
e) Physical examination

Unit VII
Cardiac Rehabilitation treatment planning and intervention
  a) Exercise and the coronary heart diseases connection
  b) Contraindication to exercise testing
  c) Cardiovascular exercise physiology
  d) Exercise prescription

Unit VIII
Home program instructions Patient education and behavior modification for risk factor management
  a) Principles of adult learning
  b) Basic counseling skills
  c) Risk factors
  d) Interventions to facilitate behavioral change

Unit IX
Psychosocial issues
  a) Psychosocial evaluation
  b) Referral of patients for psychosocial intervention
  c) Psychosocial benefits of participation in cardiac rehabilitation

Unit X
Special populations
  a) Older patients
  b) Women
  c) Diabetes Mellitus

Unit XI
Documentation
  a) CR documentation guidelines
  b) Documentation forms
  c) Documentation examples

Unit XII
Outcomes
  a) AACVPR recommendations
  b) Data collection tools
  c) Examples of outcomes
Unit XIII
Managing emergencies
a) Potential risks of CR patient participation
b) Staff training
c) Warning signs and symptoms

The goal is to provide the OT with a valuable resource in order to gain information about the role of OT in cardiac rehabilitation.
UNIT ONE

INTRODUCTION AND PURPOSE OF CARDIAC REHABILITATION
What is Cardiac Rehabilitation (CR) ?

Goals and Objectives of Unit I

1. Gain an introduction to what is CR
2. Identify where and when CR services are provided
3. Identify what the components of a CR program are
4. Identify the Goals of CR services
5. Identify appropriate outpatient referral diagnoses
6. Identify the contraindications to implementing CR Services

Definition and Scope

The 2005 AHA/AACVPR scientific statement developed the following definition:

The term cardiac rehabilitation refers to the coordinated, multifaceted interventions designed to optimize a cardiac patient’s physical, psychological, and social functioning, in addition to stabilizing, slowing, or even reversing the underlying atherosclerotic process, thereby reducing morbidity and mortality. As such, cardiac rehabilitation/secondary prevention programs provide an important and efficient venue in which to deliver effective preventive care (p 1).

All major illnesses treated in rehabilitation settings, including CVD have the potential to interfere with the individual’s physical and psychological functioning resulting in dysfunction. Cardiac rehabilitation (CR) is designed to assist patient’s recovery both physically and mentally, from coronary heart disease. The goals are to: 1) reduce disability from a recent event; 2) reduce a current heart condition from progressing and; 3) reduce the risk of another cardiac event (AHA, 2005). CR is an integral part of a health orientated process to help individuals who have survived a cardiac event to achieve their greatest possible level of physical, mental, spiritual, social, and economic functioning. (Mitchell, Muggli & Sato, 1999).
Cardiac rehabilitation programs are medically supervised programs consisting of various phases such as: acute hospitalization, outpatient recovery and re-entry to the community. The most frequently addressed performance issues in CR include:

1. A loss of ability to participate in occupational roles following a coronary event;
2. A decrease in endurance;
3. A decrease in weakness;
4. Increased fatigue;
5. Pulmonary compromise;
6. Post surgical restrictions and;
7. A fear of an additional cardiac event with activity

These issues can be effectively deal with by various members of the cardiac rehabilitation team.

Team

A multidisciplinary team carries out CR services with each discipline bringing his/her unique professional background to the program. However professional roles will blend, overlap and be subject to cross-training to meet the needs of the patient in the delivery of CR services. Regardless of professional background the CR team follows standards of care established by the AHA, AACVPR, ACC, ACSM and the guidelines established for rehabilitation per each individuals facility (Robertson, Reel, Crist & Mitchell, 1999). A fear of loosing ones professional identity can be of great concern, therefore being part of a multidisciplinary team is not for everyone, but for those passionate in the delivery of services for the patient with cardiac disease it is a wonderful opportunity for continued learning

Where are outpatient CR services implemented?

- Hospitals
• Rehabilitation centers
• Free standing clinics
• Community health and wellness centers

When are outpatient CR services implemented?
Note: these are only basic guidelines. Each individual’s physician and facility will have its own specific guidelines and all will vary based on patient’s diagnosis, medical status and severity of illness and length of recovery.

• One week post MI, PTCA, Stent
• Three weeks post placement of an assist devices
• Three to Four weeks post CABG and Valve replacement/repair.

What are the components of an outpatient CR program?

• Patient evaluation, interview and exam
• Therapeutic exercise training and exercise prescription
• Daily physical activity counseling
• Nutritional Counseling/ weight management
• Diabetes management
• Lipid management
• Blood pressure management
• Smoking cessation
• Psychosocial Management
• Facilitating a life-long commitment to life-style change and risk factor reduction

The Goals of CR programs

• Decrease risk of debilitation, morbidity and mortality
• Reduce symptoms of angina, dyspnea, fatigue and improve quality of life
• Increase physical performance to meet the demands of life, work and leisure activity
• Decrease disability, dysfunction brought about by anxiety, fear and depression.
• Reduce the potential for self inflicted unhealthy behaviors and additional cardiac events.
• Reduce medical expenses and financial burden of poor health
• Increase self-efficacy, empowerment and knowledge to make healthy choices

Who is appropriate for an outpatient CR referral (Robertson, Reel, Crist & Mitchell, 1999)?

• Myocardial Infarction (MI)
• Stable angina
• Coronary Artery Bypass Graft Surgery (CABG)
• Valve repair or replacement
• Percutaneous transluminal coronary angioplasty (PTCA)
• Stent placement
• Arthrectomy
• Chronic stable heart failure (CHF), note with a recent coronary event
• Ventricular assist devices
• Heart transplant

Prior to participation in CR all patients should have had the opportunity to complete Advanced Directive forms. The results of these forms should be available to staff so that the patient can continue to direct their care in the event an emergency arises (Robertson, Rogers, Ewing & Bott, 2004).
UNIT II

BRIEF OVERVIEW OF

CARDIAC ANATOMY

&

THE DISEASE PROCESS
Brief Overview of Cardiac Anatomy & the Disease Process

Goals and Objectives of Unit II

1. Identify the coronary anatomical structures
2. Identify the components of cardiovascular functioning
3. Identify terms used to describe heart disease
4. Identify the atherosclerotic disease process
5. Identify diagnosis associated with coronary heart disease
6. Identify the signs and symptoms of angina
7. Identify signs and symptoms of MI
8. Identify signs and symptoms of CHF
9. Identify the 4 classes of heart failure depicting severity of disease by the New York Heart Association.

ANATOMY

The heart is a muscular organ located in the mediastinum, slightly to the left of the center of the chest. The sternum protects it anteriorly; it is protected laterally by the lungs and ribs and posteriorly by the thoracic vertebral bodies. The heart is cone shaped, with the top being broad and the apex narrow. The right side of the heart projects forward to the front of the chest with the left side rotating toward the spine.

The adult heart is approximately the size of an adults clenched fist and weights approximately ¾ of a pound. However size can vary depending on age, condition of the heart and disease process. (Gersh, 2000; NHLBI, 2007).

Heart Layers

The three layers of tissue that make up the muscular walls of the heart, working from inside to outside are the endocardium, myocardium and epicardium
- **Endocardium**: is the inner smooth layer of tissue that covers the inside of the four chambers, valves and muscles that attach the valves.

- **Myocardium**: the thick myocardium is predominantly made up of cells called myocytes. The myocytes respond to timed stimulus and work together to create sequenced contraction and relaxation phases of the hearts chambers allowing time for filling of blood and ejection of blood to the lungs and body.

- **Epicardium**: a thin glossy membrane called the epicardium covers the outside of the heart. The entire heart is securely contained in the pericardial sac. (Gersh, 2000).

## Chambers

The heart has four chambers. Right and Left atria and right and left ventricles.

Although the atria are muscular they are quite weak and primarily function as receiving chambers for the blood that is returning from the veins.

The ventricles are the lower chambers of the heart that receive blood passing through valves from the atria. The verticals are the main pumping chambers of the heart.

Each ventricle holds approximately ½ cup of blood when full and 1/8 cup of blood after it has contracted. Both ventricles have muscular walls.

<table>
<thead>
<tr>
<th>Right Atria (upper chamber of heart)</th>
<th>Left Atria (upper chamber of heart)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golf ball size, sits on top of the heart</td>
<td>Golf ball size, sits on top of the heart</td>
</tr>
<tr>
<td>The right atria receives deoxygenated blood from the superior and inferior vena cave and delivers deoxygenated blood to the right ventricle (Gersh, 2000).</td>
<td>The left atria receives blood high in oxygen from the lungs and delivers oxygen-rich blood to the left ventricle. (Gersh, 2000).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Right Ventricle (lower chamber of heart)</th>
<th>Left Ventricle (lower chamber of heart)</th>
</tr>
</thead>
<tbody>
<tr>
<td>is weaker and approximately ¼ of an inch thick</td>
<td>is approximately ¼ of an inch thick</td>
</tr>
<tr>
<td>is under low pressure and is responsible for</td>
<td>The left ventricle is the thickest and most</td>
</tr>
</tbody>
</table>
contracting and pushing blood to the lungs for oxygenation. (Gersh, 2000).

powerful muscle of the heart. It is responsible for receiving and delivering oxygen-rich blood to the entire body. (Gersh, 2000).

When the right ventricle faces resistance it is called pulmonary hypertension and this can have serious implications for heart damage.

When the left ventricle faces resistance, the muscle will enlarge resulting in hypertrophy, over time the muscular wall becomes dysfunctional and can result in left ventricular dysfunction (LVD).

ventricular wall thickness is of great importance when determining the extent of heart damage as a result of LVD and/or MI.

### Anterior view of the heart

Heart Valves

An internal wall of tissue called the **septum** divides the right and left sides of the heart. The septum between the atria is called the atrial or interatrial septum. The area of septum that divides the ventricles is called the ventricular or interventricular septum.

The four valves of the heart are the tricuspid valve, pulmonary or pulmonic valve, mitral valve and aortic valve. The valves assist the chambers of the heart pump blood
through the heart, to the lungs and body to meet the demands to the body. Each valve has a set of leaflets or cusps that open and close to assure blood flow in only one direction.

The **tricuspid valve** is located between the right atria and right ventricle. The pulmonic valve is located between the right ventricle and pulmonary artery. The mitral valve is located between the left atria and left ventricle and the aortic valve is located between the left ventricle and the aorta. When pushed open the tricuspid and mitral valves allow blood to flow from the atria to the ventricles, at this time the pulmonic and aortic valves are closed. During ventricular contraction the tricuspid and mitral valves are closed to prevent back flow of blood and the pulmonic and aortic valves are pushed open to allow blood flow to the lungs and body. (Gersh, 2000).

**Note:** one way to remember the mitral valve is on the left is to use the association of mitral and marriage, knowing the wedding ring is on the left finger. Diseases of the valves will be discussed in detail later in this chapter.

**Blood Flow**

The heart, like all organs and muscles, needs an oxygen rich supply of blood to function. The heart receives its blood supply via the coronary arteries located on the surface of the heart. The coronary arteries originate at the aorta and receive oxygen rich blood simultaneously as blood is pumped from the ventricle to the aorta and the entire body. The coronary arteries carry oxygen rich blood to all parts of the heart and penetrate deep into the heart muscle. Disruption of this process results in CVD. (NHLBI, 2007).

Blood, with low oxygen, flows back to the heart through the superior and inferior vena cava. The blood then enters the right atrium and is pumped to the right ventricle and then to the lungs, where oxygenation occurs. The oxygenated blood then returns to the left atria, and is then pumped to the left ventricle.
The left ventricle is then responsible for pumping blood to the entire body (NHLBI, 2007).

Coronary Arteries

The coronary arteries encircle the heart like a “crown” pertaining to the term coronary. The following coronary arteries are frequently evaluated and are cause for treatment during interventional strategies due to the coronary disease process.
The right coronary artery wraps around the heart between the right atria and right ventricle, sending branches to the marginal arteries. (Gersh, 2000). The right coronary artery is responsible for providing adequate blood flow to the SA node, this will be of importance to remember later in this chapter when we discuss the rationale for implantable devices.

The left main coronary artery, also known as the widow maker, branches into the left anterior descending artery, circumflex artery and other branches which supply the left side of the heart and left ventricle. In 90% of the population the left anterior descending artery is the main source of blood supply to the left ventricle the main pumping source of blood supply to the entire body. (Gersh, 2000).

This is why it is so important to monitor the left ventricle via EKG during cardiac rehabilitation. Due to the responsibility of left ventricle and ventricular function it is of utmost importance to know the functional level of the left ventricle and monitor this ventricle during exercise training.

**Electrical System**

The hearts electrical system is regulated by the autonomic system. It is responsible for the electrical conductivity that facilitates the contraction of the hearts chambers. The electrical conductivity of the heart regulates heart rate, which in normal adults are approximately 60-100 beats per minute.

The first electrical impulse originates high in the right atrium, at sight of the sinus node (SA node), also known as the hearts natural pacemaker. Firing of the SA node facilitates atrial contraction and propagation of electrical stimulus to the atrioventricular node (AV node). The AV node is located between the atria and ventricles. The AV node
delays the electrical impulse to allow for atrial contraction and relaxation prior to firing and facilitation of ventricular contraction. AV node firing facilitates electrical conduction down the His-Purkinje system located in the atiroventricular septum and specialized pathways resulting in right and left ventricular contraction. The following illustration depicts the electrical conductivity of the heart (NHLBI, 2007).

Cardiovascular Disease Processes

The AACVPR 2006 Cardiac Rehabilitation Resource Manual provides a clear explanation of the terms used to describe the various diagnosis of heart disease and ICD/9 codes assigned to these terms for reimbursement purposes. It is important to stay abreast of the terminology used to describe all of the various types of cardiovascular diseased as they are assigned to ICD/9 codes for reimbursement purposes. The terminology is subject to change as diagnosis are expanded upon, added to or deleted
from reimbursement sources. AACVPR is an excellent resource for up to date information on reimbursement issues related to all of the cardiovascular diseases. The terms are as follows: (Robertson, Park & Alexander, 2006).

**Cardiovascular Disease (CVD)**

CVD is used to describe all of the diseases of the cardiovascular system. When diagnosed with CVD one can assume wide spread artherosclerosis of the circulatory system in addition to the coronary circulatory system. The following list is descriptive of CVD.

- Stroke
- Hypertension
- Disease of the arterioles, and capillaries
- Disease of the veins, lymphatic and circulatory systems
- Diseases of the heart, coronary circulation, and coronary structures
- Peripheral vascular disease (PAD)

**Heart Disease (HD)**

Heart disease is the term used to describe all of the diseases that effect the coronary circulation, electrical system, and/or anatomical structures of the heart. The following is a list of diagnoses are examples of HD.

- Valvular heart disease
- Cardiomyopathy
- Heart Failure or congestive heart failure (CHF)
- Cardiac arrhythmias
- Congenital heart disease
Coronary Heart Disease (CHD)

CHD describes the atherosclerotic disease process of the coronary arterial circulation. The term CHD is synonymous with coronary artery disease (CAD), atherosclerotic heart disease (ASHD) and ischemic heart disease (IHD). These terms are used to identify the following diagnoses.

- **Angina pectoris**: caused by insufficient oxygenated blood supply to meet the demands of myocardial function. The greater the heart rate the greater the need for oxygenated myocardial blood flow.

- **Myocardial infarction (MI)**: Acute myocardial infarction is caused by the blockage and cessation of blood flow over time resulting in permanent damage to the myocardial muscle cells. (Miller, 2006).

Coronary heart disease, (CHD) results from a build up of plaque in one or more of the coronary arteries, this is known as **atherosclerosis**. CHD initially presents as angina pectoris or myocardial infarction (Gersh, 2000).

**Atherosclerosis**

Atherosclerosis of the coronary circulation is the most common cause of heart disease and death in the industrialized world. Atherosclerosis is caused by complex pathophysiological changes. These changes occur when cholesterol and other particles form plaque and settle at the site of an injured, inflamed, or structurally defective coronary artery. The following illustration depicts plaque accumulation within the arterial wall compliments of the (NHLBI, 2007).
Plaque Formation

The formation of plaque, which can be soft, hard, stable or unstable results in a thickening of the intimal lining of the arterial wall. As more materials and cholesterol migrate to the sight, the plaque begins to grow and obstruct the flow of blood in the arterial wall resulting in anginal symptoms. The plaque may rupture resulting in bleeding and blood clot formation, which can completely occluding the artery and lead to myocardial infarction. (McConnel & Klinger, 2005).

There are several theories as to the formation of plaque. The first one is the

*Response to injury*, which hypothesis the vascular wall is first injured either by turbulence, such as in untreated high blood pressure, resulting in lesions to the endothelium and the accumulation of plaque. In an effort to heal, the lesion plaque and
its constituents bind to the injured sight and proliferate, causing arterial narrowing with the potential to rupture and completely occlude the coronary artery (McConnel & Klinger, 2005).

The second is the role of the inflammatory process that occurs at the sight of the endothelial injury. The wall of the artery becomes inflamed as a result of injury. The accumulation of cells, to assist in healing, contributes to a large mass of cells in one area. This has the potential to result in a thinning of the arterial wall and destabilize plaque. Much like a large pimple the injured site ruptures and bleeds into the artery. This process then has the potential to cause a blood clot and occlude the arterial blood flow.

A third application to the atherosclerotic process is the role of infection. Age and genetic predisposition may result in lesions from infectious toxins. Infectious toxins destabilize plaque; increase cell proliferation and cause inflammation, which accelerates the atherosclerotic process. Suspected infectious agents include, Coxsackievirus Type B, herpesvirus, cytomegalovirus, Chlamydia pneumoniae and Helicobacter pylori. (McConnel & Klinger, 2005).

Note: Infection and its effect on heart disease will become more evident later in this chapter.

Angina

William Heberden first described angina pectoris in 1772. It is estimated that in the USA approximately 6,750,000 people experience anginal symptoms and approximately 350,000 new cases are diagnosed each year. Angina pectoris will affect 20-25% of men and 14-25% of women older than age 65 years.
Angina is caused by an interruption of oxygenated blood flow to meet the demands of the myocardium. Angina is usually of short duration and can be relieved by termination of activity, supplemental oxygen and/or nitroglycerin. Angina itself is not a heart attack however, if it lasts longer than 15-20 minutes this is usually significant for MI and emergency medical intervention is necessary (Miller, 2006).

Symptoms of angina pectoris typically are described as tightness, squeezing, dull pressure or uncomfortable ache of the sternum or center of the chest. The discomfort may radiate to the jaw, neck, scapular and arm and may be accompanied by shortness of breath, fatigue, diaphoresis and irregular heart rate (Miller, 2006).

There are several types of angina: stable, nocturnal, unstable and silent or ischemia. Each type has differing characteristics and are described in the following:

1. **Stable angina** is predictable and can be repeated at a constant heart rate and blood pressure achieved during activity or exercise. For example during a stress test if one has angina at a HR of 90 bpm and a BP of 120/75 mmHg anginal symptoms will again present when one is engaged in activity or exercise upon achieving the same HR and BP. For this individual this would be the point at which heart rate exceeds myocardial profusion of oxygenated blood flow, secondary to atherosclerosis and anginal symptoms will occur.

2. **Nocturnal angina** occurs in response to emotions, dreams and or sleep apnea. The heart rate increases during these periods resulting in inadequate myocardial blood supply to meet demand and the individual experiences angina during the night and is awakened by anginal symptoms.
3. **Unstable angina** can be triggered by emotions, environmental conditions, such as cold weather, after a large meal and with or without activity. Unstable angina is unpredictable in nature and difficult to determine exact cause.

4. **Silent angina or ischemia** is more common in diabetic patients and African Americans. In diabetic patients the delayed and or silent angina is contributed to neuropathy secondary to diabetes. Special care needs to be taken when working with diabetic patients as they will not experience early onset of angina and are unable to report early symptoms as a result of decreased sensation. Typically silent angina is diagnosed via an electrocardiograph or ECG (Miller, 2006).

Diabetes will be discussed in more detail in Unit X.

**Evaluation and Diagnosis**

The Evaluation of patients diagnosed with angina pectoris would include an interview pertaining to patient’s level of function in daily activities. This would include ability to meet the demands of ones daily function both physically and emotionally, in addition to the context and duration in which the function occurs. The interview would attempt to identify what precipitated the symptoms. Patients will typically provide accurate information as to the events precipitating anginal onset (Miller, 2006).

The diagnosis of angina may require a medicated, monitored exercise stress test followed up with nuclear imaging and angioplasty to determine the number of blocked arteries and extent of coronary arterial blockage restricting myocardial profusion.
Myocardial Infarct

Myocardial infarct (MI), more commonly known as a heart attack may present as the first “manifestation” of CHD. MI occurs when one or more of the coronary arteries are completely occluded, resulting in an inadequate oxygenated blood supply and nutrients to the myocardium. A coronary thrombus or bursting of plaque, causes bleeding and clot formation in the coronary artery often cause a complete occlusion. The blood clot restricts blood flow to a portion of the heart correlating to specific arterial supply.

MI results in irreversible damage to cells of the myocardium. The extent of damage is directly related to the length of time before any intervention, which in turn is directly related to degree of death to myocardial tissue as a result of loss of oxygenated blood flow. (Miller 2006).

Complications following MI have the potential to become quite debilitating interfering with functional capacity and the ability to meet the demands of daily life. The location and extent of myocardial damage impacts the heart’s ability to pump adequate oxygenated blood and nutrients to meet the body’s demands, which will result in fatigue, shortness of breath and exhaustion. A MI, involving the anterior portion of the heart, will impact the left ventricle, which supplies blood to the entire body. The amount of blood pumped in each contraction can be measured and is termed ejection fraction (EF). An impaired ejection fraction can lead to other cardiac complications such as congestive heart failure (Gersh, 2005).
**Congestive Heart Failure**

Congestive Heart Failure (CHF) is a syndrome that can be the result of several health issues. CHF is attributed to left ventricular dysfunction often experienced following an MI, resulting from diseased valves in cases of untreated high blood pressure, or associated with hereditary factors. Unfortunately heart failure is quiet common and on the rise.

Heart failure effects 2-3 of every one hundred people in America or more than 4,000,000 people. 35% of heart failure patients require hospitalization and it is the most common reason for hospitalization in persons over age 65 yrs. (Gersh, 2005). 15% of all heart failure patients die within the first year and up to 50% of those with advanced symptoms die within one year. In 1999 heart failure costs to the healthy care system was $183 billion (Gersh, 2005).

There are *four classifications* of Heart Failure identified by the New York Heart Association. Each classification depicts the severity and degree of disability associated with the disease:

I. No limitations of physical activity, no symptoms with ordinary activity
II. Slight limitation, symptoms with ordinary activities
III. Marked limitation, symptoms with less than ordinary activities
IV. Severe limitation, symptoms of heart failure at rest

*Symptoms: fatigue, dyspnea, palpitations, or angina. Symptoms may be mild at first, then increasingly severe and may not be related to ejection fraction.*

CHF is a disease that directly affects the hearts muscle resulting in cardiomyopathy. Cardiomyopathy is the is the most common reason patients become
candidates for heart transplant (Gersh, 2000). In all forms of cardiomyopathy there is a risk for irregular heart rhythms that if left untreated can lead to cardiac arrest. There are three basic types of cardiomyopathy:

1. **Dilated Cardiomyopathy** is an enlargement of the hearts chambers typically the ventricles. The enlargement of the chamber occurs in response to the hearts attempt to compensate for muscle weakness. The muscular chamber of the heart enlarges to allow greater blood flow during diastole. The chamber fills with more blood increasing the amount of blood the weakened muscle can pump out in the next contraction. However these compensatory methods are ineffective in the long term and lead to symptoms of CHF. In some studies 50% of deaths, due to dilated cardiomyopathy occur with in the first two years of diagnosis (Gersh, 2000).

2. **Hypertrophic Cardiomyopathy** once called idiopathic cardiomyopathy occurs as a result of the thickening of the walls of the heart for unknown reasons; hence the once used term idiopathic. The thickening can occur throughout the heart walls and commonly includes the septum between the verticals. This thickening reduces blood volume within the ventricles, interferes with relaxation of the heart to allow for filling of the chambers and contraction of the heart muscle. The heart has to work harder to pump blood to meet the body’s demands which results in an enlarged, hypertrophic weakened muscle and ineffective pump (Gersh, 2000).

   a. Some studies are shedding light onto the cause as being genetic in nature; therefore hypertrophic cardiomyopathy has no age limit for sudden onset.
3. **Restrictive Cardiomyopathy** is the term applied to the stiffening of the heart muscle that restricts adequate blood flow into the hearts chambers during diastole filling time. Restrictive cardiomyopathy is the least common myopathy in the United States. For the most part it is idiopathic in nature.

Some causes can be associated with medications used to treat cancer, cancer its self, Amyloidosis or diseases of the connective tissue such as seen in scleroderma. Symptoms of restrictive cardiomyopathy include shortness of breath, occasional chest pain, edema, right upper abdominal discomfort, bloating, nausea and loss of appetite.

Treatment options are limited in that medications used to treat heart failure are typically ineffective. A pacemaker may be of benefit to treat heart block due to rhythm disturbances. Heart transplant may be an option depending on the cause of the restrictive disease. However long term survival rates from this illness are disappointing (Gersh, 2000)

As a result of heart failure, the pumping efficiency of the heart can become so impaired that instead of a pump, the heart functions more like a dam. If the left side of the heart is damaged it will result in a back flow of blood into the lungs. Fluid will accumulate in the lung tissue and tiny alveoli resulting in shortness of breath hence the term congestion. In sever cases one can feel like they are drowning. Damage to the right side of the heart will result in:

- A back flow of blood and leakage of fluid into the body’s tissues, resulting in abdominal swelling (asities) and lower extremity edema,
- Veins in the neck may become distended,
- The liver enlarges and may become tender,
- The walls of the intestines thicken resulting in nausea and loss of appetite (Gersh, 2000).
Symptoms

Patients with CHF often experience the following symptoms; shortness of breath with minimal exertion, shortness of breath that awakens one from sleep, fatigue, weakness, swelling in ankles and feet, rapid weight gain, (a pound or more a day), swollen or distended neck veins or a full feeling. Additional symptoms include inability to lay flat due to shortness of breath, coughing, and dizziness with positional changes; irregular heart beat with a fast or slow pulse (Gersh, 2000)

Note: It is important to know a patient’s ejection fraction (EF), muscular contractility or pumping efficiency of the left ventricle, as this will help determine activity tolerance. The lower the EF the more fragile the patient and most likely less tolerant of activity. Patients with low EF are progressed slowly with in their tolerance level.

CHF alone is not a diagnosis with an ICD/9 code for coverage in cardiac rehabilitation. Typically CHF is a co-existing diagnosis accompanying a cardiac diagnosis. What is EF?

Sudden Death

Sudden Death is a cardiac diagnosis characterized by initial severe bradycardia or slow heart rate as low as 30-35 beats per minute. This slowed heart rate leads to coronary ischemia and irritability of the myocardial tissue. The heart muscle, tissue and electrical component become irritable resulting in rapid life threatening arrhythmias such as ventricular fibrillation and ventricular flutter. Sudden death may also occur as a result of ventricular rupture. Typically coronary blockage, ischemia, and MI are events preceding ventricular rupture (Miller, 2006).

The best chance of survival from Sudden Death is through electrical shock delivered within one minute of a witnessed event. Even with early intervention the rate of survival outside of a hospital setting is 25-30%. Patients typically require the
placement of an automatic implantable cardiac defibrillator and medications to survive subsequent episodes.

Note: When determining risk level during initial evaluation the cardiac arrest patient will always be classified as a high-risk patient.

Heart Valve Disease

Valvular heart disease can be congenital or caused by infections, viral or bacterial such as rheumatic fever or endocarditis. Valvular heart disease is a common problem due to the calcification of the tissue surrounding the valve and the valve itself. Following an MI, death to the cells and tissue that are necessary to operate valves may also cause valvular insufficiency. Patients who have undergone treatment for mitral, or aortic valve repair or replacement are more commonly seen in CR outpatient programs.

Valvular Disease is classified as regurgitation or stenosis. Regurgitation occurs as a result of the valves inefficiency to close properly resulting in a backward flow of blood. Valvular stenosis restricts blood flow through the valve.

Tricuspid Insufficiency is usually addressed at the time of another valve repair or replacement and it is uncommon for this to be of a primary surgical nature. Primary issues associated with the pulmonic valve is also rare, however bacterial endocarditis involving the tricuspid and pulmonic valve is more commonly found in intravenous drug use (Miller, 2006).

Mitral Stenosis can be of a congenital nature but more commonly associated with contracting rheumatic fever. The first signs of valve disease may present as atrial fibrillation (A-fib), which can lead to blood clots and peripheral embolus. Other
symptoms include shortness of breath with exertion, cardiac arrhythmias, hemoptysis, pulmonary hypertension and right heart failure. (Miller, 2006).

*Mitral Regurgitation* is usually congenital in nature and associated with a prolapsed valve. It may also be the result of infection such as bacterial endocarditis or rheumatic fever. Mild to moderate mitral valve regurgitation can be tolerated well for several years as long as no other complications arise and potential arrhythmias are treated (Miller, 2006).

Aortic valve stenosis is usually a congenital in nature. It is usually accompanied by aortic regurgitation. Symptoms correlate to the degree of severity of stenosis, left ventricular function and extent of coronary heart disease. Symptoms experienced by patients such as dyspnea, syncope, and chest discomfort indicate a need for surgical repair or replacement. 60%-80% of patients with symptoms of left heart failure secondary to aortic stenosis will expire within six months. (Miller, 2006).

Aortic regurgitation is associated with congenital aortic stenosis as a result of rheumatic fever or bacterial endocarditis. Occasionally aortic regurgitation is associated with ascending aortic aneurysm. Again symptoms are related to severity and duration of the diseased valve. Repair is uncommon and this valve is usually replaced with a tissue or mechanical valve (Miller, 2006).
UNIT III

MEDICAL PROCEDURES

TO EVALUATE AND TREAT

CARDIOVASCULAR DISEASE
MEDICAL PROCEDURES

Goals and Objectives of Unit III
1. Identify a non-invasive medical procedures performed to evaluate the extent of cardiovascular heart disease
2. Identify invasive medical procedures performed to treat cardiovascular disease
3. Identify medical personal who would be qualified to perform these procedures
4. Identify the purpose of a cardiac stress test
5. Describe the procedure and purpose of an angiogram
6. Identify the placement and purpose of a stent
7. Identify surgical procedures performed to treat heart disease
8. Identify post surgical precautions for the CABG and Valve replacement client
9. Identify 2 implantable devices used in the treatment of heart disease
10. Identify post surgical precautions after an implantable devise has been inserted

Cardiac Stress Test

A physician may order a stress test to conduct an initial evaluation or as a follow up evaluation after a cardiac procedure or after a coronary event when the patient is stable. Cardiac stress tests are conducted by cardiologists, radiologists, cardiac nurse and specially trained cardiovascular specialists to either confirm suspected cardiac disease or rule out the presenting symptoms are not of cardiac origin.

A cardiac stress test is considered a non-invasive procedure, however it does carry an element of risk and therefore it is a diagnostic procedure conducted under management and involvement of a physician (Robertson, Reel, Crist & Mitchell, 1999). There are several variations of cardiac stress test that are used to determine the need for further invasive cardiac evaluations or treatment.

1. The **treadmill cardiac exercise stress test** is an important tool used in the detection of ischemia with activity. This test typically involves the use of a treadmill that, when used for diagnostic purposes, can be programmed to operate according to standard protocols, increasing in speed and grade at certain intervals.
a. Prior to and during the treadmill stress test the patient’s vital signs are monitored and 12 lead ECG monitoring is conducted.

b. An IV, inserted at the wrist prior to starting the test, will be used to inject an isotope, necessary for nuclear imaging upon completion of the test (Robertson, Reel, Crist & Mitchell, 1999). The isotope is usually injected one minute prior to the termination of the stress test. If necessary the patient may be physically assisted during that last minute to assure appropriate circulation of the isotope before the test is terminated (Robertson, Reel, Crist & Mitchell, 1999).

c. Termination of the stress test will vary, but certain factors influence the duration of the test. Such factors would include:

- onset of symptoms,
- a change in the ECG suggestive of ischemia,
- the patient may reach a predicted target heart rate with no adverse outcome or
- the patient may be unable to continue treadmill ambulation due to exhaustion.

d. Following the treadmill portion of the test exercise and resting nuclear images are obtained.

- Perfusion deficits seen during exercise but not at rest are suggestive of ischemia. (meaning the blood flow cannot meet myocardial demand).
- Perfusion deficits seen during exercise and persist at rest are indicative of previous MI or scar tissue and the extent of myocardial tissue damaged can be identified (Robertson, Reel, Crist & Mitchell, 1999).

2. Pharmacologic stress testing is used when a physician determines a stress test is appropriate however, it is evident the patient will be unable to participate in or complete a treadmill stress test. Limiting factors are often associated with
obesity, deconditioning, peripheral vascular disease, neurological disease, orthopedic limitations and or concomitant illness.

a. Pharmocologic stress testing involves the use of medications to accelerate the heart rate, simulating activity. Increasing the heart rate increases myocardial demand for oxygenated blood flow.

! When demand and supply are not synchronized this will result in ischemia and abnormal wall motion.
! Other medications used to assess coronary perfusion, in conjunction with an imagining agent, result in a phenomenon know as “coronary seal.” A coronary seal is seen when normal epicardial arteries vasodilate allowing increased blood flow however, this is not seen in stenotic arteries indicative of restricted blood flow indicative of coronary disease. (Robertson, Reel, Crist & Mitchell, 1999).

Percutaneous Interventions

Angiogram

Angiogram or angiograph are the terms used in the process of conducting a cardiac catheterization with visual monitoring of the results of the procedure via imaging equipment. The cardiac catheterization is a procedure that assists in the diagnoses of:

1. Coronary blockage,
2. Extent to which the four chambers of the heart are working and
3. How much blood is ejected per contraction.

Using a variety of catheters and imaging techniques a cardiologist can obtain valuable information leading to the diagnosis and treatment needs for the cardiac patient (Gersh, 2000).
Process

1. A Catheter is inserted usually at the groin sight, which typically involves inserting a needle into the femoral artery.
2. A guide wire is then inserted into the needle.
3. The needle is then pulled back and the guide wire stays in place to maintain a pathway and guide the catheter through the artery, up to the heart and coronary arteries.
4. Two smaller tubes are placed over the guide wire at the groin sight called a sheath and dilator these maintain an open access to the artery.
5. Once the catheter is in position the cardiologists injects a contrast material or dye that flows into the coronary arteries.
6. The contrast material or dye can be viewed via x-ray imaging equipment as it travels through the arteries showing areas of occlusion and free blood flow.
7. Upon completion of the procedure the catheter, guide wire and sheath are removed and the groin sight is closed via a collagen plug, suture or applied pressure until arterial bleeding stops (Gersh, 2000).

The illustration below shows catheter insertion and the route it is guided through into the hearts arterial system (NHLBI, 2007).
Cardiac catheterization will provide information as to the number of vessels occluded and to the extent of the occlusion. The cardiologist will then determine the best course of treatment based on each individual’s needs and risks. Some patients will be candidates for medical management, angioplasty, stent placement, implantable devices or coronary bypass graft (Gersh, 2000).

Note:
! A number of patients have reported to cardiac rehab staff that during the procedure they felt a sudden warm rush throughout the body and report this feels like they lost bladder control. This can usually be attributed to the contrast material being injected into the left ventricle for diagnostic purposes and usually last for 15-30 seconds.
! Patients often will present with concerns regarding a “lump” or nodule located in the groin following the procedure. This is usually experienced at the sight of closure and is associated with the collagen plug and will soften in a few weeks.

Percutaneous Transluminal Coronary Angioplasty (PTCA)

The term PTCA is used to describe the angioplasty procedure. PTCA is best remembered when one inter-operates it broken down into its’ parts, i.e. percutaneous (beneath the skin), trans-luminal (through an artery), coronary (artery of the heart), angioplasty (to change the shape of a coronary artery). If the PTCA procedure is to be performed, it is usually conducted directly following an angiogram, when the block artery was identified (Gersh, 2000).

The PTCA procedure reduces anginal symptoms, the risk of heart attach and emergent coronary bypass surgery (CABG). Ninety percent of all PTCA procedures are successful. However as with all procedures there is an element of risk. These risks include dissection of the artery during catheter insertion, blood clot at the balloon sight and resultant MI. The risk of death from this procedure is 1%; the risk of having an MI during the procedure or the need for emergent CABG is 3%. Although PTCA reduces
blockage about 95% of patients, 1/3 or more will experience same sight coronary occlusion within a 12-month period (Gersh, 2000).

**Process**

1. The PTCA procedure involves removal of the catheter used to inject the contrast material during the angiogram and inserting a smaller catheter with a balloon at the tip.
2. A small amount of contrast dye is injected into the blocked artery to determine the exact area of blockage.
3. The balloon tipped catheter is then guided across the blocked artery, and once in place the balloon is inflated for approximately 30-120 seconds.
4. The physician may inflate the balloon several times. This stretches the artery and packs the soft fatty blockage against the arterial wall, increasing the arterial diameter and increasing blood flow.
5. The entire procedure takes approximately 30-90 minutes (Gersh, 2000).
6. Patients may experience chest discomfort during balloon inflation due to restricted blood flow. The discomfort usually disappears following balloon deflation however; this can be quite frightening to the patient.
7. The physician again is visually monitoring the procedure and determines if improved blood flow has been achieved as a result of the procedure.
8. Upon successful completion of the procedure the catheter is removed.
9. The sheath usually stays in place for two to four hours and medications are used to prevent clot formation in the sheath. The groin sight again is closed with a collagen plug, suture or pressure to prevent bleeding.
10. The patient is instructed not to flex the lower extremity at the hip or knee until 6 hours post procedure. The patient is usually in the hospital on bed rest for 24 hours with close monitoring (Gersh, 2000).

**Stent Placement**

During the PTCA procedure, after the balloon had been inflated and the soft fatty tissue has been pushed back against the arterial wall, the physician may chose to insert a small coiled wire, called a stent into the artery to keep the vessel open. The use of a stent, to maintain arterial blood flow, has reduced re-occlusion by 50% of PTCA alone. Approximately 90% of patients who have the PTCA procedure are candidates for stent placement. Recovery after stent placement parallels that of PTCA (Gersh, 2000).
Stents are metal coil springs much like that seen on the inside tip of a ballpoint pen. Stents are manufactured in varying diameter and length. Some stents have drug-eluting properties, which greatly reduce the potential for re-occlusion. Once inserted in the arterial wall, the drug eluting stent releases a powerful medication to alter the formation of rapid tissue growth for healing and aids in keeping the fatty tissue from again blocking the artery. Several stents can be placed within and along an artery, end to end, depending on the length of the blockage. When blockage does occur inside a stent an additional stent can be used inside a stent to once again open the blockage. The illustration below depicts placement of a stent (NHLBI, 2007)
Note: If a Coronary Artery Bypass Surgery (CABG) procedure is required later in the treatment of heart disease the new graft cannot be attached at the sight or length of a previously placed stent.

**Artherectomy**

Not all coronary artery blockages are of a fatty substance some blockage is hard and calcified. In this instance the balloon angioplasty is ineffective and the Artherectomy is the procedure of choice, please refer to picture on page 41.

The artherectomy procedure involves the use of an artherectomy catheter that has a drill at the tip. The drill rotates at 2,500 revolutions per minute, shaving of hard plaque and sucking it up into the drill. Some artherctomy catheters have laser tips that “vaporize” plaque with a tiny light beam. The laser vaporizes the plaque into gasses that are dissolved in the blood stream and eliminated by the body’s natural waste system.

Both techniques are useful in the removal of calcified plaque and improve blood flow through the blocked coronary artery (Gersh, 2000).

**Coronary Artery Bypass Surgery (CABG)**

In the United States 10%-20% of CABG procedures are conducted using less invasive techniques. Studies have shown that hospital stay is decreased, decreased incidence of chest infection, atrial fibrillation, and need for blood transfusion. However, rates of MI and short-term mortality where no different from the traditional CABG procedure (Miller, 2006). CABG surgery usually lasts 3-6 hours depending on complexity of the case, as many as 8-9 arteries can be bypassed, however typically 4-5 is average.
Coronary artery bypass surgery is a procedure used to re-route blood flow around one or more of the coronary arteries that are responsible for the lack of blood flow to the myocardium. A graft is taken from another part of the body that is similar in make up and compatible with the coronary arteries. This may involve the use of the right internal mammary (RIMA) or left internal mammary arteries (LIMA), which is the radial artery or the saphenous vein of the right or left lower extremity. Hence the term coronary bypass graft (CABG) (Miller, 2006).

The re-routing of arteries and harvest of the saphenous vein is made possible by the fact that these systems do have an alternate blood supply or in the case of the venous system, a collateral pathway will form to assist in blood returned to the heart. The artery or vein used is dependent on:

- the needs of the patient, patency of the arterial venous system and
- the surgeon’s preference and skill level in order to ensure optimal outcome and patient survival (Miller, 2006).

The LIMA or RIMA are commonly used to improve blood flow to the heart. The RIMA is frequently used if the diseased coronary artery is on the right side of the heart. The LIMA is typically used to provide relief to the left side of the heart.

The LIMA is typically used to bypass blockage of the left anterior descending artery (LAD), a major artery that supplies the left ventricle with adequate blood flow. Choice of the LIMA, as opposed to the saphenous vein to bypass the LAD, is due to the LIMA’s history for long-term patency and greater incidence for long-term survival. The LIMA branches off of the left subclavian artery. It is comparable in size and make up of the LAD and is in close proximity to the left side of the heart. The LIMA is gently dissected from the chest wall. Its origin is left undisturbed while the distal end is re-
routed to bypass the stenosed sight of the LAD. It is then anastomised to a sight free of blockage on the LAD, allowing free flowing blood to the ventricle (Miller, 2006).

The saphenous vein is used when several arteries are blocked requiring more than one graft attachment. The Saphenous vein is harvested from the lower extremity. The vein is cleaned and reversed so the check valves of the venous system will no longer impede blood flow. The saphenous vein is attached to the ascending aorta. Several small openings can be made in the vein that is then attached to coronary artery, distal to the stenosed sight. The following picture shows a single saphenous vein bypass graft to the LAD and RIMA to the right coronary artery (RCA) (Miller, 2006).

![Image of a heart showing saphenous vein bypass graft]

As with all surgical procedures, the CABG carries with it certain risks. There is a 2% risk of dying from the operation and up to 8% if the surgery is of an emergent nature such as following an MI.

CABG surgery, valve replacement or repair and heart transplant all require the procedure be performed following a sternotomy. A sternotomy is when an incision is
made through the skin to the full depth of the sternum. The sternum is then spread apart allowing access to the anatomical structures on which the procedure is to be performed (Miller, 2006). Following the surgery the sternum is wired together and the skin incision is close via a variety of methods (Gersh, 2000).

During surgery some hospitals will use a heart lung machine which functions to re-route blood continuing to oxygenate the body allowing the surgeon to operate on a still heart without blood occluding vision. However, advances in cardiac care has enabled some surgeon’s to forgo the heart lung machine and still only the portion of the heart they are working on. Studies have found the latter to have a faster recovery rate post surgery.

A more recent procedure, called a minimally invasive heart bypass or MIDCAB, is being performed. This involves making a small incision either vertical or horizontal near the left breast and removal of part of a rib that overlays the heart muscle. This allows for access to the anatomical structures beneath to perform the procedure. Proponents of this procedure claim costs are reduced, recovery is quicker and it is less painful. There is no statistical information as of yet on the success rates of the grafts of this procedure (Gersh, 2000).

Note: I have personally had the opportunity to work with two patients who underwent this procedure, one male and one female, both reported significant discomfort post surgery, which was still evident 3-4 weeks later upon admission to CR. These patients were seen soon after the procedure was being performed in the area and non have been referred to us recently.

Another procedure being performed is the robotic CABG. Of course this is under the guidance of a highly skilled surgeon and his or her surgical team. The use of this
procedure is presently limited and is only recommended for performing CABG on certain areas of the heart.

The outcome for CABG surgery is very positive. CABG surgery improves symptoms in 90% of patients. The procedure prolongs life especially for individuals who have multi-vessel coronary disease and/or disease of major coronary arteries such as the left main coronary trunk or already impaired ventricular function. However, new blockage is not uncommon. Due to the progressive nature of the disease new blockage can develop in the grafts or new sights in the coronary arterial network. Forty percent of patients who have had a CABG will show signs of new blockage within 10 years post surgery (Gersh, 2000).

Valve Repair or Replacement.

The previously mentioned valvular diseases usually require medical intervention to remediate symptoms and prevent further heart disease. Treatment for valve disease usually requires surgical repair or replacement of the diseased valve. As in CABG the typical surgical procedure requires a sternectomy and therefore post CABG surgical precautions are applied during recovery. Patients may have porcine (pig valve) or mechanical valve replacement depending on the patients age and other medical conditions. Medications are prescribed to prevent clotting and control arrhythmias (Miller, 2006).

Heart Transplant

Heart transplantation is considered when an individual has exhausted all other means of treatment and is in end-stage heart failure. Physicians perform approximately
2,300 heart transplants annually in the United States. Due to the limited supply of available organs candidates are screened carefully to determine who is most likely to benefit from the procedure. Typically a younger individual under the age of 65 years will be more likely to gain from the procedure. The transplant candidate must be prepared to be subject to rigorous testing to assure compatibility, comply with medical recommendation and be psychologically prepared for events prior to, during and following the procedure (Gersh, 2000).

Heart transplant has proven to be successful and is considered the standard of care for end-stage heart failure. It has shown to improve longevity and quality of life. Approximately 60% of transplants survive 5 years and 35% up to 12 years (Kavanagh, 2006). However the life long rigorous medical follow up protocol can seriously strain family and social relationships, drain financial resources and interfere with vocational pursuits (Kavanagh, 2006).

Contraindications to heart transplant include; pulmonary hypertension, conditions that will be worsened by using immunosuppressive medications, unresolved drug, alcohol or tobacco abuse, extreme obesity or an inability to adhere to rigorous medical evaluations and medication regime (Gersh, 2000).

The heart transplant involves the use of the heart lung bypass machine so blood flow to the body is not interrupted. The damaged heart is then removed via incision at the atria, aorta, and pulmonary arteries. The donor heart is then attached to these sights. The new heart is started with a shock and once it starts to respond and pump the blood, the heart lung machine is removed to allow the new heart to circulate blood (Gersh, 2000).
The new heart is denervated below the suture line at the atrial attachment. Prominent clinical findings post surgery are a fast resting heart rate and elevated blood pressure. The fast resting heart rate, typically 15-25 beats above average, is a result of denervation the sinoatrial node (SA node) that is no longer under the influence of vagal innervation. The rapid heart rate is caused by the intrinsic SA node for the transplanted heart. The heart rate will not respond to the Valsalva maneuver, carotid sinus massage, or change in body position from laying down, sitting or standing. Changes in heart rate are the direct response of variations of catecholamines being released in response to physical and/or emotional stimuli. Resting hypertension is also common and can be attributed to peripheral vascular disease associated with prior history of CHF, increased sensitivity to circulating catecholamines, Cyclosporine therapy, or concomitant use of steroids (Kavanagh, 2006).

The limitations of transplanted hearts becomes more evident during bouts of activity or exercise. The transplanted heart rate will not immediately increase in response to exercise and cardiac output during exercise is dependent upon venous return during skeletal muscle action, which increases blood volume. Increased blood volume results in an elevated left ventricular end-diastolic volume that in turn results in increased stroke volume. Elevated heart rate upon cessation of exercise activity is directly related to catecholamines released in response to exercise (Kavanagh, 2006).

Note: I had the wonderful opportunity to work with my first heart transplant patient in 2006. I was fortunate to have had the opportunity to meet and work with this patient while using a left ventricular assist device and on the heart transplant list waiting for a new heart as a result we had built a wonderful relationship prior to her heart transplant.

Based on this trust the patient was able to help me guide through safe progressive exercise program 30 minutes in duration. We found it beneficial to allow for prolonged warm up and cool down sessions. Upon completion the patient had confidence to engage in moderate level activity of her choice.
In summary, it is important to be familiar with the many diseases and accompanying symptoms associated with heart disease. This enables the OT to evaluate and implement treatment that improves function, provides education, and psychosocial support and encouragement for patients and families going through an often frightening period in life. Being familiar with heart disease allows you to answer patients and family questions with confidence and to determine to what extent function has become impaired.

Research and a review of the literature regarding the manifestations of heart disease, supports the role of occupational therapists in teaching energy savings techniques, work simplification, adaptive equipment usage, behavior modification, stress management, coping skill and relaxation training. Heart disease management supports the treatment intervention of occupational therapy exercise prescription, endurance training, ADL training, patient education and home program instruction with the goal of increasing physical and mental function so the patient can meet the demands of daily life.

**Implantable Devices**

**Pacemaker**

The function of a pacemaker is to restore function of an abnormally slow heart rate, also known as bradycardia accompanied with symptoms such as fatigue, shortness of breath, fainting or passing out. Disease of the SA node can be a result of a heart rate that is to slow at times or to fast, this is also known as bradycardia/tachycardia or sick sinus syndrome. When the SA node is not functioning properly it lacks the ability to
initiate the electrical impulse needed to contract the atria and propagate a stimulus to the atrioventricular node (AV node) in order to elicit a synchronized contraction of the ventricles (Gersh, 2000).

A pacemaker insertion procedure takes up to a one hour. The pulse generator or pacemaker is usually implanted beneath the skin and fat towards the lateral end of the clavicle, in the chest wall of the non-dominant upper extremity. The lead wires are inserted into a vein and threaded to the right side of the heart. There are two main types of pacemaker's: 1) single chamber pacemaker and 2) dual chamber pacemaker (Gersh, 2000).

The **single chamber pacemaker** has one wire coming from the generator that initiates an electrical impulse in either the atria or ventricle. In most individuals this pacemaker only paces when the intrinsic pacemakers of the heart are not functioning as needed and only paces on demand (Purcell and Fletcher, 2006).

A **dual chamber pacemaker** has two wires leading from the pacemaker. One wire is inserted into the upper chamber of the heart while the other is guided into the lower chamber of the heart. (Purcell and Fletcher, 2006). A dual chamber pacemaker allows for atrioventricular (AV) pacing capabilities and simulates the heart's intrinsic electrical conductivity.

AV pacing is common and allows for normal sequencing of the contraction of the atria and ventricles (Gersh, 2000). AV pacing is also known as rate responsive pacing meaning the pacemaker will respond to the body's needs by increasing cardiac output without dramatically increasing the myocardial oxygen demand. The adaptive rate function will be applied when the native sinus node cannot increase heart rate to meet
metabolic demands. This type of pacemaker can sense the body’s need for additional energy and produce appropriate heart rate increases in patients with chronotropic incompetence. Sensors of the pacemaker have been developed to detect body movement, increase in exercise, respiratory rate and body temperature. These functions allow the AV pacemaker to mimic a healthy normal heart’s response to physiological and metabolic demands and increase heart rate accordingly to meet the body’s needs (Robertson, Rogers, Ewing & Bott, 2004).

Advances in pacemaker technologies have resulted in exercise prescription for patients with pacemakers to be essentially the same as prescribed for other patients. Increasing heart rate in exercise is the single most important factor for increasing cardiac output and oxygen uptake. A pacemaker will provide this necessary mechanism to increase heart rate thus increasing cardiac output to meet the demands of the body (Robertson, Rogers, Ewing & Bott, 2004).

Following pacemaker insertion, there is usually some swelling and discomfort at the insertion site. Bra straps or clothing that will rub or irritate the newly implanted pacemaker or incision should be avoided. Bathing or showering can be resumed after 48 hours. Each patient has individual needs just as each patient’s physician has timelines for patients to resume certain activities. The purpose of precautions and timelines for resuming activity is to assure the pacemaker wires are securely imbedded in tissue and will not be moved or dislodged with activity or in the event that excessive bleeding into tissue may occur, as a result of trauma at the surgical site (Robertson, Rogers, Ewing & Bott, 2004).
The following are general precautions following pacemaker insertion:

1. No driving for two weeks.
2. No vigorous activity above shoulder height for one month. Examples of vigorous activity include; shaking rugs, shoveling snow, tennis, golf, baseball, swimming, bowling or bicycling that includes upper extremity involvement.
3. Avoid direct impact at the insertion sight as one might experience using a rifle during hunting.
4. Avoid lifting, pushing, pulling or carrying more than 15 pounds.
5. Avoid strong magnetic fields, such as those encountered during and Magnetic resonance imaging (MRI) or magnetic fields associated with activities such as arc welding. Cell phone use is acceptable but should be held 12 inches from the pacemaker. Microwave ovens and Airport metal detectors do not affect the function of today’s pacemakers (Gersh, 2000).

**Internal Cardiac Defibrillator**

Cardiac arrest due to life threatening arrhythmias accounts for 400,000 deaths each year. Medications may reduce the risk of reoccurrence of these arrhythmias, however medications used in combination with internal cardiac defibrillators (ICD) have been 99% effective in averting these life-threatening rhythms. An ICD is implanted in cases where an individual has experienced cardiac arrest and is at risk for an additional event caused by ventricular tachycardia (VT) leading to ventricular fibrillation (VF) and subsequent death if not treated via electrical shock. An ICD is designed to recognize abnormal rhythms and automatically correct the rhythm to prevent cardiac arrest. An ICD has pacemaker functions in that they will pace or correct an abnormally slow rhythm, attempt to over ride an abnormally fast rhythm, and shock a life threatening rhythm. (Gersh, 2000).

When working with a patient with an ICD, it is important to be knowledgeable of the parameters of pacing functions and at what heart rate a shock will be delivered. Initial evaluation would include an electrocardiogram (ECG), which is important to
establish normal rhythm and onset of abnormal rhythms. Typically one would prescribe exercise or activity 10-15 beats below IDC discharge rate (Robertson, Rogers, Ewing & Bott, 2004).

**Shocks** are sudden and can cause discomfort. Patients have described the shock as similar to a “kick in the chest”. The pacemaker function settings are typically set to pace heart rate (HR) at 60-160 beats per minute. At a HR of 160 beats per minute the pacemaker will try to over ride the elevated HR. If the pacemaker cannot pace the HR down and the HR continues to accelerate the IDC is usually set to deliver a shock at a HR of 170 beats per minute. Medications used in combination with an ICD implant typically keep HR well below 160 beats per minute and has not been an issue when prescribing exercise HR parameters. Patients are instructed to keep a diary and consult with their physician when the ICD discharges (Gersh, 2000). Patients may experience symptoms such as lightheadedness or dizziness before the ICD delivers a shock.

However, it is important to be aware of each individual’s parameters and functions of the ICD, so as not to inadvertently increase HR to the extent one is exerted into the HR range where a shock would be delivered. One should avoid touching the patient during the discharge. Recovery and precautions are the same as those following pacemaker implantations. However, patients may be in need of increased reassurance and psychosocial support as a result of the fear frequently associated with an impending shock.

*Note: Patients I have worked with who have an ICD have had a long history of heart disease are usually very knowledgeable of the function of their device.*
Left Ventricular Assist Device

Left ventricular assist devices (LVAD) are used in severe cases of end stage heart failure, as a bridge while awaiting a donor heart for heart transplant. The LVAD is a pump that is implanted intra-abdominally. The pump is attached to a hose, which has one end sutured into the apex of the left ventricle and the other sutured into the aorta. The pump draws blood through the hose from the left ventricle and pumps it into the aorta that distributes blood throughout the body. (Gersh, 2000) The pumping mechanism is operated by an external battery pack, which is small enough to wear in a “fanny pack” at the waist, which allows for mobility from the major power source. The larger battery, about the size of a small cooler, has a continuous charge when connected to an electrical source. When it is necessary to re-charge the smaller battery pack the patient will connect to the larger power source until the cycle is completed. Patients are instructed to transport the larger power source with them at all times.

The LVAD contributes to cardiac output and has capabilities of increasing cardiac output to meet the demands of the body during modest daily physical demands. The left ventricle continues to contract and increase cardiac output with activity however the LVAD assist with this function and can pump out up to 11 L/min of blood from the chamber. The result it that patients feel better and light to moderate exercise is appropriate. One study suggests that 82% of patients show improved exercise tolerance over a six to eight week period increasing in duration of exercise up to 20-30 minutes. Patients typically tolerate surface walking and/or treadmill ambulation and upper extremity exercise however bicycling may cause discomfort due to the entrance port in
the abdomen. When prescribing exercise for patients with an LVAD one needs to work closely with the patient's physician (Robertson, Rogers, Ewing & Bott, 2004)

Education programs for LVAD patients should address a patient's awareness of signs and symptoms of hypotension and potential device malfunction. Patients should be instructed to report any signs of infection at the insertion sight. Additional education would parallel that provided for heart failure. Ongoing psychosocial support is necessary. Those who are at the top of the transplant list wear a beeper. Should the patient receive a beep it is usually to follow instructions to prepare for heart transplant in a matter of hours (Robertson, Rogers, Ewing & Bott, 2004)

Note: I have had the opportunity to work with one LVAD patient who was very well educated to the functioning of the device and highly motivated to improve current level of functioning. We worked closely with the ordering physician at the Mayo clinic in Rochester, MN. who also gave exercise guidelines. Taking her blood pressure (BP) manually or using an automatic sphygmomanometer was very deceiving because even though we had consistent readings, the physician at Mayo clinic advised that an accurate BP using either of these techniques was not possible with the LVAD. When prescribing exercise, using the rate of perceived exertion scale and listening to the patient proved to be the best indicator of exercise tolerance. Familiarity with the rate of perceived exertion scale helped the patient pace activity during ADL's. Cardiac rehab was a very positive experience for the patient. It enabled this individual to increase strength and endurance in a safe and supportive environment. The patient was physically and psychologically ready for heart transplant surgery and had a successful outcome.
UNIT IV

MEDICATIONS
MEDICATIONS

Goals and Objectives of Unit VI
1. Identify the role medications play in the management and treatment of coronary heart disease
2. Identify medications that may alter vital signs
3. Identify the side effects of medications used in the treatment of coronary heart disease.
4. Identify the role anticoagulants play in the management of clients with heart disease
5. Identify the recommended protocol for taking nitroglycerin
6. Identify medications used to lower cholesterol and additional benefits of the lipid lowering medications
7. Identify the effects beta blockers have on heart rate and how this may impact heart rate during exercise
8. Identify the purpose of diuretics in the management of heart disease
9. Identify why a patient may not adhere to a prescribed medication regime
10. Identify strategies used to encourage medication compliance.

Effects of Medications

Medications are an important therapeutic intervention strategy in the treatment and management of heart disease. Patients are often prescribed medications to:

1. Manage heart disease,
2. Prevent the potential for further heart damage, when other interventional strategies are not recommended,
3. Control symptoms and
4. Assist in optimal cardiac functioning.

A comprehensive cardiac rehabilitation program will provide a patient education instructional course regarding cardiac medications. A pharmacist who is part of the cardiac rehab team may present the initial course. Continued education and follow-up information may be presented by the cardiopulmonary rehabilitation specialist (stieglitz, 2006).
Medications, such as Beta-blockers, slow the heart rate and protect the heart during recovery. It is important to remember this when prescribing exercise since the heart rate influenced by medications. Typically using the 20 bpm + RHR is an appropriate THR range when exercising the patient on Beta-Blockers.

Patients taking cardiac medications frequently report symptoms such as:

1. lacking in energy,
2. early on set of fatigue with activity,
3. lightheadedness or
4. dizziness, which may interfere with their perception of activity tolerance

All symptoms that interfere with a patients functioning should be reported to the physician. Over time some patients will become accustomed to the changes and not be as sensitive to the medication.

Cardiac medications save lives but do not necessarily make the patient feel good. Due to the complexity of medications, side effects of medications and potential for medication changes, there is an on going dialogue between the pharmacists, physicians, cardiac rehabilitations specialists and the patient. It is important that all team members be familiar with medications used in the treatment of heart disease (Stieglitz 2006).

**Medications used in Treatment**

There are several classes of medications used in the treatment of heart disease. Most health care organizations have standards of care that specify best pharmacological treatment interventions for cardiac care. An example is the analogy **MONA** that greets all cardiac patients in an emergency room. MONA is the analogy for morphine, oxygen, nitroglycerin, and aspirin. Hospital trials with the above mentioned medications and
treatment time within 30 minutes has resulted in best practice to improve outcome following a cardiac event.

The following class of medications is frequently prescribed for patients in cardiac rehabilitation. Research indicates that these medications are considered to prolong life, reduce risk of future events and reduce symptoms associated with heart disease. These include; ACE inhibitors, diuretics, calcium channel blockers, beta-blockers, nitrates, anticoagulants, and lipid lowering medications (Stieglitz, 2006).

ACE Inhibitors

Common names of ACE inhibitors include but are not limited to: 1) Captopril, 2) Enalapril (Vasotec), 3) Lisinopril (Zestril) and 4) Ramapril. ACE inhibitors:

1. lower blood pressure,
2. help the heart to heal following a myocardial infarct,
3. protect the kidneys in diabetic patients and
4. are used in the treatment of heart failure.

Common side effects are dry cough, dizziness as a result of low blood pressure, rash and facial swelling. If patients are aware of side effects they are less fearful of taking medications and are aware of changes that may occur.

Diuretics

Diuretics stimulate the kidneys to eliminate more urine. They reduce the potential for fluid retention and build up of fluid in the lungs and lower extremities. Common names for diuretics are: Lasix, Furosemide, Dyazide and Bumex. Patient should be instructed that diuretics are often referred to as “water pills”. They help the body get rid
of fluid, thereby reducing blood pressure and the amount of resistance the heart has to work against. Instruction should include the need for daily weighing to monitor the need for increasing ones diuretic or notifying the physician of fluid retention.

    Side effects include (Mosby, 2004):

    1. dizziness,
    2. potential electrolyte imbalance,
    3. dehydration,
    4. irregular heart rhythm,
    5. fatigue, and
    6. nighttime urination

    It is recommended that diuretics be taken in the morning to reduce sleep interruption.

    **Digoxin:**

    Digoxin is another medication frequently prescribed to patients in cardiac rehabilitation. Common names are Lanoxin, Digitek and Lanoxicaps. These medications increase the pumping efficiency of the heart and contractility to improve cardiac output. They also reduce the risk of supraventricular arrhythmias. Common side effects include nausea, slowed heart rate, irregular heart rate, patients should be instructed to take their heart rate before each dose, blurred vision with yellow/green halos and confusion. Staff needs to be aware of side effects to identify patients with potential Digoxin toxicity (Mosby, 2004).

    **Calcium Channel Blockers:**

    Calcium Channel Blockers decrease the amount of work the heart has to do, increase the amount of oxygen delivered to the heart and lowers blood pressure.
Common names are Cardizem, Norvasc, Procardia, and Verapamil. Side effects from these medications include constipation, dizziness, and nausea (Mosby, 2004).

**Beta Blockers:**

Beta Blockers lower blood pressure, decrease the amount of work the heart has to do by blocking select receptor site within the smooth cardiac musculature, reduce anginal symptoms and have been used in the treatment of heart failure. Common names are Enderal, Propanolol, Metoprolol, Lopressor, Toprol XL and Coreg (Mosby, 2004).

These medications may not make a patient feel better in fact they can make a patient feel very tired and/or low on energy. Often patients complain that they feel worse, but these medications have proven to save lives with regard to heart disease (Stieglitz, 2006). Side effects include those mentioned, headache and dizziness (Mosby, 2004).

**Nitrates**

Nitrates are medications that increase the amount of blood delivered to the heart by dilating the coronary arteries. They reduce the symptoms associated with angina. Nitroglycerin can be delivered in several forms such as tabs, spray and patches. Patients should be instructed to sit down and rest when taking nitroglycerin and be instructed in the appropriate regime for taking nitro to reduce anginal symptoms and what to do if there is no symptom relief. Common names are Nitro, Imdur and Isosorbide. Side effects include dizziness and headache (Mosby, 2004).

**Anticoagulants**

Anticoagulants are another class of medications that are important in the management of heart disease. These medications are often referred to as blood thinners,
however not all anticoagulants thin the blood such as Plavix. Plavix reduced platelet aggregation or in simple terms makes blood more slippery to reduce potential clotting. Common names of “blood thinners” are Aspirin, Coumadin, Lovenox, and Ticlid. Side effects from these drugs are bruising and bleeding. Patients should be cautioned to take extra care not to get cut, injured or in an accident. Coumadin also has dietary interactions and patients should be given a list of foods to avoid while taking this medication. Patients should also be instructed to inform any healthcare worker or professional that they are on Coumadin especially before any procedure that may cause bleeding (Stieglitz, 2006).

Lipid Lowering Medications

Common names are Lipitor, Zocor, Mevacor, Lescol, and Zetia. This class of medications reduces the amount of cholesterol manufactured in the liver and delivered to the blood stream. Cholesterol lowering drugs, also known as “Statins” a name frequently used to refer to a class of medications prescribed to control and treat high cholesterol also referred to as dyslipidemia. Some statins now work to reduce cholesterol in the digestive tract and others are combination properties. Statins lower bad cholesterol, some but not all raise good cholesterol, they stabilize plaque and reduce arterial wall swelling and potential occlusion.

Patients are typically instructed to take cholesterol-lowering medications with the evening meal or at bedtime. Side effects include muscle weakness or aching, upset stomach and rash. Some patients have a poor tolerance for a certain “statin” fortunately there are several different choices so a patient may be prescribed a different medication if they can’t tolerated the one they have first been prescribed (Stieglitz, 2006).
Promoting Medication Compliance.

Medication compliance is of utmost importance in the treatment of heart disease. Thirty percent of patients become non-compliant after 6 mo and there is research to confirm 80% of non-compliance after 12 months. Research has identified that the reasons for non-compliance are typically related to:

- Patients lack of knowledge regarding the purpose for taking medications
- Experiencing un-pleasant side effects and/or
- Cost of medications

Forgetfulness and non-compliance are not to be confused. A patient may forget to take a medication on occasion however the intent to be compliant is present (Stieglitz, 2006).

Patients with cognitive deficits or forgetfulness are instructed in ways to compensate for this problem. Compensation techniques may include the use of family or home health assistance in setting up a timed daily pillbox. All patients should be instructed to or assisted in the task of writing up a medication list to include the name of the drug, dosage and number of times per day the drug is to be administered, prescribing physician and primary caregiver (Stieglitz, 2006).

Information regarding medications can be very intensive. However this can be simplified for patients to improve understanding. Patients need to be well informed of the reasons to use medications, which include:

1. To treat heart disease are aimed at decreasing blood pressure,
2. improving the pumping efficiency of the heart, reducing workload on the heart,
3. eliminating the possibility of fluid being pushed out of the blood vessels into the lungs and/or legs, and
4. controlling abnormal rhythms.

Patients should be instructed to take all medications as prescribed and inform their primary caregiver before stopping any medications. Health care professionals in cardiopulmonary rehab need to have a thorough understanding of medications used to treat heart disease. This allows the professionals to confidently counsel patients on:

1. how to take medications,
2. why they are taking the medications,
3. what medications do,
4. how they may make a person feel,
5. in addition to reinforcing medications compliance.

This all needs to be accomplished in terms the patient will understand (Stieglitz, 2006).
UNIT V

MONITORING OF THE CARDIAC REHABILITATION PATIENT
MONITORING

Goals and Objectives of Unit V
1. Identify methods to monitor a client’s vital signs while participating in CR
2. Identify normal and abnormal physiological changes in vital signs during participation in CR
3. Identify subjective tools one can utilize to monitor a CR client
4. Identify methods a CR professional can teach a client to utilize to self-monitor during IADL’s and ADL’s
5. Demonstrate an understanding of basic ECG monitoring of the CR client

Heart Rate (HR)

Monitoring of patients’ vital signs during CR is usually conducted prior to exercise to establish a baseline, during peak exercise to assess tolerance of exercise and again post exercise to assure restoration of physiological functioning. Heart monitoring during CR is necessary when monitoring a patient in cardiac rehabilitation when prescribing exercise and when participating in the prescribed exercise.

Exercise training HR known as the target heart rate (THR), is usually determined by one of three methods: 1) data obtained during and exercise stress test, 2) volitional fatigue or the appearance of adverse signs and 3) symptoms or using a mathematical calculation (Balady et al., 2000). One of the oldest methods of establishing THR was promulgated by the AHA and uses a fixed percentage for establishing appropriate HR during exercise. The percent of heart rate max is easy to compute if you are aware of HR max during the exercise stress test. One would take a percentage, possibly 60%-75% of this and calculate training THR (Robertson, Park & Alexander, 2006). Another appropriate method of establishing THR for the CR patient is to add 20-30 bpm to the resting HR knowing that an increase of 50 bpm is unacceptable and the patient needs to
discontinue activity and rest until an appropriate HR is restored (Doherty, 2003). An example would be if the patients resting heart rate (RHR) was 60 bpm you would add an additional 20-30 bpm. Therefore, it would be appropriate to increase exercise HR to 80-90 bpm. This is an acceptable measure to utilize especially if the patient is on a Beta Blocking medication. Another appropriate method used in CR to calculate THR is to take 260 and subtract the patients age, then multiply this number by 60-75% which would = THR during exercise.

The governing medical team of a facility, following national guidelines, typically establish guidelines for THR. The establishment of these guidelines is based on medical conditions, medications, procedures and individual factors that may influence HR. Due to the numerous influencing factors on heart rate it is therefore understood that HR alone is not an adequate method to monitor the patient and is a guideline used in combination with additional monitoring methods (Robertson, Park & Alexander, 2006).

Note: When one notices an elevated HR at rest one may suspect infection or illness, emotional concerns or the patient may have forgotten to take prescribed medications.

Blood Pressure (BP)

A normal systolic blood pressure (SBP) response is to increase with exercise. Again, one establishes a baseline BP at rest and expects an increase with exercise. An appropriate SBP increase with exercise is 30 mm Hg. A drop in SBP, or failure to rise with increased exercise is an abnormal response. Exertional hypotension may occur in CR patients with clinically significant heart disease as a result of prolonged exertion. The absents of significant clinical disease exertional hypotension may be a result of antihypertensive medications (Balady et al., 2000).
Oxygen Saturation

A simple non-invasive method to measure oxygen saturation during CR participation is to use an oxygen saturation monitor. It measures the percent saturation of arterial oxygen and provides a record for the examiner. Guidelines for oxygen saturation at rest or with activity are recommended to be at or above 90%. If a patient shows signs of dyspnea or labored breathing and is consistently below 88% or less a physician should be notified. The physician may prescribe supplemental oxygen at a flow rate of 1 L/m to be titrated up until the oxygen saturation is consistently 90% or above. (Balady et al., 2000).

Note: Supplemental oxygen used during endurance training protects the heart and reduce the risk of coronary irritability in addition to decreasing dyspnea with exertion. A patient may express concern regarding using supplemental oxygen, however these benefits once relayed to the patient usually provide reassurance and improves compliance.

Rate of Perceived Exertion (RPE)

Rate of perceived exertion (RPE) is a valuable and reliable tool to monitor a patient’s exercise and activity tolerance. Assessment of RPE is an excellent indicator as to the exertional physiological effects of exercise and when used appropriately correlates highly with HR during exercise.

There are two widely used RPE scales. 1) The original and most commonly used in CR, rates exercise intensity on a scale from 6-20; 2) The second revised scale, and preferred by those performing exercise testing has a rating scale from 0-10. The greatest value of either scale is that it provides exercisers of all fitness levels with easily understood guidelines of exercise intensity. It has been found that a cardiorespiratory training effect and threshold for blood lactate accumulation are achieved at a rating of
somewhat hard to hard or an approximation of 12-16 on the RPE scale (Balady et al., 2000).

CR programs typically implement the use of the Borg RPE scale during the initial CR exercise evaluation. Patients are orientated to the use of the scale and instructed to focus on how hard one feels they are working, to include overall bodily systems feedback. Patients are instructed not to focus on any one symptom such as leg fatigue, but entire body feedback. Patients are then asked to rate his/her perceived exertion during exercise (Balady et al., 2000).

Borg’s RPE scale was developed to allow the exercising patient to subjectively report how hard one perceived he/she was working at the prescribed intensity, under the physical and environmental conditions (Balady et al., 2000). The following is an example Borg’s RPE scale (Balady et al., 2000):

6. No exertion at all
7. Extremely light
8.
9. Very light
10.
11. Light
12.
13. Somewhat hard
14.
15. Hard
16.
17. Very hard
18.
19. Extremely hard
20. Maximal exertion

CR programs prefer that a patient not perceive a workload that exceeds a PRE of 14, somewhat hard (see scale above). A desired exercise training RPE is within a range of 11-13. The CR specialist will understand the need for a learning curve in order for
patients to effectively use the RPE scale and to understand the potential for initial underestimation or over-estimations of workload (Balady et al., 2000). The REP scale can be applied to functional ambulation, IADL’s and ADL’s. A patient may apply the RPE scale to self-monitor an be aware of when to implement energy savings techniques, work simplification techniques or to stop the activity.

**Eletocardiographic (ECG) Monitoring**

The intent of this discussion is to provide an overview of the purpose of electrocardiography (ECG) and its use in cardiac rehabilitation. It is by no means all inclusive of ECG interpretation, as in any area of interest there are additional learning requirements. ECG interpretation requires extensive time and focus to achieve proficiency.

The ECG is a diagnostic tool to be interpreted by a physician. There are published standards and guidelines for the minimal knowledge and skills a physician must possess for the interpretation of the ECG. However, it is also the responsibility of other health-care professionals working in cardiac rehabilitation (CR) to: 1) be able to read the results of ECG information contained in medical reports, 2) recognize changes in a patient’s current ECG, and 3) recognize significant life threatening arrhythmias that may occur during exercise training. The ability to respond appropriately to changes in ECG pre, peak and post exercise, promotes a safe environment for patients to increase cardiovascular fitness in CR. (Wung, 2006).

The ECG is an electrical recording of the heart’s electrical firing potential and assumed muscle response to electrical impulse. Electrodes are placed in strategic
locations to record this process on grid paper. The grid paper that runs from the ECG machine has small and large squares. The width of each square represents time; a large square is 0.2 mm and a small square is 0.04 mm. The height of each square represents voltage; a large square is 0.5 mV or 5 mm. A small square is 0.1 mV or 1 mm. These measurements are of importance when determining a change in an ECG that might warrant a report to a patient’s physician. Most ECG machines have standard speed for recording the ECG. One can usually manipulate the voltage for a close inspection (Wung, 2006).

The ECG recording begins with the firing of the SA node or atrial depolarization, the P wave on the ECG and depolarization is between 60-100 beats.min. This impulse then travels to the atroventricular node (AV) node. The AV node slows electrical conduction to allow for the atria to contract and the ventricles to fill. After allowing for adequate ventricular filling time the impulse then travels to the bundle of His, bundle branches and the Purkinje fibers. “The Purkinje system is subendocardial” cite therefore ventricular impulse is from the endocardium to epicardium. This process represents depolarization of the ventricles, or the QRS on the ECG. The QRS and ST segment represents the “absolute refractory” period when the ventricles will not respond to further impulse. The T-wave represents ventricular relaxation or repolarization. Each impulse and response is intricately timed with the PR interval 0.12-0.20, QRS < 0.12 and T-wave 0.44 ms. The timing becomes important in the diagnosis and potential causes of arrhythmias (Wung, 2006). Pictures below show electrical conduction (Gersh, 2000).

Depending on the placement of electrodes the wave appearance is positive or negative. When the impulse travels toward a positive electrode an upward or positive
deflection is recorded. When the impulse travels away from the positive electrode a downward or negative deflection is recorded. The entire cycle is based on an isoelectric line with the impulses creating a deviation from the isoelectric line with the exception of the ST segment, which runs parallel to the isoelectric line (Wung, 2006).

There are several forms of ECG monitoring. A physician usually conducts 12 lead ECG monitoring in cardiac testing, in conjunction with nuclear medicine for diagnostic purposes or it may be required in emergent situations to assist in the diagnosis of a patient. A 12 lead ECG may be ordered to determine cardiovascular functioning as a precautionary measure before surgery and is typically ordered and interpreted by a physician during and after a cardiac event or procedure to attain a baseline of cardiac function (Wung, 2006).

Several diagnoses can be assumed with the presents of abnormal arrhythmias seen on an ECG. Arrhythmias can originate in the atria or the ventricle. Arrhythmias originating in the atria a termed supraventricular and include but are not limited to A-V node reentrant tachycardia, premature atrial contraction, atrial fibrillation, atrial flutter and atrial tachycardia (Wung, 2006).

Abnormal ventricular arrhythmias include but are not limited to 1st, 2nd and 3rd degree A-V block, bundle branch block, ventricular tachycardia, ventricular flutter and ventricular fibrillation. Abnormalities in the ECG typically indicate an interruption in coordinated atrial and ventricular function, resulting in reduced filling time and profusion of oxygenated blood to the body resulting in symptomatology (Wung, 2006).

Myocardial ischemia occurs with increased activity such as exercise and is a result of the heart not receiving the oxygenated blood to meet the demand of the
myocardium. There are specific guidelines that can be applied to observed changes in 12 lead and limb leads in response to myocardial ischemia. ST depression or downward sloping from the isoelectric line that meets the guideline of at least 1 mm down sloping and 2 mm wide (one cm square down and 2 cm squares wide) is indicative to myocardial ischemia. Prolonged ischemia results in myocardial infarction. ST elevation and T-wave abnormalities are a hallmark of myocardial infarction (MI). The presents or absents of Q-waves in the development of an MI have been used to determine the extent of myocardial tissue damage. (Wung, 2006),

The ACC/AHA have standards for testing and training patients with known cardiac disease. Patients a low risk should be monitored by ECG during exercise for at least 12 sessions. Patients at moderate to high risk should be monitored during exercise for at least 12 sessions, or until safety is assured and recommendations for activity levels is understood. Through continued educational opportunities health care professionals working in CR are able to detect changes in ECG and identify life-threatening arrhythmias and intervene should the need arise (Wung, 2006). This is an area of CR that requires continued learning and the opportunity to attend ECG interpretation classes.
UNIT VI
CARDIAC REHABILITATION
PATIENT EVALUATION AND CHART REVIEW
PATIENT EVALUATION AND CHART REVIEW

Goals and Objectives of Unit IV

1. Identify the rational for conducting a chart review prior to meeting a client
2. Identify a tools used to gather information pertinent to establishing goals and interventional strategies
3. Identify the value of utilizing risk stratification
4. Identify the 3 levels of risk stratification
5. Identify the benefits of conducting an IADL and ADL evaluation of CR client
6. Identify the components of CR documentation
7. Identify the components of a physical examination

Chart review

Prior to meeting the patient and conducting the initial interview the cardiopulmonary rehabilitation specialist will need to conduct a chart review to gain a thorough understanding of:

1. The patients cardiovascular disease,
2. Interventional procedures, cardiovascular functioning status post intervention,
3. Potential for further intervention at a later date and
4. Functioning following the cardiac event.

Frequently the cardiac rehabilitations specialist is the first health care professional to see the patient, in the outpatient setting, following medical intervention or a cardiac event such as a myocardial infarct. It is beneficial to have an understanding of left ventricular functioning, symptoms that may indicate a change in medical status since the procedure; prescribed medications; the effects of medications and; the impact co-existing diagnosis on function (Robertson, Reel, Crist and Mitchell, 1999).
The chart review will provide a wealth of information that one can confirm with the patient. Prior knowledge of the patient’s condition, procedure, medications and concerns, reassures the patient that you are knowledgeable of their condition, and that you are aware of the situation. Letting the patient know you are aware of their problems builds confidence and trust, it is the starting point of building a rapport and reaffirms that what has happened to them is of importance to you.

**Patient interview**

A detailed patient interview will confirm or identify discrepancies in the data obtained from the chart review. The patient interview is a tool to identify valuable information regarding patient’s goals, concerns, occupational histories and social support systems. This information is pertinent to establishing goals and interventional strategies that improve cardiovascular endurance to meet the demands of daily occupational roles. The interview also identifies areas of risk factor reduction and education programs a patient would benefit from to reduce the risk of future cardiac events. This process will also provide the cardiac rehabilitation specialist with information as to what resources will be needed to assist the patient reach full potential (Robertson, Reel, Crist and Mitchell, 1999). An example of an outpatient cardiac rehabilitation admission interview form can be viewed later in this chapter.

Prior to participation in a cardiac rehabilitation program, all cardiac patients undergo a thorough medical evaluation and to assure safe participation in the program. The medical evaluation, conducted by a cardiac rehabilitation specialist, may include the following components (Roberts, Reel, Crist & Mitchell, 1999).

- Comprehensive evaluation of existing or primary coronary artery disease.
- Recent illness, hospitalization, medical intervention and/or surgical intervention.
- Co-existing diagnosis or medical history that would have an impact on current primary diagnosis and participation in an exercise program.
- Symptoms experienced pre cardiac event and presenting post coronary intervention.
- Risk factor stratification.
- Prescribed medications, dosage and regime.
- Medication allergies.
- Dependency issues, i.e. drugs or alcohol.
- Occupational functioning and return to work issues
- History of musculoskeletal injuries.
- Exercise history.
- Psychosocial history.
- Several assessment tools can be used to obtain pertinent patient information or self-evaluation, such as the Physical Activity Readiness Questionnaire, PAR-Q, SF 36 or the Lung Heach Questionnaire

The following page is an example of a patient interview and history data collection form.
Cardiac Rehab Phase II - Admission Interview

Patient: ___________________________

Phone #: Home ___________________________
#: Work ___________________________
Next of Kin: ___________________________
Phone #: ___________________________

□ Single □ Married □ Divorced □ Widowed

Physicians: ___________________________

Admit date: ___________________________

Diagnosis: ___________________________

Date/Surgery/Procedure: ___________________________

Home accommodations: □ House □ Apt □ Other

Return to self care/ADL's: □ Yes □ No

Return to work: □ Yes □ No □ Retired □ Unemployed

Occupation: ___________________________

Insurance ___________________________

Psychosocial Support:

□ Has family support
□ Has transportation / can drive

Communication Deficits: HOH □ Yes □ No
Hearing Aids □ Yes □ No
Glasses □ Yes □ No

Staff Signature ___________________________

Staff Signature ___________________________

Patient Label

Cardiopulmonary Assessment:
BP: (R) _______ (L) _______ Pulse _______

EKG Rhythm: ___________________________

Heart Sounds: ___________________________

Lung Sounds: Clear (check): □ Yes □ No
If no, describe: ___________________________

SaO2 ___________________________

Incision Status: ___________________________

Groom Site Status: ___________________________

EF: ___________________________

Ankle edema: □ Yes □ No
If yes, describe: ___________________________

Weight _______ Height _______ BMI _______

Exercise History: ___________________________

Orthopedic Limitations: U/E □ Yes □ No
L/E □ Yes □ No

(check) □ Balance □ Mobility □ Range of Motion

Pain: □ Yes □ No

Explain: ___________________________

Adaptive Equipment: ___________________________

Risk Stratification:
(circle): Low □ Moderate □ High

Risk Factors (check):

□ Previous ASHD or Cardiac Event
□ Smoking
□ Exposure to 2nd hand smoke □ Hypertension
□ Family History □ Stress
□ Obesity □ Anxiety
□ Diabetes □ Age
□ High Cholesterol □ Gender Male
□ Post Menopause Female □ Lack of Exercise
□ Other (explain): ___________________________
Medical history (please check all that apply):

- Abnormal Chest X-Ray
- Anemia
- Anxiety or Depression
- Arthritis
- Bleeding Disorders
- Cancer
- CHP
- Chronic Back or Neck Pain
- Chronic Fatigue Syndrome
- Chronic Headache
- Colon Growth/Polyps
- COPD
- Cough lasting more than 2 weeks
- Diabetes
- Diabetic Neuropathy
- Difficulty sleeping
- Eating Disorders
- Fibromyalgia
- Gerd
- Glaucoma
- Head Injury or Concussions
- Heart Attack or Heart Problems
- High Blood Pressure
- High Cholesterol
- History of alcohol/drug use
- Hx CABG Date
- Hx MI Date
- Irregular Heart Rhythm
- Jaundice/Hepatitis
- Kidney Disease or Problems
- Positive test for HIV/AIDS
- Post Sudden Death Syndrome
- Pacemaker
- Pneumonia
- PVD
- Rheumatic Fever
- Rotator Cuff Inj/Repair
- Seizures
- Syncope (Dizziness)
- Skin (Hives, Eczema, Shingles, Sores, Psoriasis)
- Sleep Apnea
- Stroke or TIA
- TB (Tuberculosis)
- Thyroid Disease
- Total Hip Arthroplasty
- Total Knee Arthroplasty
- Ulcer/Stomach Problems
- Other

List any major surgeries or hospitalizations you have had:

________________________________________________________________________
________________________________________________________________________

Allergies: _________________________________________

________________________________________________________________________
________________________________________________________________________

Medications you are currently on:

<table>
<thead>
<tr>
<th>Name</th>
<th>Dose</th>
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<th>Frequency</th>
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</table>

Patient/Representative Signature______________________________

C
Risk Stratification

The American College of Physicians, American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) and the American Heart Association (AHA) have published guidelines pertaining to the necessary supervision that exercising patients may require, in secondary prevention programs, such as outpatient cardiopulmonary rehabilitation settings (Roberts, Reel, Crist & Mitchell, 1999). Risk Stratification Guidelines assist the cardiac rehabilitation specialist in determining to what extent supervision will be required during exercise.

Risk stratification is a tool to be used prior to and during exercise training. It allows for the assessment of the risk level the patient exhibits and to the extent and duration of ECG and hemodynamic monitoring may be required. However, “it is not clear the risk is related to exercise; rather, it is simply the risk of morbidity or mortality related to the clinical status of the individual (Roberts, Reel, Crist & Mitchell, 1999).

Risk stratification has its limitations and cannot be adequately used with patients with:

1. Non-diagnostic exercise tests,
2. Significant co-existing diagnosis,
3. Underlying abnormal resting arrhythmias,
4. Paced rhythms,
5. Left ventricular, (LV) hypertrophy or dysfunction,
6. Digitalis therapy or
7. Inability to reach 85% of max heart rate with diagnostic test negative tests for ischemia.

Regardless of the outcome of the risk stratification assessment it is ultimately up to the cardiac rehabilitation specialist to provide the appropriate level of supervision one feels is required for safe patient participation in cardiac rehabilitation programs (Balady et al., 2000). The following is a quick glance reference, listing the level of risk or
involvement to be aware of before implementing a CR program. The components of the risk stratification guidelines have been addressed in detail in the appropriate chapters.

**Risk Stratification Guidelines**

The following is the ACSM Risk Stratification Guideline (Balady et al., 2000).

**Low Risk**

- No significant LV dysfunction ejection fraction (EF) >50%.
- No resting or exercise induced dysrhythmia
- Uncomplicated MI, CABG, artherectomy, stent, absence of CHF and or signs symptoms indicating post-ischemic event.
- Normal hemodynamics with exercise and recovery.
- Asymptomatic including absents of Angina with exertion or exercise recovery.
- Functional capacity of > 7.0 METS
- Absents of clinical depression.

**Moderate Risk**

- Moderately impaired LV function (EF 40-49%).
- Signs and symptoms including angina at moderate levels of exercise (5-6.9 METS) or exercise recovery.
- Patients are assumed to be of moderate risk when not meeting criteria of low or high-risk stratification guidelines.

**High Risk**

- Decreased LV function (EF < 40%).
- Survivor of cardiac arrest of sudden cardiac death.
- MI or cardiac surgery complicated by cardiogenic shock, CHF, and or signs/symptoms of post procedure ischemia.
- Abnormal hemodynamics with exercise.
- Signs/symptoms including angina at low level exercise (< 5.0 METS).
- Functional capacity < 5.0 METS.
- Clinically significant depression.
Awareness of Risk Stratification guidelines is a predictive tool to help the CR therapist be prepared for potential problems during the implementation of the exercise prescription.

**Activities of Daily Living Evaluation**

Included in the initial evaluation is a thorough assessment of patients functioning in activities of daily living (ADL) and instrumental activities of daily living (IADL). The ADL and IADL evaluation, in CR, can be conducted per patient interview, functional assessment and includes a psychological assessment. An important component of the assessment is the establishment of short-term goals (STG) and long-term goals (LTG) to be achieved through education and exercise in the CR program. Understanding what a patient wants to do or needs to do and the barriers to function provides the CR therapist with information as to the performance skill the patient will need to acquire to achieve expressed goals (Doherty, 2003).

The ADL and IADL evaluation also provides the CR therapist with tools to motivate the patient to participate and take an active role in the recovery process. A patient may be restricted in function by post surgical or coronary event precautions. It is important to provide reassurance of returned function and goal achievement once the precautions are lifted, but in the interim it is equally important to reiterate compliance with post surgical precautions (Doherty, 2003).

The ADL and IADL evaluation conducted by the CR professional is typically documented in SOAP format. The following is an example of a CR ADL/IADL initial note, which typically will have the following components, included in the document.
The following is an example of a CR ADL/IADL initial note one might reference during the evaluation process (Perinchief, 2003).

**CR ADL/IADL initial note**

**S:** Medical history and diagnosis. Activity history and current activity level. Living situation. Home accessibility. Level of assistance currently being provided. Return to occupational roles. Report of any symptoms, changes in medical status since hospitalization. Level of awareness of precautions and risk factors. Use of assistive devices including supplemental oxygen.

**O:** Evaluation per patient report.
- Dressing
- Bathing
- Meal preparation and shopping
- Indoor/outdoor home maintenance
- Driving
- Perceived problem areas in ADL’s or IADL’s

Physical evaluation of patient
- 6 minute walk test or treadmill work physical tolerance test

Upper extremity (U/E) evaluation
- Active range of motion (AROM)
- Manual muscle test (MMT)
- Pain assessment

Lower extremity (L/E) evaluation per observation and patient report
- Quality of functional mobility and distance
- Strength, coordination and balance
- Safety issues
- Pain assessment

Initial ECG monitoring
- Compared to baseline 12 lead ECG available in medical chart
- ECG present for physician review.

**A:** Summarize above evaluations and paint a picture of the patient’s level of function and what factors are limiting function. Skilled therapeutic intervention in CR is warranted because? (See list of possible limitations below). Patients rehab potential. Patient’s goals.
**P:** Frequency and duration of treatment. STG and LTG’s established and will be achieved by when? Next session will implement CR STG to improve flexibility, strength, and endurance to achieve LTG. Implement patient education to reduce risk factors and potential for further CHD.

**Possible limitations in function experienced by CR patients.**

- Decreased upper body flexibility post surgical procedure
- Dyspnea with exertion and or respiratory compromise
- Weakness due to prolonged recovery post event
- Irregular heart rhythm and/or symptoms with activity
- Obesity
- Orthopedic limitations
- Physical deconditioning as a result of or in addition to a co-existing diagnosis
- Psychological fear or lack of confidence in abilities
- Patient safety issues. (Non-compliance with precautions, medications, and harmful behaviors or at risk for falls).

The ADL and IADL evaluation is only one portion of the comprehensive CR patient evaluation. One needs to be prepared to gather data from other sources of the initial evaluation so as not to over fatigue and possibly frustrate the patient by duplicating data gathering information.

**Physical Exam**

Following the above initial evaluation process, the cardiac rehabilitation specialist will conduct a physical examination. A 12-lead electrocardiogram (ECG) conducted and viewed by the patient’s physician should be available in the patients chart and serve as a reference in establishing an appropriate heart rhythm when comparing the 3 lead ECG obtained in the CR outpatient setting. Any change in ECG rhythm, with accompanying symptoms, should be reported to patient’s physician. Further evaluation is then postponed until a physician’s permission is received to resume the evaluation.
Components of the physical examination are as follows (Robertson, Reel, Crist and Mitchell, 1999).

- Assessment of strength, flexibility, posture, musculoskeletal stability, neurological, and orthopedic conditions that might impact participation in an exercise program.
- Cognition ability to participate in assessment or need for presence of a family member or caregiver.
- Potential barriers such as hearing problems, visual or language barriers that would impair the ability to participate in the assessment.
- Weight bearing non-weight bearing activity tolerance and initial exercise capacity.
- Heart rate, rhythm with special attention to irregular pulse and an awareness of the effects of medications on heart rate.
- Resting blood pressure.
- Auscultation of lung sounds with special attention to uniformity of breath sounds.
- Palpation and visual examination of lower extremities for edema and skin integrity especially in diabetic patients.
- Assessment of surgical site and incision healing with special attention to potential infection.
- Assessment of dyspnea at rest and/or with activity.
- Oxygen saturation.
- Body weight, height, body mass index and waist-hip ratio.

Cardiologists and cardiovascular specialists, in a controlled environment, use the following procedures for diagnostic purposes: 1) imaging modalities such as echocardiography, 2) exercise stress tests with nuclear imaging and 3) pharmacological stress testing. These evaluation and warranted medical interventions have taken place prior to a referral to outpatient CR.
The initial outpatient CR evaluation will include an assessment of the patient’s endurance and physiological responses post procedure, prior to exercise during exercise and post exercise. Cardiac rehabilitation specialist typically use exercise tests such as the 6-minute walk test as an assessment of functional capacity. Results of functional capacity testing are used to guide exercise prescription (Robertson, Reel, Crist and Mitchell, 1999).
UNIT VII

Cardiac Rehabilitation Treatment

Planning and Intervention
Treatment Planning and Intervention

Goals and Objectives of Unit VII

1. Identify the cardiovascular benefits of exercise for the CR client
2. Identify the psychological benefits of exercise for the CR client
3. Identify contraindications to exercise for the client with CVD
4. Define and differentiate the terms physical activity, exercise and cardiorespiratory fitness
5. Identify the goals of CR participation
6. Identify physiological responses to exercise
7. Identify how the physiological benefits of exercise can be monitored and documented
8. Identify the body’s physiological responses to exercise
9. Identify methods to determine functional capacity of the CR client
10. Identify the 5 components of exercise prescription

Connection between Exercise and Coronary Heart Disease

According to the American Association of Cardiovascular and Pulmonary Rehabilitation, (AACVPR) 70% of adults in the USA live a sedentary or inactive lifestyle and 50% of young people ages 12-21 years do not engage in physical activity on a regular basis. Research has shown that a sedentary lifestyle increases the risk for coronary heart disease, (CHD). Factors that influence this behavioral pattern can be contributed to industrialization, automation, and decreased physical requirements for occupational, household, and leisure-time activities However, adapting behaviors such as engaging in physical activity has proven to be a modifiable risk factor to reduce the potential risk of coronary heart disease (Squires & Hamm, 2006).

The 1996 National Institutes of Health Consensus Conference on physical activity and cardiovascular health identified the importance of defining the terms of physical
activity, exercise, and cardiorespiratory fitness. This organization defined the terms as follows; “Physical activity is the bodily movement produced by skeletal muscles that requires energy expenditure and produces progressive health benefits.” (p.53). This level of activity is informal in nature and may include such behaviors such as low-level leisure activity, components of self-cares and IADL’s. Physical activity allows one to meet the demands of daily life. Exercise is defined as “planned, structured, and repetitive of bodily movement done to improve or maintain one or more components of physical fitness” (Squires & Hamm, 2006).

Characteristics of physical activity are structured, consistent, sustained workouts of high, moderate and low intensity. Clothing, equipment and an environment conducive to physical activity are necessary components. Cardiorespiratory fitness is defined as “the capacity to take in and process oxygen for the production of energy for physical activity via aerobic metabolism”. Cardiorespiratory fitness is directly proportional to exercise tolerance. However, genetics, age, gender, and chronic diseases that also impact the nervous system, blood and skeletal muscle also influence cardiorespiratory fitness (Squires & Hamm, 2006).

Physical activity plays and important role in the prevention of CHD. Several studies identify a decrease in death rate from CHD with increased demand of physical occupational roles when compared to sedentary occupational roles. Physically demanding roles decreases the age at which the first myocardial infarct is experienced and death as a result of CHD. Interestingly cardiorespiratory fitness is influenced by genetics regardless of habitual exercise. However, the death rate, from CHD, is
dramatically decreased for both males and females with increased levels of fitness (Squires & Hamm, 2006).

Reasons for the cardio protective effects of exercise can be attributed to adaptations of the epicardial coronary arteries which results in the following: 1) increased cross-sectional area of the lumen; 2) improved capacity for vasodilatation with enhanced endothelial function and; 3) potential increased collateral circulation in patients with left ventricular dysfunction. Exercise and physical activity contribute to reducing the severity of common modifiable risk factors such as hypertension, dyslipidemia, obesity, psychosocial stress and metabolic syndrome (Squires & Hamm, 2006).

Although the incidence of cardiac related death is rare during exercise and intense physical activity, it does occur. Cardiac arrest, during exercise, is 56 times higher than during rest for sedentary men and 5 times higher for physically active men. The risk for myocardial infarct during exercise is 2-6 times higher than at rest (Squires & Hamm, 2006).

The cardio protective mechanisms of exercise and physical activity are not completely understood, but the reduction in risk factors such as, improved physiological and psychological functioning, reduce the risk of CHD and consequential debilitation. Research provides a solid base for the use of exercise training as part of a comprehensive approach to primary and secondary prevention in cardiac rehabilitation (Squires & Hamm, 2006).

**Contraindications to Exercise Testing**

A physician’s referral is required prior to exercise testing and implementation of exercise training. Patients need to sign an informed consent form. Emergency
equipment should be readily available and staff trained and ready to respond to emergencies should the need arise (Robertson, Reel, Crist & Mitchell, 1999).

Graded Exercise Tests are commonly used in cardiac rehabilitation programs to establish a patient’s baseline functional capacity upon entrance into the program. The graded exercise test is conducted under close supervision using ECG and hemodynamic monitoring. Special attention is paid to the onset of signs/symptoms that may place the patient at risk for cardiac instability. Typically, the exercise test is conducted using a treadmill with graded increases of intensity at specific points of duration. Cardiac rehabilitation specialists conduct exercise test following specific guidelines for the purpose of therapeutic applications. The exercise test is a tool to assist the cardiac rehabilitation specialist to establish: 1) baseline functioning; 2) implement an exercise prescription; 3) assess patients progress over time; 4) evaluate outcomes and; 5) it is often a motivator for patient to see improvement in their performance (Balady et al., 2000).

Patients with a cardiac history are 60-100 times at greater risk for another cardiac event, during exercise testing and training than patients who do not have a cardiac history. However, safe appropriate exercise testing and training has shown to be beneficial in reducing risk factors in cardiac patients. To reduce the risk of a cardiac event or exercise induced complications it is imperative to have conducted a thorough assessment of risk stratification and the evaluation of a patient’s diagnosis, past medical history and current clinical status. Then compare this information to the established contraindications to exercise testing and training. Contraindications to exercise testing and training are as follows (Balady et al., 2000).
Contraindications to Exercise Testing (Balady et al., 2000).

- Acute myocardial infarction (within 2 days).
- Unstable Angina.
- Uncontrolled cardiac arrhythmias causing symptoms or hemodynamic compromise.
- Symptomatic severe aortic stenosis.
- Uncontrolled symptomatic heart failure.
- Acute pulmonary embolus or pulmonary infarction.
- Acute myocarditis.
- Acute aortic dissection.

Relative Contraindications: (Relative contraindications can be superseded if benefits outweigh the risk of exercise) (Balady et al., 2000).

- Left main coronary stenosis.
- Moderate stenotic valvular heart disease.
- Electrolyte abnormalities
- Severe arterial hypertension.
- Tachyarrhythmias or brady arrhythmias
- Hypertrophic cardiomyopathy.
- Mental or physical impairment leading to inability to exercise adequately (safety issues).
- High degree of atrioventricular block.

Contraindications and Relative contraindications do not take into account the impact other medical conditions such as diabetes, pulmonary hypertension, debilitating neurological or orthopedic conditions, pregnancy, or morbid obesity. These may be contraindicated to exercise testing (Balady et al., 2000).

Contraindications to Exercise Training:

- Unstable ishemia
• Heart failure that is not compensated
• Uncontrolled arrhythmias.
• Severe and symptomatic aortic stenosis.
• Hypertrophic obstructive cardiomyopathy.
• Severe pulmonary hypertension.
• BP 180/110
• Myocarditis, pericarditis, dissecting aneurysm, Thrombophlebitis.
• Systemic embolus.

Note:
I can reflect upon times when I have had the comfort of stating “that’s an absolute contraindication to exercise training, but more often I have had to deal with the gray areas of the relative contraindications. Most of the patients I work with have several compromising diagnoses due to the progressive nature of artherosclerotic heart disease combined with diabetes and obesity. Understanding and being aware of contraindications and relative contraindications provides you with confidence, skills and knowledge to engage patients in cardiovascular endurance training. This ensures successful outcomes while reducing the risk of a cardiac event for the patient. I always go with my gut feeling and err on the side of caution especially when first meeting a patient.

I have had occasions where during exercise the patient will verbalize a change in status or they will report information not available in the medical chart. In addition to all the above conditions, I have found several things that contribute to issues during exercise. I am suspicious of underlying causes when symptoms present such as:

- Dehydration (especially in the elderly) results in irregular heart rhythms.
- Elevated heart rate, higher than 120 bpm usually a sign of fever or infection (often bladder, UTI or at the surgical sight).
- Hypoglycemia (patient forgot to eat before exercise). Symptoms of hypoglycemia are similar to onset of cardiac events and can be very frightening for the patient especially if they are very weak to begin with.
- Smoking,
- excess caffeine, or
- forgetting to take medications as prescribed can result in elevated heart rate and irregular rhythms.

I have found that patients don’t intentionally forget to tell you things and that they are very surprised when symptoms present and we are able to collaborate and solve the problem.

Cardiovascular Exercise Physiology

The goal of cardiac rehabilitation is to provide patients, who have been diagnosed with coronary heart disease, a comprehensive rehabilitation program that includes:

- physical,
- psychological,
At the core of cardiac rehabilitation is the exercise prescription. Exercise prescription is designed to improve cardiovascular function for safe progression of activity to meet the demands of daily life.

Participation in regular exercise results in physiological adaptations that improve physical function and enable one to return to prior level of function and limit the effects of illness. The purpose of the following information is to assist allied health professionals in understanding the physiology of the body’s responses to exercise (Mayers, 2006).

The acute physiological response to exercise starts with a “transformation of chemical energy to mechanical energy” occurring at the cellular level. This process requires the integration of numerous systems, most notably the cardiovascular and pulmonary systems. An oxidative process occurs at the cellular level and in response, the body can perform work through energy generated to conduct a muscle contraction. This process is termed “cellular respiration” which begins with the break down of fuels such as fats and carbohydrates, with the assistance of oxygen, to generate energy for exercise. Muscles used during exercise consume oxygen in the mitochondria and produce chemical energy in the form of ATP with carbon dioxide as a by-product. This is the process by which aerobic exercise is performed (Mayers, 2006).

The entire body’s metabolic and physiological systems operate in a coordinated manner to provide energy to the exercising muscle. However, the cardiovascular and pulmonary systems play a critical role. Specific factors occur in the heart to meet the
demands of the body during exercise. The heart must be able to receive returning venous low oxygenated blood, pump blood to the lungs for oxygenation and eject oxygenated blood to the arterial circulatory system. Exercise capacity is determined by cardiac output in that the heart has the capacity to pump blood to meet the demands of the myocardium, lungs and exercising muscle (Mayers, 2006).

The lungs must have the capacity to oxygenate the blood delivered to it and the arterial venous circulatory system needs to be able to deliver oxygenated blood to the working muscle. The working muscle then needs to have the capacity to efficiently extract the oxygenated blood. Patient who suffers from cardiovascular or pulmonary disease experience decreased exercise capacity as a result of one or several of these factors not functioning due to disease or injury (Mayers, 2006).

Central factors to cardiovascular function are “heart rate, stroke volume, filling pressure, ventricular compliance, contractility, after-load and ventricular volume”. As the heart rate increases, that stroke volume and the amount of blood pumped each beat also increases which determines the cardiac output. Cardiac output is typically impaired in cardiac patients either for brief periods, prior to medical intervention, with no resultant myocardial damage or for longer periods, such as in the event of a myocardial infarct or sudden death (Mayers, 2006).

Functional capacity in cardiac rehabilitation patients is often measured using a series of calculations to determine VO2 Max or Maximal cardiac out-put x arteriovenous oxygen difference. This can also be calculated out as MET’s, which is an approximation of what MET level or MET level reserve a patient needs to function at, to meet certain ADL activities. A patients reported ADL activity level can assist in setting
goals and determining the required MET level the patient needs to achieve to resume
his/her desired level of activity (Mayers, 2006).

Note: To describe this process or calculations to a patient one can use the example as follows. A MET is the ability to breath in enough oxygen to oxygenate the blood pumped through the heart to do work. An example of ADL MET levels is included later in this chapter.

Benefits of exercise can be seen through the monitoring of hemodynamic responses pre, peak and post exercise. Results that are typically seen, post exercise, are a lower resting heart rate and blood pressure. Patients show improved endurance, strength agility and flexibility through the continued progression of intensity and duration of exercise. Improvements not observed, through monitoring, are those reported by patients, such as of feelings of improved energy levels and feelings of well-being psychologically. These positive outcomes are most likely a result of “increased blood volume, enhanced vascular tone, and enhanced vasodilatory capacity and better redistribution of available blood flow”. These improvements, noted by research, allow the delivery and efficient utilization of oxygenated blood flow during work and reduces the symptoms associated with cardiopulmonary disease (Mayers, 2006).

**Exercise Prescription**

Development of the exercise prescription is soundly based on scientific evidence and is used as guideline to implement cardiovascular exercise training to improve physical fitness. Due to the vast number of diseases, degree of disease and diagnosis encountered with coronary artery disease in addition to patient variability one must use flexibility and variation to meet the individual needs of patients. This assures safe progression during cardiovascular endurance training.
The art of exercise prescription is practiced within the established guidelines with modification, and adaptation to a patient's response with special attention paid to the patient's expressed desires and goals. The art of prescribing exercise becomes evident in the patient's satisfaction with the outcome of improved cardiovascular fitness with an absence of symptoms (Balady et al., 2000).

The exercise prescription is implemented following the initial evaluation and it is based on the accumulation of all sources of data gathered to complete a patient profile.

The exercise prescription takes into consideration guidelines for:

1. Target heart rate,
2. BP,
3. Oxygen saturation,
4. Rate of perceived exertion,
5. Dyspnea,
6. Claudication, and
7. Angina scales.

The exercise prescription is essentially a STG progressing toward achieving LTG's and can be manipulated each session, if all areas including heart rhythm are within acceptable parameters. There are specific guidelines for special populations such as diabetics and patients who require supplemental oxygen during exercise. The exercise prescription has 5 exercise components each with guidelines inherent to the component.

These components are: (Balady et al., 2000).

1. Intensity.
2. Progression.
3. Duration.
4. Frequency.
5. Mode.
The exercise prescription can be adapted and modified in the following areas in accordance to the patient’s premorbid level of exercise and current level of fitness (Balady et al., 2000).

1. Interval conditioning: Work followed by prescribed rest periods.
2. Circuit Conditioning: Work performed on a number of modalities with or without rest breaks between modes of exercise.
4. Continuous Conditioning: Continuous energy expenditure at a set intensity for a set duration.

The exercise prescription is used as a guideline in the plan of care. The goal is for the patient to achieve an endurance level or functional capacity to meet the demands of activities of daily living asymptomatic and continue to pursue a healthy lifestyle (Balady et al., 2000).

The following is an example of an exercise prescription form and home exercise program that were compiled following the AACVPR guidelines for CR program certification for Altru Health System. (Robertson, Reel, Crist & Mitchell, 1999).
Cardiac Rehab Outpatient Exercise Prescription Guidelines

1. Enter into outpatient exercise program.
2. Follow ACLS Protocol for emergency care.
3. All exercise prescription will follow patient diagnosis specific plan of care guidelines for safety and appropriate progression.
4. All pre-existing and co-existing limitations will be considered when prescribing exercise.
5. Termination points for exercise will be followed per practice guide for Cardiac Rehab Outpatients.

Physician: ___________________ Diagnosis: __________ Procedure: __________

Risk stratification: [ ] High [ ] Mod [ ] Low THR: ____________ Exercise O2: ____________ L/M

Resting Data

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<th>HR</th>
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<th>BP</th>
<th>O2 SAT</th>
<th>Prior Exercise Hx</th>
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</table>

Warm Up [ ] Cool Down [ ] 5-10 reps [ ] 5-10 min. [ ]

Toning/Strengthening Home Program Instruction: [ ] Yes [ ] No Reps ______ Sets ______ Wt ______ Lbs

Exercise Prescription

<table>
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<tr>
<th>Mode</th>
<th>Duration</th>
<th>Intensity</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Treadmill</td>
<td>Severe</td>
<td>60% - 75% of MHR if appropriate.</td>
<td>3 x per week</td>
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<tr>
<td>Monark Bike</td>
<td>3-5 mins</td>
<td>CABG: RHR +30 BPM</td>
<td>2 x per week</td>
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<tr>
<td></td>
<td></td>
<td>Mi: RHR +20 BPM</td>
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<tr>
<td></td>
<td></td>
<td>Not to exceed RPE of 13 on Borg Scale.</td>
<td></td>
</tr>
<tr>
<td>Airdyne</td>
<td>Moderate</td>
<td>Not to increase more than 0.5 MET per session.</td>
<td>1 x per week</td>
</tr>
<tr>
<td>Nu-Step</td>
<td>10-20 mins. Initially.</td>
<td>As patient tolerates within limitations</td>
<td>Home program</td>
</tr>
<tr>
<td>Crank</td>
<td>Mild D</td>
<td>BP within guidelines</td>
<td>4-5 x per week</td>
</tr>
<tr>
<td>Rowing</td>
<td>25-30 mins. initially.</td>
<td>O2 Saturation 90% or above R/A</td>
<td></td>
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STG: Patient will show improvement in either tolerance physiologically, psychologically, RPE, frequency, duration or intensity per week.

STG: Patient will verbalize an understanding of 1 identified educational need per session.

LTG: Achieve _______ MET tolerance for ADL/EX _______ mins asymptomatic by discharge.

LTG: Verbalize an understanding of all CAD teaching identified as need on teaching sheet with written diagrammed materials to refer to at home.

LTG: Exercise home program to continue with independent exercise upon discharge.

LTG: Return to work if appropriate.

Staff Signature: ___________________ Date: ___________________

Physician's Signature: ___________________ Date: ___________________

Perceived Exertion Scale

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<tbody>
<tr>
<td></td>
<td>Very, very light</td>
<td></td>
<td></td>
<td>Very light</td>
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<td></td>
<td>Fairly light</td>
<td></td>
<td></td>
<td>Somewhat hard</td>
<td></td>
<td>Hard</td>
<td></td>
<td>Very Hard</td>
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</tbody>
</table>

100
Treatment Planning & Intervention by Diagnoses

Angina Treatment

Treatment may include cardiac interventional procedures such as:

- stent placement and or medications to vasodilate the arteries, lower blood pressure and decrease heart rate thereby decreasing myocardial demand.
- Physical activity and appropriate exercise prescription.

Participation in cardiac rehabilitation promotes physiological adaptation of peripheral circulation and facilitates the process of collateral circulation improving myocardial profusion. Increased activity tolerance and physical fitness increases anginal threshold and allows patients to partake in activities of greater intensity and meet the demands of daily life. (Miller 2006).

MI Treatment

Intervention is of an emergent nature and the primary goal is to reestablish circulation. The most successful intervention is provided within 2 hours of the onset of symptoms with thrombolytic medications (“clot busters”). Thrombolytic medications can be administered up to 12 hours post onset of symptoms but the sooner the intervention, the less damage to heart muscle and potential mortality. There is debate as to the best method of reperfusion using either thrombolytic therapy or angioplasty. If angioplasty is delayed by more than 90 minutes post onset of symptoms the treatment of choice is early intervention with thrombolytic therapy (Miller 2006).
Due to the hearts irritability, post MI patients are at risk for serious arrhythmias that accompany an MI, as well as post infarction angina, left ventricular dysfunction and congestive heart failure. These place patients at high risk for a second MI if appropriate management is delayed or not implemented. Frequently patients will require an implantable device such as a pacemaker to take control of the hearts natural pacemaker or and AICD to control arrhythmias (Miller 2006).

**Medication:** In addition to using devices to control the above mentioned problems medications play and important role in patient management post MI. To reduce the risk of a second MI, patients are typically prescribed the following “cardiac cocktail” which includes:

1. An anticoagulant, reducing risk of additional clot formation,
2. Beta-blocker, to reduce the potential life threatening arrhythmias, stabilize the myocardium and lower blood pressure,
3. ACE inhibitor to reduce “remodeling” of the damaged ventricle and development of ischemic cardiomyopathy,
4. Lipid lowering medications, which reduce arterial swelling and cholesterol production,
5. Nitrates which vasodialate the vessel reducing anginal symptoms, and a diuretic to reduce potential for fluid retention. (Robertson, Park & Alexander, 2006).

Medications have been so effective in the reduction of a second MI that some medical facilities now require documentation as to why proven medications have not been prescribed for a patient.

In addition to experiencing a variety of medication side effect patients often become overwhelmed with the number of medications they have been prescribed. Medication non-compliance is usually the result of a patients, lack of understanding the benefits of medications. Confusion and frustration may cause the patient to stop taking prescribed medications; this has the potential to place the patient at risk for another heart
attack and possible mortality. Medications have a great impact on a patients physical and psychological functioning. In order for the CR specialist provide effective education and encourage medication compliance one needs to have a good understanding of the impact these medications have on functioning in addition to the risks, benefits and side effects.

**Engaging in Activity:** Patients are often very fearful of activity and the very real possibility of having another MI during activity; however, research has shown that physically active patients are 25% less likely to die from an MI than sedentary individuals. (Miller, 2006). Therefore a referral to an outpatient CR program is an appropriate interventional strategy to increase a patient’s activity level in a safe and supportive environment.

Following recovery of usually 1 week, patients are encouraged to participate in cardiac rehabilitation to improve cardiac function where the heart rhythm can be monitored while a patients’ activity level is increased sensibly in intensity and duration. Safe activity progression provides the patient with the endurance and confidence to meet the demands of daily life. While in CR patients will also receive information concerning risk factor reduction and life-style modification to decrease the risk of future heart disease (Miller, 2006).

**CHF Treatment**

*Implantable Devices:* Patents often require an implantable cardiac defibrillator and medications to improve cardiac function. An implantable device is usually warranted if the EF is less than 35%. The biventricular pacemaker used to treat CHF is a dual chamber pacemaker with three leads. The third lead is thread through the great cardiac vein into the muscle of the left ventricle. The signal through the third wire synchronizes
right and left ventricular contraction. It has also shown to keep the heart in midline during contraction resulting in an equalized contraction of the hypertrophic muscle. The biventricular pacemaker functions to increase the coordinated pumping efficiency of the heart and is also known as cardiac resynchronization. Patients with the biventricular pacemaker report fewer symptoms and higher energy levels over time after the pacemaker insertion (Purcell and Johnson, 2006).

Medications typically prescribed in the management of CHF include but are not limited to diuretics, ACE inhibitor, beta-blocker and digoxin. The treatment of CHF does not cure the disease, however heart function can be improved, symptoms are reduced and quality of life is improved (Gersh, 2000).

As previously stated congestive heart failure is a secondary diagnosis addressed in outpatient CR. The goal is to provide education regarding symptom recognition, when to seek early intervention, medication compliance, diet and exercise prescription to improve activity tolerance. It is also important to provide education pertaining to energy savings techniques, work simplification and home modification to increase awareness of the need to pace activity, promote safety and avoid excessive fatigue while engaged in activities of daily living.

CABG Treatment

Patients are usually referred to CR 3-4 weeks post CABG. However, some physicians prefer a more aggressive approach specifically for the younger uncomplicated patient and may refer a patient 1-2 weeks post surgery. Regardless of duration post surgery the AHA and AACVPR support the therapeutic intervention provided in CR programs.
Typically post surgical patients are in a weakened deconditioned state. Regardless of age or gender one needs to have endurance to resume activities of daily living and return to prior functional ability, while adhering to post surgical precautions to prevent complications. The one of the more serious being sternal dishisance.

Activities that involve pulling, pushing, lifting or carrying more than 10 lbs is to be discourage for 12 weeks post surgery to allow for appropriate healing of the sternum (Miller, 2006). The skin incision will heal in approximately 6 weeks, but the cartilage of the sternum will take up to 12 weeks.

Central nervous system deficits are common following the CABG surgical procedure. The extent to which they interfere with functioning will vary from patient to patient and with the complexity of the medical history. Three percent of patients will present with focal motor or sensory deficits and rates as low as 3% and as high as 50% have been reported to experience cognitive deficits post surgery. However, cognitive function shows improvement in as short as six weeks up to six months.

A stroke can also result in focal deficits, which is believed to be most frequently caused atheroembolisms that become dislodged from the aorta during grafting. Cognitive changes may occur as a result of intraoperative hypotension, inadequate cerebral perfusion, and response to anesthesia (Miller, 2006).

Note: Patients frequently express concern regarding issues with retention, and concentration especially in instance regarding reading material. This is important to remember when providing handouts and educational materials. It is advisable to have family present if this is of concern to the patient. Patients and family are also very fearful of this problem and it is important to be able to understand the situation and provided reassurance along with compensatory techniques to assist with cognitive recovery (Miller, 2006).
Post CABG patients will often express concern pertaining to sensory loss to the ulnar innervation area of the right or left upper extremity, resulting in numbness in the ring and small finger. This can be usually be attributed to positioning during surgery, retraction of the sturnum or during dissection of the LIMA or RIMA which may have irritated or put pressure on the trunk of the brachial plexus. As with most nerve compression injuries healing will take time (Gersh, 2000). It is important to be able to reassure the patient and offer suggestions to facilitate active range of motion, strengthening, and coordination of the effected phalanges to reduce the risk of muscle atrophy and prolonged weakness.

**Heart Transplant Treatment**

When the transplant patient is referred to CR it is important to take into consideration the above mentioned clinical findings and how the patient will respond to exercise and resuming activity physiologically and emotionally. Transplant patients are typically very decondition as a result of prior disease and have limited exercise capacity as a result. Studies show a 10%-15% reduction in lean body mass attributed to pre transplant illness. Post transplant patients are further compromised as a result of prolonged recovery post surgery, immunosuppressant steroids and cyclosporine therapy. However to discourage physical inactivity would only lead to further weakness and disability (Kavanaugh, 2006).

**Home Program Instruction**

A goal of CR is to motivate an individual to make life-style changes to reduce the risk of future heart disease and promote health. Prior to discharge, the CR specialist will begin a discussion with the patient on the need to continue to exercise. Options to
participate in community exercise programs following discharge from CR, are also explored with the patient.

Home program discussion will focus on the following elements; 1) the need to adhere to CR exercise guidelines, 2) to follow post surgical precautions, 3) the need to implement patient educational principles necessary to make life-style changes and 4) that the patient understands all instructions.

Upon discharge the CR professional will provide a home program for the patient to share with community health-care professionals. This is essential to staring an independent or supervised exercise program safely within the community. On the following page is an example of a home program form complied from information following AACVPR guidelines for CR certification (AACVPR, 1999).
Cardiac Rehab Home Program Instructions

Home program instructions for: ___________________ Diagnosis: ___________________ Procedure: ___________________

**Session #1**

Starting exercise level: TM ___________________ TM ___________________

NS ___________________

**Session #2**

Exercise level achieved by discharge from Cardiac Rehab Phase II: Treadmill ___________________

Nu-Step ___________________

Bio-Step ___________________

In order to maintain the level that you achieved during Cardiac Rehab you should follow the recommended guidelines for exercise:

- Target heart rate ________/or 20 BPM - 30 BPM above resting heart rate.
- Frequency of exercise 3-5 x per week with activity most days of the week.
- Intensity of exercise (see above). Consistent exercise is important.
- Duration of exercise 30-60 mins. Shorter duration 10 min. x 3 or 15 min. x 2 is also acceptable.
- Mode of exercise patient preference per cardiac precautions.
- Always remember to include warm-ups and cool downs with your exercise sessions, 10 reps, 1 x per day.
- Toning / Strengthening Exercises, 10 reps. 1-3 sets, 2-3 x per week. Follow diagrams and instructions.

Comments regarding important lifestyles changes:

- Meds. Carry updated list in purse/wallet at all times. Take all meds as prescribed per physician.
- Weight ___________________
- Diet. AHA heart healthy, vegetables, fruit and fiber, small portions ___________________
- Stress. Slow deep breathing, relaxation, hobbies & things to look forward to reduce stress.
- Smoking. Avoid second-hand smoke. ___________________
- Blood Pressure. AHA Guidelines optimal less than 120/80 ___________________
- Diabetes ___________________
- Cholesterol. Follow up with physician appoints and labs for management. ___________________

Plan: To continue with independent exercise program: ___________________

Comments: ___________________

Call Cardiac Rehab at (701) 780-1528 if you have any questions regarding your home program. We will contact you with a follow-up phone call in 6 months.

Patient Signature ___________________ Date __________

Cardiac Rehab Staff Signature ___________________ Date __________
Unit VIII

PATIENT EDUCATION AND

BEHAVIOR MODIFICATION FOR

RISK FACTOR MANAGEMENT
Patient Education & Behavior Modification

for Risk Factor Management

Goals and Objectives of Unit VIII

1. Identify the educational topics to be addressed in CR
2. Identify educational programming conducive to behavioral change and risk factor modification
3. Identify a CR program educational objective, method and outcome pertaining to client care
4. Identify the principles of adult learning
5. Identify the components of basic counseling skills
6. Identify components of a plan of care for the CR client.

Patient Education

Approximately 25% of a patient's treatment time, in cardiopulmonary rehabilitation, is devoted to education and training to reduce:

1. risk factors of future heart disease,
2. debilitation associated with heart disease and potential mortality as a result of heart disease.

Patient education is typically presented on a one-to-one basis or in a group setting, depending upon the sensitivity of issues being discussed and the needs of patients.

Family and caregivers are also encouraged to attend educational programs as appropriate (McConnel & Klinger, 2006). According to the AACVPR manual the following outline is an example of information and topics to be covered during patients care in cardiac rehabilitation. These topics include but are not limited to:

1. Basic Cardiac Anatomy: This following is just an example of basic anatomy and can be modified to each patient's needs, diagnosis and extent to which anatomy needs to be addressed (McConnel & Klinger, 2006).
a. *Example of Objective:* the patient will verbalize an understanding of the basic coronary anatomy.

b. *Example of Methods used may include:* lecture, group discussion, video, use of a heart model and handouts.

c. *Example of Outcome goals:* patient to have knowledge of basic cardiac anatomy and be able to identify structures that typically are affected by obstruction of blood flow to the heart. These structures would include the following arteries, Left main, Left anterior descending, Circumflex and Right posterior descending arteries

2. **Coronary Heart Disease (CHD):**

   Cardiac rehabilitation programs provide patient education and training regarding factors that contribute to coronary heart disease (CHD). Factors to be addressed include:

   - The distinction between partial blockage and complete blockage of a coronary artery, the artery involved and the symptoms experienced as a result of the occlusion.

   - Treatment methods to reduce symptoms, correct malfunctions and or prevent mortality, such as medical management, percutaneous transluminal angioplasty, stent placement and coronary artery bypass graft are also addressed and discussed (McConnel & Klinger, 2006)

3. **MI:** Patients must be provided with a clear explanation of the cause of a myocardial infarction, symptoms and treatment.
a. Learning objectives would be achieved through the use of lecture, group discussion, heart models, handouts and case examples.

b. The outcome goal for the patient would be the patient would be able to verbalize that an MI is caused by a complete coronary artery blockage. Patient would be able to verbalize symptoms associated with an MI such as severe chest pain, discomfort radiating to jaw, neck, back and/or shoulders and possibly radiating down one or both extremities.

c. Unlike anginal symptoms, an MI is usually associated with diaphoresis, clammy skin, lightheadedness, shortness of breath, nausea or vomiting. Symptoms that are not relieved with rest mean that medical intervention is necessary. Treatment usually includes the use of medications to dissolve the blood clot, and stabilizing the patient (McConnel & Klinger, 2006).

4. Signs and Symptoms of Angina: Patients need to be provided with information regarding the cause of angina, symptoms and treatment. Teaching methods previously described are appropriate to achieve learner objectives.

   a. Blood flow is restricted by a build up of fat or cholesterol in the coronary arteries which leads to inadequate blood flow to meet myocardial demand.

   b. Angina is experienced as a squeezing, pressure or discomfort in the chest area, radiating to the jaw, neck, back, shoulders and possibly down one or both extremities.

   c. The patient will verbalize and understanding of signs, symptoms, causes and treatment of angina.
d. The patient will verbalize an understanding of how to administer nitroglycerine and awareness of medication to control angina.

5. Medication Compliance: Patient education should also address the issue of medication compliance and how to take medications appropriately. The following is an example of the instructions provided to a patient taking nitroglycerin:

Appropriate use of Nitroglycerin (McConnel & Klinger, 2006).

- keep nitroglycerin in the small brown bottle it comes in, or stainless steel pendant, as this protects it from light and maintains its potency
- Carry it with you at all times and renew the prescription every 6 months.
- Some experts recommend removing the cotton from the bottle immediately so this is not an obstacle when you need to access it in a hurry.
- You need to sit down and place one nitroglycerin tab under the tongue and wait 5 minutes, at the first sign of symptoms.
  - If no relief of symptoms is felt, repeat the process an additional 2 more times.
  - If no relief after 15 minutes call 911.
- Patients should be instructed to inform their primary caregiver if their symptoms of angina change become more frequent with decreased activity tolerance or awakening with anginal symptoms (McConnel & Klinger, 2006).

The following is a CR Education Plan of Care Guideline compiled from AACVPR program certification guidelines. The plan of care identifies educational needs to
facilitate behavioral change, program goals, intervention to achieve goals and outcomes.

The plan of care can be tailored to meet each individual patient's needs.

<table>
<thead>
<tr>
<th>Educational Needs</th>
<th>Program Goals</th>
<th>Interventions</th>
<th>Patient Goals/Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Living with Heart Disease.</td>
<td>1. Understand heart anatomy and disease process. 2. Understand cardiac diagnosis, tests, procedures &amp; surgery. 3. How the heart works.</td>
<td>Provide the following education and materials: 1. Pt. specific report of procedure/surgery. 2. AHA Videos on cardiac procedures and handouts. 3. Heart model demo.</td>
<td>Patient will verbalize an understanding of: 1. How the heart functions. 2. Medical intervention specific to their procedure/surgery. 3. Awareness of precautions.</td>
</tr>
<tr>
<td>2. Emergency Care.</td>
<td>1. Recognize signs/symp of angina, heart attack and stroke. 2. Action steps to take in an emergency. 3. Ability to seek help and decrease myocardial injury.</td>
<td>Provide the following education and materials: 1. AHA video's, handouts signs and symptoms Are you at risk? 2. When to call 911 3. How to take Nitro (if approv.)</td>
<td>Patient will verbalize an understanding of: 1. Signs/symp. of angina heart attack and stroke. 2. Will know when to call 911 3. How to take Nitro (if approv.) 4. Aware of CPR classes</td>
</tr>
<tr>
<td>3. Cardiac Low Fat High Fiber Diet.</td>
<td>Follow through with: 1. Low fat diet (25 grams) 2. Low cholesterol (300 mg) 3. Low sodium (200 mg) 4. Awareness of healthy eating portion size, 5. Fluid intake, 6. High fiber (20-30 gms)</td>
<td>Provide dietary education and materials: 1. AHA video's, handouts, low cholesterol, low fat, low sodium diets. 2. How to read labels. 3. Weekly nutrition class. 4. Food pyramid guidelines. 5. Benefits of increasing H2O and decreasing caffeine.</td>
<td>Patient will demo and follow through with: 1. Low fat, 30%, low chol, 200-300 mg, diet. 2. 2-3 grams Na+ per day. 3. Read labels. 4. Food Pyramid Guidelines. 5. Attend 1 nutrition class. 6. No more than 4 cups coffee per day 8 oz glasses of H2O (if no fluid restriction).</td>
</tr>
<tr>
<td>5. High Cholesterol.</td>
<td>1. Obtain lipid panel. 2. 1:1 consult regarding lipid panel results. 3. Patient awareness to achieve appropriate blood cholesterol levels &amp; reduce risk factors.</td>
<td>Provide education and materials for: 1. Dietary changes. 2. Medication awareness. 3. Achieve goals (all mg/d) TC &lt; 200, HDL &gt; 35, LDL &lt; 100. Trig &lt; 150.</td>
<td>Patient will verbalize awareness of: 1. What the # mean. 2. Ways to reduce chol. 3. Collaborate with physician for chol monitoring. 4. Risk of high cholesterol.</td>
</tr>
<tr>
<td>6. Congestive Heart Failure.</td>
<td>1. Patient will be knowledgeable of signs/symp. of CHF. 2. Seek intervention with early onset of symp.</td>
<td>Provide Instruction H/O, videos of signs/symp. of CHF. 2. Daily weight tracking. 3. Dietary instructions.</td>
<td>Patient will be aware of signs/symp. of CHF. 2. Compliance with MD prescribed care. 3. Follow low sodium diet.</td>
</tr>
</tbody>
</table>

Potential Learning Barriers (circle all that apply)  
1. Age  
2. Degree of acceptance  
3. Degree of illness  
4. Family problems  
5. Financial difficulty  
6. Hearing difficulty  
7. Language (learning barriers need to be spelled out in comments if learner is not the patient)  
8. Learning difficulty  
9. Physical handicaps  
10. Reading difficulty  
11. Religious/cultural beliefs  
12. Visual difficulty  
13. None  

Identified Learner (s)  
A. Patient  
B. Spouse/significant C. Parent  
D. Other:  
E. Other:  
F. Other:  
G. Other:  

Outcomes/Evaluation of Learning (1-7)  
1. Demonstrates understanding  
2. Verbalize understanding  
3. Needs reinforcement (explain in comments)  
4. Poor understanding, repeat all  
5. Family involvement necessary  
6. Unable to teach (describe in comments)  
7. Noncompliant (follow up required if outcome is 3-7)
## Cardiac Rehab Education Plan of Care Guideline

Individualized to meet patients' needs (include families and caregivers)

<table>
<thead>
<tr>
<th>Educational Needs</th>
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</thead>
<tbody>
<tr>
<td>7. Medication Compliance.</td>
<td>Patient will be knowledgeable of: 1. Prescribed meds. 2. Purpose of meds and side effects. 3. Dosage of meds, when and how to administer meds. 4. Will carry personal med card.</td>
<td>Patient education and instruction handout/videos on meds. 1. Use of Nitro tabs/spray. 2. Provide med card. 3. Provide opportunity to attend pharmacy class or 1:1 consult with pharmacist. 4. Instruction of the importance of med compliance.</td>
<td>1. Patient will verbalize an understanding of all meds, dosage and purpose. 2. Will have completed and carry accurate med card. 3. Attend pharmacy class. 4. Inform staff and/or physician of med changes or side effects.</td>
</tr>
<tr>
<td>9. Smoking Cessation.</td>
<td>Patient will be aware of: 1. Risks of smoking and second-hand smoke. 2. Cessation aids: meds___ patch___ gum___ 3. Smoking cessation class and/or support groups. 4. Develop plan to stop smoking; set stop date.</td>
<td>Provide education/instruction handout/video on: 1. Smoking cessation and benefits. 2. RT referral if indicated. 3. Physician referral for smoking cessation options. 4. Individualized plan to set stop date.</td>
<td>1. Patient will verbalize an understanding of risks of smoking. 2. Be aware of smoking cessation aids. 3. Stop smoking by D/C. 4. Will attend smoking cessation class and/or community support group.</td>
</tr>
<tr>
<td>10. Daily Exercise.</td>
<td>Patient will adhere to safe approp. level of exercise. 2. Engage in warm up/cool down toning/strengthening exercise program. 3. Engage in Cardiovascular ex. 20-30 min. 5-6 x per week. 4. Incorporate activity pyramid into daily activity. 5. Complete exercise pre/test post/test with 95% correct score on post.</td>
<td>Provide education H/O. and video’s on: 1. Exercise precautions contraindications and benefits. 2. Individualized exercise prescription. 3. ADL activity progression. 4. Home program instruction. 5. Referral to independent exercise program.</td>
<td>Patient will verbalize understanding of and intent to follow: 1. Exercise home program progression and maintenance. 2. Exercise precautions and home program restrictions. 3. Awareness of meds achieved and ADL activity level at D/C. 4. How to use THR or RPE to self monitor.</td>
</tr>
<tr>
<td>11. Understanding Psychosocial effects of heart disease.</td>
<td>Patient will understand psychosocial aspects of emotions; depression, anxiety, fear, denial. Complete SF 36 and assess needs for referral for psychosocial intervention.</td>
<td>Provide education/instruction H/O. and videos: 1. Recognizing and dealing with emotions. 2. 1:1 consult with pastoral services. 3. Heart support group mtg.</td>
<td>1. Patient will verbalize an understanding of the psychosocial effect of heart disease. 2. Follow through with prescribed MD care &amp; med compliance. 3. Be aware of resources to help cope.</td>
</tr>
</tbody>
</table>

**Short Term Goal:** Patient will be provided with education addressing 1 need each session attended.  
**Long Term Goal:** All educational needs identified will be addressed within 12 sessions or at time of D/C.
The following is a review the basic principles of behavior modification that lead toward healthy lifestyle behaviors following a cardiac event. Patients diagnosed with coronary heart disease are challenged with the need to make behavioral changes both psychologically and physically in many life areas. These changes include diet, weight loss, increasing physical activity, medication adherence and smoking abstinence. The domain of behavioral therapy is to intervene and guide the risk factor modification model of change (Miller & Taylor, 1995).

When looking to apply theory to behavioral modification via patient education one can utilize the Social Learning Theory. Social Learning Theory applies the behavioral therapy approach in health care and has been applied in several cardiovascular research trials. The Social Learning Theory is the most widely cited and applied model and it demonstrates human functioning related to behavioral, cognitive and environmental factors (Miller & Taylor, 1995).

Social learning theory suggests that human behavior is influenced by social interaction, cognitive perception and environmental systems that behavioral change comes about when the patient believes that he/she can perform the behavior. This belief is known as self-efficacy and can be influenced by persons of authority (AACVPR, 1999). The behavior is further reinforced when the patient has had a past experience of success such as with weight loss or smoking cessation. A strategy to reinforce behavioral change is to provide positive feedback of previous successes.

A major component of social learning theory is self-efficacy. Self-efficacy is the ability to formulate a plan and implement this strategy to achieve a successful outcome. Self-efficacy strongly relates to ones choosing to undertake tasks, specifically if there is a
doubt of successful completion. Self-efficacy is influenced by four main factors (Miller & Taylor, 1995).

- **Information and Persuasion**: Cardiac rehab patients receive a vast amount of information from numerous sources pertaining to risk factor reduction. However, health care professionals are the most influential source in encouraging health behavior modification. Persuasion from an authority can be perceived as information and instruction one may receive from a health care professional during patient education. Health care professionals provide support with realistic expectations and guidelines, critical in influencing change.

- **Observation of Others**: Observing behaviors modeled by others has a large impact on the potential for bringing about change. Research supports the value of cardiac rehab group programs for facilitating and enhancing the opportunity to observe positive outcomes achieved by other patients in response to risk reduction behavioral changes.

- **Successful Performance of Behavior**: Of interest is that most patients will focus on unsuccessful attempts to change a behavior as opposed to changes that they have achieved with success. It is imperative for the health care professional to identify successors and behaviors that lead to success and use this information to bring about a cognitive change in the negative thought process and apply these skills and techniques to facilitate change. Behavior modification programs facilitate collaboration with the patient to identify what didn’t work in the past and what could be done differently to facilitate a positive outcome in the future.

- **Physiological Feedback**: Providing patients with feedback regarding graded exercise tests on the treadmill, exercise training progression, and endurance training, in the absence of symptoms, has a strong impact on a patient’s self-efficacy and behavior to engage in routine activities (Miller & Taylor, 1995).
Facilitating Change

Basic Counseling Skills

Elements of a successful behavioral modification program are strongly related to the positive and accurate expectations of results. For example a patient is more likely to adhere to lipid management, exercise, low fat, low cholesterol diet and medical management if they have evidence this will have some benefit. Providing education, examples, personal lipid profiles and lab results are all ways to encourage adherence to behavior modification. Similar approaches can be applied to all of the risk factor reduction components addressed in cardiac rehab (Miller & Taylor, 1995).

Providing patients with the support, tools and skills is important so they can define necessary behavioral modifications they need to make. Setting realistic goals and positive expectations are of utmost importance toward a successful outcome. Using tools, such as contracts, can be useful in encouraging behavioral change. This gives the patient the responsibility of adhering to an agreed upon goal. Implementing relapse and prevention training prepares a patient for times when situations arise that threaten self-efficacy and feelings of defeat, especially if a patient is not seeing progress as expected. Providing positive feedback, problem solving suggestions, rewards and social support are all components of a successful behavior modification program.

It is important to provide intervention in organized stages when the patient demonstrates readiness for change. There are three basic stages of intervention required for modifying a person’s behavior (Miller & Taylor, 1995).

1. The Antecedent Stage: the patient is contemplating change.
2. The Adoption Stage: the patient begins to initiate change.
3. **The Maintenance Stage:** the patient adheres to the changed behavior over time.

A systematic approach to providing information, when patients are ready, has been shown to bring about successful behavior modification changes. The use of behavioral interventions has reduced risk factors and facilitated healthy lifestyles in patients with coronary heart disease. Facilitating change in behavior is a challenge a systematic approach assist in identifying readiness for change, increases awareness of acceptance of information and prepares one for relapse (Miller & Taylor, 1995).

Some risk factors such as diabetes, smoking and psychosocial issues require extensive intervention that can not be accomplished in CR alone and necessitate a referral to outside health-care sources designed to address these issue in greater detail. However the CR specialist will identify this need, initiate the need for referral and reinforce other professional recommendations.

The following is a form used to provide patients and families with information pertaining to ADL and IADL activity in comparison to energy expenditure achieve while engaged in CR exercise program.
# Myocardial Infarction (MI) Heart Attack Home Activity Guideline

You might wonder what activities are safe to engage in at home and how much energy it takes for you to do them. The following is a guideline only. If you experience any signs or symptoms such as fatigue, shortness of breath, nausea, dizziness, etc., discontinue the activity. As you increase the amount of exercise you can tolerate, so will you be able to increase what you can do at home. If you have additional questions, contact your physician.

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>SELF-CARE</th>
<th>HOUSEHOLD</th>
<th>RECREATIONAL</th>
<th>VOCATIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>Sponge bathe</td>
<td>Light meals (majority done while sitting)</td>
<td>Walking (2 mph)</td>
<td>Typing</td>
</tr>
<tr>
<td></td>
<td>Shave</td>
<td>Wash dishes</td>
<td>Croquet</td>
<td>Desk work</td>
</tr>
<tr>
<td></td>
<td>Dress</td>
<td>Set table</td>
<td>Writing</td>
<td>Light assembly or machine work</td>
</tr>
<tr>
<td></td>
<td>Grooming (shaving, combing hair and washing hair)</td>
<td>Dusting</td>
<td>Billiards</td>
<td>Using hand tools</td>
</tr>
<tr>
<td></td>
<td>Shower if you did so in hospital</td>
<td>Light sweeping/dusting</td>
<td>Card games</td>
<td>Occasional lifting (10 lbs. max. or amount recommended by physician)</td>
</tr>
<tr>
<td>Light to Moderate</td>
<td></td>
<td>Light laundry (small, light load) Washing floor with sponge mop</td>
<td>Walking (3 mph)</td>
<td>Light repair work</td>
</tr>
<tr>
<td>3-4 METS</td>
<td>Shower</td>
<td>Light gardening (weeding, planting)</td>
<td>Slow bicycling</td>
<td>Light household</td>
</tr>
<tr>
<td></td>
<td>Setting hair Brewing</td>
<td>Ironing (sitting best)</td>
<td>Fishing from boat or dock</td>
<td>carpentry (small fix-it projects)</td>
</tr>
<tr>
<td></td>
<td>Driving (with approval of doctors)</td>
<td>Bed making</td>
<td>Leisurely Cycling</td>
<td>Painting (small jobs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grocery shopping (10 lb. bag )</td>
<td></td>
<td>Occasional lifting (20 lb. max.)</td>
</tr>
<tr>
<td>*Moderate</td>
<td>Sexual activity</td>
<td>Walking (3 1/2 mph)</td>
<td>Walking (4-5 mph)</td>
<td>Occupational lifting (50 lbs. max.)</td>
</tr>
<tr>
<td>4-5.5 METS</td>
<td></td>
<td>Golfing (carrying clubs)</td>
<td>Tennis</td>
<td>Heavy carpentry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heavy gardening</td>
<td>Softball</td>
<td>Painting (interiors, exteriors)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heavy sweeping</td>
<td>Stream fishing</td>
<td>Light shoveling (no lifting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heavy shoveling with lifting</td>
<td>Square dancing/Polka/Jitterbug</td>
<td>Light farming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climbing a ladder</td>
<td>Cross country skiing (2 1/2 mph)</td>
<td>Occasional lifting (50 lbs. max.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Putting on storm windows</td>
<td>Ice or roller skating</td>
<td></td>
</tr>
<tr>
<td>*Heavy</td>
<td>Shoveling snow with lifting</td>
<td>Walking (4-5 mph)</td>
<td>Tennis</td>
<td>Heavy farming</td>
</tr>
<tr>
<td>5.5-7 METS</td>
<td>Putting on snow windows</td>
<td>Tennis</td>
<td>Softball</td>
<td>Heavy industry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stream fishing</td>
<td>Football</td>
<td>Occasional lifting (50 lbs. max.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Square dancing/Polka/Jitterbug</td>
<td>Basketball</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cross country skiing (2 1/2 mph)</td>
<td>Handball</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ice or roller skating</td>
<td>Downhill Skiing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hiking Hills with 11 lb. load</td>
<td></td>
</tr>
<tr>
<td>*Very Heavy</td>
<td>Sawing hardwoods by hand</td>
<td>Jogging (5 mph)</td>
<td>Javelin</td>
<td>Heavy construction</td>
</tr>
<tr>
<td>7 METS and over</td>
<td></td>
<td>Swimming (laps)</td>
<td>Football</td>
<td>Frequent lifting/carrying (50 lbs.)</td>
</tr>
<tr>
<td></td>
<td>Moving heavy furniture (dolly work)</td>
<td>Pushing moderate wheelbarrow</td>
<td>Basketball</td>
<td>*50 lbs. is max weight to be lifted by cardiac patients</td>
</tr>
<tr>
<td></td>
<td>Splitting wood</td>
<td></td>
<td>Handball</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Downhill Skiing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hiking Hills with 11 lb. load</td>
<td></td>
</tr>
</tbody>
</table>
Forms continued

The following is a patient education form supporting the documentation that education pertaining to exercise precautions was provided to the patient. Adding this

**Cardiac Rehab Exercise Precautions**

- Set a specific time for your walking program (same time every day is a good habit forming program) when you feel your best.
- Be sure you have taken your medications per physician orders before exercise.
- **Do not** walk if your starting heart rate is 120 beats or more.
- Wear appropriate clothing and shoes for exercise.
- Wait **one hour** after a meal.
- Do not exceed 13 on the rate of Perceived Exertion Scale (Borg).
- Follow Cardiac Rehab Home Program walking instructions.
- Be well rested before your walk. Being tired puts more work on your heart and can result in accidents.
- **Do not** walk outdoors in hot (over 80°), humid, windy, or cold weather (under 50°).
- During winter months (below 50°), shopping malls, gyms, hallways, etc. provide a good place to walk.
- Wear a scarf or mask when going from indoors to outdoors in cold/windy weather.
- Walk on a level surface. Walking up hill takes more energy your heart has to work harder.
- Walk at a continuous pace, do not stop to talk!
- If you are overly tired, have a cold, flu, fever, or infection, do not exercise.
- If you feel chest pain, **chest discomfort or any symptoms**, stop exercising, take a Nitro tab under your tongue if prescribed and notify your doctor.

**Signs and symptoms:** The American Heart Association says the body likely will send one or more of these warning signals of a heart attack:

- Uncomfortable pressure, fullness, squeezing or pain in the center of the chest lasting more than a few minutes.
- Pain spreading to the shoulders, neck or arms.
- Chest discomfort with lightheadedness, fainting, sweating, nausea, or shortness of breath.
- Also: indigestion, burning in throat, and jaw pain.
Unit IX

PSYCHOSOCIAL ISSUES
PSYCHOSOCIAL ISSUES

Goals and Objectives of Unit IX
1. Identify the components of a “toxic climate” leading to coronary disease or poor recovery from a cardiac event.
2. Identify tools used to conduct a psychosocial evaluation of the CR client
3. Identify the psychosocial ramifications of coronary heart disease
4. Identify the physiological effects of depression in the CR client
5. Identify factors that facilitate behavioral change and adherence to the management of coronary heart disease.
6. Identify a patient's perception of barriers to change and implementation of risk factor reduction
7. Identify signs and symptoms of depression and the need for a referral for psychosocial intervention

According to (AACVPR) there is a strong correlation between depression, hostility, anxiety, and stress in relationship to coronary heart disease. Dr. Dean Ornish presented a theory to describe mechanisms by which depression, anxiety, hostility and stress impair the recovery from cardiovascular disease. Emotional difficulties have shown to produce autonomic nervous system changes that can lead to decreased immune functioning, lipid level elevations and changes in neurotransmitters. Individuals in this state of stress for long periods of time are at risk for experiencing a “toxic cardiac climate”. Patients who suffer from psychological issues if left unattended tend to be less compliant with a medication regime, less likely to pursue healthy lifestyle changes and to continue with unhealthy behaviors such as smoking, poor nutrition and a sedentary lifestyle (Herridge & Liton, 2006).

A comprehensive cardiac rehabilitation program will include a plan of care addressing issues that impact psychosocial recovery, such as social support, age, gender, motivation, and self-efficacy. A patient’s psychosocial functioning needs should be
addressed upon initial evaluation with a multidisciplinary team available for referrals to
assist in the recovery process (Herridge & Liton 2006).

Psychosocial Evaluation

There are several common psychosocial screening tools the CR specialist can
incorporate with the initial evaluation to assess the needs of patients for psychosocial
intervention. This type of screening is also beneficial in assessing a patient’s readiness to
discuss issues with their primary caregiver. These screening tools include but are not
limited to:

1. Medical Outcomes Study Short form (MOS SF 36);
2. Beck Depression Inventory scale (BDI) and
3. The Herridge Cardiopulmonary Questionnaire (HCQ)

Typically they are a self-administered questionnaire that are easy to administer and score,
takes little time for the patient to complete and are cost effective. Information gleaned
from this type of evaluation can determine the need for further assessment and need for a
referral to the appropriate source (Herridge & Liton, 2006).

Cardiac rehabilitation staff needs to be prepared to face the challenges of the
varying degrees of psychosocial issues and/or behaviors a patient may present following
a post cardiac event. It is also important to take into consideration any co-existing
psychosocial issues pre cardiac event. A thorough review of a patient’s medical history
and a psychosocial screening should be conducted, along with the initial evaluation upon
entering cardiac rehabilitation (Herridge & Liton, 2006).

Discussing evaluation results with a patient provides the opportunity to
investigate the reasons why a patient is having psychosocial problems and how these
issues may impact recovery. Staff can provide information regarding treatment options, offer support and encouragement. Staff can also provide patient education that may help reduce fears, anxiety and depression often experienced after a cardiac event (Herridge & Liton (2006).

Feelings of fear, anxiety stress, anger, hostility, and depression are discussed at length in CR patient education programs. Feelings such as fear, anxiety and stress can mimic physiological symptoms similar to those experienced as a result of angina, resulting in decreased level of function and independence. Symptoms associated with depression can delay or halt recovery. Stress, anger and hostility are emotions that contribute to increased heart rate, blood pressure and vasoconstriction creating a “toxic cardiac climate”. A psychosocial screening, patient education and drawing a patient’s attention to potential risk factors assists them realize the need for change (Herridge & Liton, 2006).

Questions

The cardiac rehabilitations specialist is in an excellent position to help patients remove these barriers and provide the environmental and psychosocial support the individual needs to alter perceptions and remove obstacles toward healthy behaviors. The following are questions the CR specialties can asked during the initial assessment to investigate the presents of potential barriers to CR recommendations (AACVPR, 2004).

Psychosocial initial interview questions:

- What do you see as your biggest challenge in regards to improving your health?
- How have you been able to change unhealthy behaviors in the past?
- How have things changed for you since your cardiac event?
- What kind of concerns do you have about meeting with a counselor or mental health professional?
- How can we assist you in best meeting you goals?
Signs and symptoms of Depression:

- Low energy or restlessness, poor concentration and memory
- Recurrent worry, regrets, somatic complaints and thoughts of death
- Anhedonia- a diminished interest or loss of ability to experience pleasure
- Significant change in sleep, eating and sexual drive habits
- A recurring sense of being overwhelmed by current stressors
- Self-blame and Self-criticism
- Suicidal thoughts

Patient Referral

The results of the psychosocial screening tool are typically discussed with the patient. If a patient has a score indicative of psychosocial issues the patient is informed of this. Permission is then requested to inform the patient’s primary caregiver or the patient may chose the option of personally consulting his/her primary care giver (Herridge & Liton (2006).

A patient may have a score that raises concerns, upon initial screening that suggests the need for a referral. Often at discharge, their score has improved and a psychosocial referral is not warranted. Outcomes data collection indicates that cardiac rehabilitation improves not only physiological functioning but also psychosocial functioning and recovery post cardiac event (Herridge & Liton (2006).

Psychosocial Benefits of Participating in a CR program.

Extensive research and literature supports the positive outcomes of CR participation. However, the success to achieve goals and objectives of CR are “minimally effective” in the absence of patient compliance. Research offers data to
support this claim that within six months of an MI 50% of CR patients will fail to comply with prescribed regimes (Mitchell, Muggli, & Sato 1999).

Individuals who survive a cardiac event experience disruptions in careers, family life, and future plans. Recovery requires the support of multiple contextual factors, that include family involvement and commitment to life-style modifications. An objective of CR is to improve quality of live after a cardiac event. This corresponds with the goal of providing the patient and family with education regarding risk factor reduction and psychosocial support to make necessary life-style modifications (Mitchell, Muggli & Sato, 1999).

Factors that influenced adherence to CR program goals and objectives are influenced by support systems, self-efficacy, lack of barriers to change and a prior history of an active life-style, these positive influences encouraged patients to make necessary life-style changes and utilize risk factor reduction to promote health. Patients who do not perceive barriers to participation in CR, felt activity was essential to their good psychosocial and physical health (Mitchell, Muggli, & Sato 1999).

Barriers to adherence were associated with a patient’s perception toward change and incorporating regular physical activity into his or her daily routine. Patients who were sedentary, lacked regular physical activity, had poor functional capacity or were angry about change in their life-style were less likely to believe in the benefits of change and adherence to CR program recommendations. A key barrier to change was a patient’s lack of environmental supports post discharge. Interviews with patient,s regarding non-compliance, revealed that most individuals in the hospital setting were prepared to make necessary life-style changes to decrease the risk of an additional cardiac event. However,
upon returning home they experienced a perceived struggle of roles between being a cardiac survivor and their roles prior to the cardiac event. Those unable to bring the two roles into perspective were more likely to abandon risk factor modification and revert to unhealthy behaviors, in an effort to identify with their “normal” roles and gain control of their life (Mitchell, Muggli & Sato, 1999).

In conclusion, the willingness of the individual to accept responsibility to initiating and sustaining healthy behaviors is directly related to perceived barriers to participation in and adherence to CR recommendations. (Mitchell, Muggli & Sato, 1999).
UNIT X

SPECIAL POPULATIONS
SPECIAL POPULATIONS

Goals and Objectives of Unit X
1. Identify how the aging process decreases functional capacity
2. Identify the benefits of physical fitness in the elderly client
3. Identify educational consideration for the elderly client in CR
4. Identify safety considerations when engaging the elderly client in exercise
5. Identify why women may have a poor prognosis following a cardiac event
6. Identify atypical symptoms of heart disease common in women
7. Identify the leading cause of heart disease in women
8. Identify the cause of increased incidence of heart disease in post-menopausal women
9. Identify CR treatment considerations of the female client with heart disease
10. Identify the benefits of physical activity for the diabetic patient
11. Identify symptoms of hyperglycemia and hypoglycemia
12. Identify precautions that apply to exercising the diabetic patient
13. Identify educational components pertinent to the management of heart disease in the diabetic patient
14. Identify components of a plan of care for the diabetic patient with heart disease
15. Identify components of an exercise prescription for the diabetic patient with heart disease.

Older Patients

The United States of America has a population. Approximately 25 million people over age 65 years have coronary heart disease (Wenger, 2006). As we age biological and physiological changes occur systemically. The cardiovascular system becomes less efficient in that cardiac reserve and capacity to pump blood to meet the demands of the body decreases. With the less efficient cardiovascular system the individual has decreased functional ability and tolerance of stress, disease and illness of the body (Wenger, 2006).

CHD is the most common cause of death in the elderly. Additional cardiac diseases include hypertensive cardiovascular disease, valvular and pulmonary heart disease. Eighty-three out of every 1,000 men and 90 out of every 1,000 women 65 years
of age and older will experience some form of CHD. Although the elderly have a greater risk for CHD, studies have shown that individuals who are more active and those who participate in regular exercise programs are at less risk of disability resulting from a cardiac event. Sedentary individuals can experience approximately 10%-20% less oxygen uptake and maximal work capacity than active individuals. The goal of cardiac rehabilitation is to return elderly patients, who have experienced a coronary event, to their former independent living situation for as long as possible (Wenger, 2006).

The geriatric population experiences a decrease in maximal heart rate, aerobic capacity, cardiac output and ejection fraction hear. To compensate the muscle enlarges to fill with a larger amount of blood in an effort to pump out more blood to the body with each contraction. Improved cardiac output is necessary to compensate for a decreased t rate. These factors assist the heart pump blood to meet the demands of work. However, if one adds CHD to the already compromised cardiac functioning experienced in normal in aging, cardiac compromise following a cardiac event can be very debilitating (Wenger, 2006).

As the aging population grows, providing education regarding modifiable risk factors is appropriate to reduce the potential debilitation brought about by CHD. Education should include participation in a regular low level exercise program, energy conservation techniques and work simplification with the introduction of adaptive equipment to ease ADL’s and promote safety.

According to Wenger (2006) a randomized, controlled study of patients over 65 years of age in an exercise group demonstrated significant improvements in exercise capacity, subjective feelings of well being and quality of life measures when compared to
the control group. Exercise capacity improved an average of 17.3% in 3 months (Wenger, 2006).

Cardiac rehabilitation referrals for elderly patients, specifically women, are surprisingly low. This is despite the fact that cardiac rehabilitation is an essential component to recovery post cardiac event. Studies show that elderly cardiac patients benefit from participation in a cardiac rehabilitation program with appropriate exercise prescription, which takes into account all physiological aspects of aging. Patients show improvements in functional capacity, improved independence and limited disability (Wenger, 2006).

The OT cardiac rehabilitation specialist is instrumental in the role of educating the geriatric cardiac patient. An introduction to adaptive equipment is essential when a patient does not have the cardiac reserve to complete ADL’s without:

1. undue fatigue
2. energy saving techniques,
3. work simplification and

This teaching can promote independence, safety, and the ability to complete task successfully absent of fatigue. This is another reason why an OT is an excellent choice for inclusion in the role of the cardiopulmonary rehabilitation specialist.

Women

Cardiovascular disease is the leading cause of death in women, with the majority of these deaths contributing to CHD. Nearly one in every two women will die of a coronary event. Since 1984, the number of coronary deaths in women has exceeded coronary deaths in men and will continue to rise as the population ages. Coronary
disease in women is usually more severe than in men further complicating survival rates (Cannistra, 2006).

The Multicenter Investigation of the Limitation of Infarct Size (MILIS) Study reports that 13% of women, post coronary event, die in hospital compared with 7% of men. This study also showed that deaths occurring within a 48-month period following a cardiac event, to be 36% in women compared to 21% of men. After six months, women are more likely than men to present with symptoms such as angina, CHF, and or a second MI. According to the AHA, regardless of the mass media information available regarding CHD statistics, 51% of women believe cancer is their greatest health threat (Cannistra, 2006).

Possible reasons for poorer prognosis in women include:

1. increased age,
2. post menopause when symptoms present,
3. advanced disease complicated by co-existing diagnosis such as hypertension and diabetes

Women’s symptoms to raise suspicion of heart disease can be vague and variable resulting in delayed referrals for a cardiac medical interventional testing. In addition the effectiveness and use of established medical therapies and procedures are not as effective in women as compared to men. Women, with CHD, are more likely to present with atypical symptoms such as upper abdominal pain, nausea, and fatigue. Although chest pain is less sensitive and specific as that experienced in men, it is still the most common presenting symptom (Cannistra, 2006).

Total risk factors for heart disease are comparable between men and women. However, smoking is the leading cause of preventable CHD in women. Fifty-percent of all MI, occurring in middle-aged women, were a result of smoking. Smoking may be
more hazardous in women because the first MI will occur at a younger age than in men. Dyslipidemia is a risk factor for both men and women with high cholesterol being a hallmark of CVD. Both men and women's risk factors address issues with high levels of low-density lipoprotein (LDL). However, a greater predictor of CHD in women is low level of high-density lipoprotein (HDL) (Cannistra, 2006).

The pre-menopausal woman has the protective benefits of estrogen, however post-menopausal women experience increases in LDL cholesterol and decreases in HDL cholesterol as a direct result of estrogen deficiency. A post-menopausal woman is at equal risk for heart disease as men (Cannistra, 2006).

Women without diabetes will typically present with heart disease ten years later than men. However, diabetes negates the age difference. Heart disease in women, with diabetes is often more severe than in men due to its effects on dyslipidemia and hypertension both elevated risk factors for the severity of CHD in women (Cannistra, 2006).

Treatment of women with heart disease includes:

1. education pertaining to signs and symptom recognition,
2. risk factor reduction and
3. participation in and exercise program

Interventional strategies will address safety as female patients tend to recover more slowly are typically more sensitive to the side effects of medications. Women often experience atypical symptoms of a cardiac event. Exercise levels may progress at a lower rate due to severity of CHD and level of impairment. Weight-bearing exercise is of importance to reduce risks of osteoporosis, especially in the postmenopausal patient. Education needs include discussion of hormone replacement therapy, psychosocial
concerns, depression and role conflicts that may interfere with recovery and smoking cessation (AACVPR 4th ed 2004).

**Diabetes**

Diabetes is one of the most common chronic diseases of today. Approximately 10.3 million Americans are diagnosed with diabetes and an additional 5.4 million have undiagnosed diabetes (Gordon, 2006). Diabetes is a syndrome of metabolic disorders characterized by defects in insulin production, action, or both. Untreated or poorly managed diabetes causes serious damage to the heart, eyes, kidneys, nerves and blood vessels. More than 20% of participants in CR will have a diagnosis of diabetes (Gordon, 2006).

Patients with CHD and CVD and with a co-existing diagnosis of diabetes, present with special concerns and require diligent monitoring while participating in a CR exercise program. The diabetic CR patient will not present with the typical responses to angina or cardiac symptoms due to abnormal autonomic sensitivity to these symptoms. Patients are also sensitive to hypoglycemic or hyperglycemic reactions in addition to safety concerns with regards to peripheral neuropathy (Gordon, 2006).

The initial screening of the CR diabetic patient involves an extensive data gathering process part of which can be gleaned from the chart review followed by patient interview. Following the initial interview, the patient should be asked to demonstrate the ability to use his/her glucometer, perform pre, peak and post exercise glucose readings and track these reading in a log book. The CR specialist will then assess the patient’s knowledge of signs and symptoms of hyper/hypoglycemia and how the patient has
addressed these symptoms in the past (Gordon, 2006). Typically the patient should have a blood glucose reading of 88-110 pre-exercise.

Due to the extensive educational needs of the diabetic patient a referral to diabetes teaching center is recommended. The CR specialist will need additional educational information to focus on the scope of diabetes, beyond that available in the contents of this chapter. This is necessary in order to address the extensive needs of the diabetic patient. The following is an example of a CR plan of care for the diabetic patient. This plan of care was developed following the guidelines and recommendation of AACVPR for program certification.

CR Plan of Care Guidelines for Patients with Diabetes

<table>
<thead>
<tr>
<th>Admit Assessment for Diabetes</th>
<th>Plan of care/intervention</th>
<th>Patient intervention and goals</th>
<th>Outcome at discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years of diagnosis</strong></td>
<td>! Review log of BG readings.</td>
<td>! Patient verbalizes an understanding of optimal BG</td>
<td>! Demonstrates ability to document BG readings in log book</td>
</tr>
<tr>
<td>Type I, II, or III</td>
<td>! Instruction in exercise guidelines</td>
<td>! Verbalizes effects of diabetes on the heart</td>
<td>! Demonstrates appropriate BG readings.</td>
</tr>
<tr>
<td>Diet</td>
<td>! Provide patient education on hyper/hypo glycemic reactions</td>
<td>! Keeps daily log of BG reading and how staff log book</td>
<td>! Adheres to exercise guidelines and precautions.</td>
</tr>
<tr>
<td>Oral agents</td>
<td>! Assess knowledge of diabetic diet and follow through with diet instructions.</td>
<td>! Verbalizes understanding of appropriate foot care and need for</td>
<td>! Adheres to a diabetic diet.</td>
</tr>
<tr>
<td>Insulin</td>
<td>! Provide instruction on foot care and provide handouts for home reference</td>
<td>! Monitors feet after exercise.</td>
<td>! Demonstrates appropriate foot care and monitoring post exercise.</td>
</tr>
<tr>
<td>Insulin pump</td>
<td>! Review insulin injections skills if appropriate</td>
<td>! Is aware of 15/15 rule for adjusting food for increased activity to prevent hypoglycemic reactions.</td>
<td>! Absence of skin breakdown.</td>
</tr>
<tr>
<td>Recent fasting blood glucose (FBG)</td>
<td>! Assess medication compliance</td>
<td>! Carries glucose tabs.</td>
<td>! Patient has all teaching material to refer to at home.</td>
</tr>
<tr>
<td>Appropriate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor blood glucose (BG) at home</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td></td>
</tr>
<tr>
<td>Last reading of HbA1C</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td></td>
</tr>
<tr>
<td>Peripheral neuropathy</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td>! Does not have recent fasting blood glucose (FBG)</td>
<td></td>
</tr>
</tbody>
</table>
Exercise Guidelines for the Patient with Diabetes

Exercise guidelines, for the CR patient with a co-existing diabetic diagnosis, includes:

1. Assessment applicable to all CR patients
2. Assessment of appropriate foot wear,
3. Degree of peripheral neuropathy that might compromise safety and a review of dulled or absent signs/symptoms that may present with exercise

The exercise prescription will have the following components (Gordon, 2006).

Exercise program (Gordon, 2006).

- **Aerobic in nature**: weight-bearing and non-weight bearing modes
- **Frequency**: 3-5x per week
- **Duration**: 20-60 minutes. Shorter bouts are acceptable with increased frequency
- **Intensity**: Low-moderate impact. Approximately 55-75% of maximal heart rate
- **Timing**: Time exercise so as not to coincide with peak insulin absorption
- **Insulin use**: Avoid injection into exercising muscle

Exercise precautions (Gordon, 2006).

- Prolong warm up and cool down sessions.
- Avoid unsafe exercise modalities or the potential for injury due to neuropathy
- Discuss appropriate footwear
- Inspect feet daily after exercise
- Maintain adequate hydration
- Monitor blood glucose with exercise
- Have beverage, snack or glucose tabs ready in the event of a hypoglycemic reaction
Goals and Objectives of Unit XI

1. Identify required components of CR documentation
2. Identify the components to be considered when developing documentation forms.
3. Identify data included in the CR plan of care
4. Identify documentation components of a CR exercise prescription
5. Identify the components of the provision of services that are found in CR documentation

CR Documentation Guidelines

Documentation in CR follows uniform standards established by the AHA, AACVPR, Medicare, Medicaid and private insurance companies. Following standard guidelines assures program effectiveness and results in appropriate reimbursement for professional services rendered (Robertson, Reel, Crist & Mitchell, 1999).

The requirements for documentation include components of evaluation, intervention, progression, and outcome measure. An appropriate document shows a clear, concise, logical and organized plan of care, outcome and discharge plan. However, the following components should be considered in the development of documentation forms and guidelines (Robertson, Reel, Crist & Mitchell, 1999):

- **Clarity of information:** Information should be accessible and understandable to other health-care professionals.
- **Consistency of information:** The format should be consistent from patient to patient and from team discipline to discipline.
- **Efficiency of information:** Essential information needs to be immediately accessible without redundancy, using acceptable abbreviations and terminology.
- **Forms:** Clear, concise and easy follow plan of care and void of duplication.
- **Document:** Should serve as a legal record that can be used to protect all parties involved in the care and treatment of patients. Many CR programs have computerized systems and accompanying programs in which to document. These programs offer an efficient method with specifically designed forms to assure all documentation requirements are adhered to.

### CARDIOPULMONARY REHAB REPORT

<table>
<thead>
<tr>
<th>NAME</th>
<th>ID: 12-12-12</th>
<th>Date: 2-20-07</th>
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<tbody>
<tr>
<td>Age:</td>
<td>55 YRS</td>
<td>Date of Birth: 1/1/54</td>
</tr>
<tr>
<td>Phone:</td>
<td>000-000-0000</td>
<td>Session: 22</td>
</tr>
<tr>
<td>Physician:</td>
<td>HEARTBREAKER</td>
<td>Diagnosis: ASHD, CABG</td>
</tr>
<tr>
<td>Meds:</td>
<td>SEE MED SHEET</td>
<td>THR 30 BPM + RHR</td>
</tr>
</tbody>
</table>

**1. Goal:** VERBALIZE RISK FACTORS TO REDUCE FUTURE HEART DISEASE

**2. Goal:** 5.0-6.0 MET TOL FOR ADL/EX 30 MINS ASYMPTOMATIC

### Resting Data

<table>
<thead>
<tr>
<th>HR</th>
<th>Weight</th>
<th>B/P</th>
<th>O2 SAT</th>
<th>SYMPTOMS</th>
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<tr>
<td>60</td>
<td>200.0</td>
<td>120/60</td>
<td>97</td>
<td>R/A</td>
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### Exercise Data

<table>
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<tr>
<th>Activity</th>
<th>Time</th>
<th>Workload</th>
<th>Max HR</th>
<th>METS</th>
<th>RPE</th>
<th>% THR</th>
<th>B/P</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treadmill</td>
<td>15 min</td>
<td>1.3 MPH 0.51G</td>
<td>90</td>
<td>2.1</td>
<td>13</td>
<td>75</td>
<td>150/65</td>
<td></td>
</tr>
<tr>
<td>NuStep</td>
<td>15 min</td>
<td>L1, 60-70 RPM</td>
<td>85</td>
<td>1.7</td>
<td>12</td>
<td>70</td>
<td>140/62</td>
<td></td>
</tr>
</tbody>
</table>

### Exercise Summary

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
<th>Heart Rate</th>
<th>B/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool Down</td>
<td>5 min</td>
<td>60</td>
<td>115/60</td>
</tr>
</tbody>
</table>

**Comments:**

PROGRESS NOTE EXAMPLE:

- S: PT RETURNS TODAY FEELING READY TO EXERCISE. NO NEW CARDIAC COMPLAINTS SINCE LAST SESSION. COMPLIANT WITH HOME WALKING PROGRAM.
- D: INSTRUCTIONS AND DEMONSTRATION IN WARM UP AND TONING STRENGTHENING PROGRAM WITH 3LT WT. IMPLEMENTED EXERCISE PROGRAM AS ABOVE. COMPLETED COOL DOWN, FOLLOWED D/B EDUCATION SESSION. ECG MONITORING COMPLETED IN LEAD 11.
- A: NSR, RATE, BP, RPE AND SAO2 AND EXERCISE TOLERANCE W/IN GUIDELINES. STG ACHIEVE
- D: P: PROGRESS EX DURATION, INTENSITY AND CONTINUE WITH PT EDUCATION.

**Signature:**

---

**Note:** The provided text includes a table with patient data and exercise details, along with comments and a signature section.
Reimbursement

CR outpatient services are a reimbursable purchased service that can only be implemented with a physician’s referral. Each state has specific guidelines for reimbursement of services. For example, in ND 12 sessions are covered by private insurance and 36 sessions are covered by Medicare and Medicaid. Patients are usually seen 3x per week. However, this is all subject to change and each individual is advised to contact his/her health care reimbursement representative prior to starting a CR program.

A medical director oversees CR and once a referral has been received, the staff follows specific practice guidelines in the delivery of service.
UNIT XII

OUTCOMES
OUTCOMES

Goals and Objectives of Unit XII
1. Identify the primary reason for conducting outcomes assessments in CR
2. Identify the 4 domains of outcome measures utilized in CR
3. Identify data collection tools frequently used to measure outcomes in CR
4. Identify components of outcome data reports
5. Identify ways outcome measures improve quality of care in CR

The focus of cardiology has been to extend the individuals life through early identification and intervention to reduce and treat risk factors associated with cardiac morbidity. Numerous studies have been conducted using disease-specific instruments to identify cause and affect outcomes such as the 4-level New York Heart Association (mentioned earlier in this chapter) Criterion of Disease Severity and/or Angina Rating Scales. These measures, when interpreted, are widely accepted criteria with positive outcomes utilizing interventions and medications to reduce morbidity. But the question remains, does this intervention improves the quality of life as well as longevity (Shephard, 2001)?

Quality of Life

Improving quality of life (QOL) is a major goal in the implementation of cardiac rehabilitation. Identification of cardiovascular disease and the prevention of premature death have long been goals of cardiology. However, the question remains as to what extent is the quality of life improved with the extension of the calendar lifespan.

QOL measurement outcomes are concepts that assess factors limiting QOL in cardiac disease. Methods to measure these concepts and assess the changes in a patients functioning as a result of participation in cardiac rehabilitation are termed outcome
measures. Outcomes data provides valuable information pertaining to quality improvement, accreditation and reimbursement. Without outcome measures one cannot assess the efficacy of intervention or make changes to improve intervention (AACVPR, 2004).

During the last decade of life, most people become progressively disabled from a combination of diseases, resulting in deterioration and loss of independence. Ultimately there is a loss of muscle strength, endurance, flexibility and agility to a point where activities of daily living can no longer be carried out. This loss of function greatly impacts QOL. In a study on mobility and agility, conducted in Great Britain, 81% of women and 96% of men ages 65-74 years of age could not complete a simple walking test of 4.8 km/h due to deconditioning (Shephard, 2001).

Regular physical activity such as participation in a cardiac rehab, can reduce the risk for sudden cardiac death by 50% in middle-aged adults. In addition, physical activity can reverse functional aging, reducing ones biological age as much as 20 years. Individuals quality of life is enhanced further by prevention of nonfatal heart attacks in middle aged adults. Such cardiac events often result in anxiety and depression, resulting in decreased QOL. An appropriate exercise program has been shown to improve physiological and psychological functioning correlating to improved QOL (Shephard, 2001).

Quality of life (QOL) is influenced by personal perceptions, coping mechanisms and environmental constraints. In patients with ischemic heart disease women have a poorer QOL than men and express more complaints about general health, anxiety,
depression, and loss of self-esteem. Additional factors influencing an individual's perception of QOL include:

- physical functioning and mobility
- ability to complete self-cares
- intellectual functioning and emotional function
- interpersonal contacts and intimacy
- meaningful work
- feelings of well being, comfort, self-efficacy and community membership

Cardiac disease can negatively impact the perception of quality of life because of physical constraints and psychological processing of the changes brought on by illness (Shephard, 2001).

Measuring the quality of life and instruments to determine QOL are subjective and can be difficult to use. Generic questionnaires such as the SF-36, Nottingham Scale, Dartmouth COOP and the Sickness Impact Profile are QOL measurements commonly used in cardiac rehabilitation. They explore a wide range of elements regarding health, physical, emotional, and social function; role performance; work in the home and community and perceptions of pain. Generic questionnaire responses have a reasonable reliability and face validity however have limitations. When using generic questionnaires one needs to consider cost, time requirements, ease of completion and scoring and patient acceptability (Shephard, 2001).

Randomized control trials of cardiac rehabilitation stressed the importance of providing psychosocial therapy to improve the outcome of patient’s perceived quality of life. Psychosocial therapy should include control of anxiety and depression and instilling a sense of hope and control. A two year follow up study of psychosocially treated patients in cardiac rehabilitation revealed a 41% reduction in cardiac mortality
and 46% reduction in nonfatal cardiac events when compared to a control group (Shephard, 2001).

Without outcome measures this information would not be available to CR specialists. Measuring outcomes is a valuable tool in proving what you do makes a difference in the lives of others.

**AACVPR Outcomes Data Collection Recommendations**

According AACVPR the primary reason for including outcome assessment within CR programs is to assess the effectiveness of patient care and to use the results to guide quality improvement interventions. In addition, measurement outcomes provide valuable information as to the benefits of intervention, assist in the assessment of accreditation of CR programs and in some states impact reimbursement considerations. AACVPR recommends that CR programs measure outcomes in the following four domains (Robertson, Rogers, Ewing & Bott, 2004):

1. **Health:** Tracking coronary events during CR or Quality of life;
3. **Behavioral:** Medication compliance. Home program compliance. Smoking cessation.
4. **Service:** Patient satisfaction surveys. Reimbursement for services rendered.

**Data Collection Tools**

There are numerous tools one can use to measure outcomes. Some tools are standardized and require the purchase of a license to use them, others are developed
by clinicians and some are in a survey format. The following are assessment tools identified by AACVPR for the purpose of outcome measure assessment in the areas of general well-being and psychosocial well-being (Robertson, Rogers, Ewing & Bott, 2004).

**General Well-being and Quality of Life:**
- Dartmouth Primary Care Cooperative (COOP)
- Medical Outcomes Study SF-36 (Short Form 36) Health Status Questionnaire
- Sickness Impact Profile
- Nottingham Health Profile
- Quality of Well-Being Index

**Psychological Status and Well-being**
- Profile of mood states
- Beck Depression Inventory
- Center for Epidemiological Studies Depression Inventory (CES-D)
- Spielberger State-Trait Anxiety Inventory

**Example of CR Outcome Measure**

Outcome measures involves gathering data over time, compiling data, reporting the result, assessing effectiveness and implementing change where necessary. The goal is to improve the quality of care and then starting the process over again to assess if the intervention was successful. As previously stated, outcome measures assess if the intervention is effective and is the driving mechanism for quality improvement.

At the facility where I work in CR, for our outcome measure in the clinical domain, we chose to assess the effectiveness of our method of teaching patients about BP and how to control hypertension. We developed a pre and post BP questionnaire to use as a tool to collect data. Our goal was 95% of our patients would achieve a score 95% or
above on the quiz following teaching or prior to discharge. We are pleased with the outcome results, which reflected that our teaching methods are quite effective.

In another example, we use the SF-36 as a tool to assess mental well-being. All patients are asked to complete the SF-36 pre and post program. Our goal was that 100% of patients would have a passing score of mental well being at discharge or we would discuss this with the patient and make a referral to the primary caregiver. The results of this tool were amazing. It opened the door to discuss with patients how they were dealing with the impact of illness. We were able to identify patients in need of a referral and facilitate this process. To our amazement, the number of patients who scored low at the beginning of the program and prior to program at discharge had acceptable scores. This information would support the impact that CR has on improving psychological as well as physiological functioning.
Unit XIII

MANAGING EMERGENCIES
MANAGING EMERGENCIES

Goals and Objectives of Unit XIII
1. Identify the potential risk of medical emergencies in CR
2. Identify staff training needs
3. Identify signs and symptoms that have the potential to lead to an emergency
4. Identify guidelines for managing emergencies
5. Identify emergency documentation guidelines

According to AACVPR the safety of CR exercise programs is well established with low numbers of critical situations occurring during exercise. In part, this is due to the diligent assessment of a patient’s status each and every time, prior to starting the CR session, and post session monitoring. However, patient hospital stays are shorter and this is resulting in patients being referred to outpatient CR earlier in the recovery and healing timelines. As with all CR patients there is always the possibility of an unpredictable occurrence that would require emergency medical intervention (Robertson, Rogers, Ewing & Bott, 2004).

Staff training

Medical Facilitates, accredited by JCHO, must meet certain standards to respond to emergencies. Guidelines for managing emergencies should include standing orders and accompanying documents available to staff in the CR policy and procedure manual.

Professionals providing services in CR are typically provided educational opportunities to acquire skills necessary in the event of an emergency. The AHA recommends the following emergency cardiac care (ECC) training courses, for CR specialist staff training, in the following areas:

1. BLS
2. Automatic external defibrillator (AED) training and,
3. ACLS
Implementation of the AED has improved survival rates and support the concept of early defibrillation saves lives in the chain of survival. All CR staff should have access to emergency equipment located in the area that the program is being conducted (Robertson, Rogers, Ewing & Bott, 2004).

Warning Signs and Symptoms

The following are clinical problems that could arise in CR and require intervention:

- New or changing pattern of angina
- New or changing patterns of arrhythmias
- Decompensated heart failure
- Hypoglycemia or Hypoglycemia
- Syncopal or near Syncopal episodes
- Hypotension or Hypertension
- Decreased exercise tolerance
- Claudication
- Depression
- Cardiac or respiratory arrest

Intervention may include the following actions (Robertson, Rogers, Ewing & Bott, 2004).

- Not beginning exercise or terminating the exercise session
- Assisting the patient in a recovery position
- Comforting the patient and providing reassurance
- Monitoring of Vital signs
- Administering supplemental oxygen
- Administering glucose orally or intravenously
- Transporting patient to an emergency center
- Announcing Code blue and initiating emergency procedures
- Implement Basic life support (BLS)
• Implement Advanced cardiac life support (ACLS)
• Notify Program medical director and primary physician
• Notify family
• Document emergency incident per policy and procedure.

Documentation

Emergencies must be documented according to the individual facilities standards of care and/or practice guide. Typically, one individual is assigned this task and is responsible for record events preceding, during and post emergency. This person would also document medications delivered during intervention and timelines and the patient’s response to intervention. Accurate documentation is of utmost importance and will be used to review the incident post emergency.
CHAPTER V
SUMMARY

The literature review investigated why there is a limited representation of occupational therapy in cardiac rehabilitation, especially in the midst of other well recognized allied health care professionals included on a multidisciplinary CR team. The results indicate that there is limited information regarding: 1) the role of occupational therapy on a multidisciplinary cardiac rehab team; 2) lack of awareness among other health care professionals as to the unique contributions occupational therapy has to offer on a CR team; 3) a limited awareness of cardiac rehabilitation within the occupational therapy profession and; 4) limited resources from an comprehensive education model that an OT can refer to when exploring a career in cardiac rehabilitation. These issues led to the desire of an occupational therapist, who works in cardiac rehabilitation, to design and develop an educational resource for occupational therapists to refer to when considering a career in CR. The lack of awareness of the components of cardiac rehabilitation has the potential to directly impact the number of occupational therapist entering this specialty area.

The purpose of this scholarly project was to provide the entry-level occupational therapist with a reference source when choosing to embark upon a career in cardiac rehabilitation. This project may also serve as an instructional tool for occupational therapy educators when introducing students to cardiac rehabilitation and for students who are interested in further study in the field of cardiac rehabilitation. Occupational therapists have the necessary educational background to provide services in all the areas addressed in cardiac rehabilitation.
rehabilitation. In addition occupational therapist bring their own unique knowledge, skills and abilities to meet the complex needs of the cardiac rehabilitation patient.

Limitations

The limitations in this project could include:

1. The audience to which this information would be beneficial may be limited due to the limitations of the format in which it has been presented,
2. This scholarly project does not encompass all components of the management of heart disease specifically genetics and stem cell research, both of which have future potential to become standards of practice in the treatment of coronary heart disease and coronary vascular disease,
3. The information is not all inclusive of all of the educational needs of the occupational therapist in the area of cardiac rehabilitation, and
4. This project does not prepare the occupational therapist for a certification in the specialty area of cardiac rehabilitation.

Proposed Implementation

This module is designed as an orientation manual to be used by an OT instructor or mentor of an entry level OT, to promote learning in the area of cardiac rehabilitation. It is to be used to orientate the entry level OT to the role of OT and the skills required to provide services on a multi-disciplinary CR team.

The information is in an easy to use informational manual format, with the intention that the OT will be able to refer to this manual as a resource prior to and during clinical practice. It expands upon the information available in the OT literature enabling the entry level OT, with an organized reference from an OT perspective, to:

1. Apply it to clinical practice if one wants to pursue a career in CR,
2. Serve as a resource for students interested in CR and;
3. Promote the role of OT in CR.
The educational module has 13 educational units, which would be best presented over the course of thirteen weeks or one full semester. It is best to present one unit at a time in the small group setting to ensure: 1) not to overwhelm the learner, 2) allow time to process information, discuss new learning and ask questions, 3) allow for hands on labs during appropriate units and 4) allow for on-site opportunities to observe or practice newly learned skills and information.

This teaching module can be integrated into the students learning as an independent learning experience such as Special Topics, Independent Study, and Community Experience or within an applicable occupational therapy curricular course unit. Each student participating in this module should have access to this module as a personal reference.

Conclusions

In conclusion the occupational therapist can provide unique contributions on a multidisciplinary cardiac rehabilitation team to meet the physical and psychological needs of the patient with cardiac disease. It is hoped this educational module will provide the OT with information and education that professionals, who are part of the outpatient CR team, have access to. This ensures that the entry level OT will have additional tools to provide services with confidence on a multidisciplinary CR team.

Recommendations

Recommendation for future action would be:

1. The American Occupational Therapy Association (AOTA) may want to assess the need to publish additional articles in the American Journal of Occupational Therapy (AJOT) or the OT Practice pertaining to cardiac rehabilitation from an occupational therapists perspective.
2. AOTA could consider marketing cardiac rehabilitation as a specialty area for occupational therapists similar to other continued education specialty areas offered by AOTA.
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