Cardiac Rehabilitation

An Honors Thesis (ID 499)

By

Carol A. Harding

Thesis Director
Lorraine Fitzsimmons, R.N.

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A Normative Progressive Cardiovascular Care
Program Model (Functionally Determined)

Planning/Research

Provider
Education

Patient/Risk
Education

Rehabilitation

Patient/Risk
Prevention

Treatment

Information/Monitoring

Evaluation

Recovery Care

Intensive Care

Emergency Care

NORMAL LIFE

Acute Cardiovascular Episode

Non-Acute Cardiovascular Cause

Non Cardiovascular Cause

Death

Cardiovascular Disease Identified

Public Prevention

Public Education

From: Paul D. White Symposium on Cardiovascular Disease, Russek, H., ed.
CARDIAC REHABILITATION

Introduction

Cardiovascular disease is the leading killer of Americans, killing 997,766 Americans in 1976. In Indiana, 17,774 died in the same year. Cardiovascular disease disabled approximately 25% of the population. This is second only to musculoskeletal conditions as a cause of disability. The World Health Organization has labeled heart disease as the "cardiovascular plague". "The deaths, illness, disability and economic loss to family and to the nation caused by diseases of the heart and blood vessels clearly places them as the number one health problem in America today." Economically speaking, coronary heart disease costs Americans $25 billion dollars per year. The direct cost, (representing diagnosis, treatment and rehabilitation) totals $3 billion dollars. Other costs include indirect factors such as disability and loss of earnings due to disability or premature death.

Cardiovascular disease may be linked to many factors, of which the main ones will be discussed in a later chapter. Overall, however, coronary heart disease appears to be pandemic to highly developed, industrialized nations. Probably this accounts in part for the fact that American men rank 18th in the world in life expectancy.

In view of the tremendous problems associated with coronary heart disease, it is becoming increasingly important that health personnel be concerned with the rehabilitation of patients who have suffered a myocardial infarction or those who live with severe angina. Although rehabilitation may be defined as the "process by which a patient is returned to his greatest physical, mental social, vocational and economic usefulness and if employable, is provided an opportunity for gainful employment in a competitive industrial world".
Table I - Mortality Rates for Leading Causes of Death, 1967

Comparison of Deaths from Specific Causes to Deaths from All Causes, United States, 1967

- Others: 29%
- Cancer: 17%
- Cardiovascular Diseases: 54%

Comparison of Deaths from Specific Causes to Deaths from Major CVR Diseases, United States, 1967

- Others: 17%
- Stroke: 20%
- Hypertension: 6%
- Arteriosclerotic Heart Disease: 57%

cardiac rehabilitation must also include prevention and health maintenance. Cardiac rehabilitation may then be defined as a program which aims to "restore a patient with cardiovascular disability to, or to prepare a patient with significant potential for such disability for, a prudent and productive lifestyle through treatment, therapy, and education."\(^3\)

The cardiac rehabilitation program must be designed to encompass all aspects of the patient's life. Although a general program format should be followed, it is important to keep the needs of the individual and his family in mind when implementing this program. According to McIntyre, "The patient's relationships with others, his environment, personality and personal life experiences must all be considered when he is faced with the problem of living with heart disease. This is because all facets of life influence and are influenced by, cardiac function."\(^4\) Andreoli concludes that "the success of the patient's rehabilitation program will depend on the patient's ability to accept the illness and make constructive plans, his physical condition and the limitations imposed by his condition and the expectations of family, friends, and employer in the social situation to which he returns."\(^5\) For this reason it is vitally important to the success of the rehabilitation program that the health team continually assess the patient's environment, family and social relationships and general lifestyle in addition to constant physical assessment.

**Risk Factors**

Coronary heart disease may be defined as "ischemia and infarction of the heart due to an inadequate blood supply to the myocardium."\(^6\) This blockage may be partial and temporary and is termed angina pectoris. When the blockage is permanent and complete the result is myocardial infarction. Age, sex and
race as well as social and economic factors are all related to the incidence of coronary heart disease. Atherosclerotic changes in the arteries are a consequence of the aging process and begin to appear clinically after age 40 (although heart disease does affect many people under age 40.) Men are much more likely to develop coronary heart disease than women especially before women reach menopause. However, as women live longer, rates of heart disease become quite similar among the sexes. In general, white men die more often from coronary heart disease than do their non-white counterparts. Finally, coronary heart disease is "seven times more prevalent in North America, Australia, Europe, and New Zealand than in Japan, Africa, and South America. Also, the incidence is higher among urban populations than among those in rural areas." 7

The leading cause of coronary heart disease is oblitative atherosclerosis. Atherosclerosis is a "disorder of lipid metabolism characterized by deposits of fat-containing substances along the intima of blood vessels." 8 This accounts for 99% of all cases of heart disease. Some other rare causes of coronary heart disease include: "congenital abnormalities of the arteries, luetic changes in the arteries due to earlier syphilitic infection, vascular changes due to autoimmune disorders and coronary embolism." 9

Prevention of coronary heart disease will not be the result of a vaccine. The problem is complex and involves many variables. The National Heart and Lung Institute Task Force on Atherosclerosis prepared the following statement concerning the development of coronary heart disease. "Epidemiological studies have uncovered several factors which are associated with increased risk of developing atherosclerotic heart disease and other manifestations of atherosclerosis. Increased serum lipids, high blood pressure and cigarette smoking are major controllable risk factors." 10 Prevention of coronary heart disease lies in attempts to modify detrimental lifestyles leading to elimination or at
least decreases in associate risk factors.

A. Increased Serum Lipids

Hyperlipidemia may be caused by a metabolic derangement as with diabetes mellitus and is termed secondary hyperlipidemia. Primary hyperlipidemia is idiopathic. This is the more common form. There has been a correlation between the ingestion of excess calories, saturated fats, and cholesterol and higher than optimal blood lipids. This type of diet typifies North American and other Western countries (those more afflicted with coronary heart disease) and is not characteristic of certain cultures less affected by heart disease. One such group is the Japanese who have relatively low rates of coronary heart disease. Japanese-Americans consuming a typical American diet, however, are at a much higher risk than their non-American cousins. This tends to link specific diets with the prevalence of coronary heart disease. An abnormal lipid level may be thought of as serum cholesterol of over 200 mg. per 100 ml. or a fasting triglyceride of more than 250 mg. per 100 ml. Cholesterol is a naturally occurring substance. It is a precursor of certain hormones and the bile acids. In the body, cholesterol is produced by the liver as well as other body cells and is primarily derived from saturated fatty acids. Cholesterol is also ingested in animal fats, including egg yolks. It is possible that the high level of saturated fatty acids ingested in animal fats may contribute to atherosclerosis, possibly even more than the cholesterol ingested. Also, there is some controversy as to whether restriction of dietary intake of cholesterol helps to lower blood levels because the liver may simply produce more to raise blood levels. In contrast, ingestion of vegetable fat, in the form of vegetable oil, helps keep down levels of saturated fatty acids as the primary fatty acids are unsaturated.
B. Hypertension

Elevated blood pressure, defined as greater than 140/90, is associated with both greater incidence of coronary heart disease and higher mortality. A severe, fixed diastolic pressure seems to be the most serious indicator of increased susceptibility to heart disease, however among older populations, a high systolic pressure seems to be equally risky. Even a moderate rise in blood pressure constitutes a risk to the patient and it is important that this be diagnosed and treated early to prevent this potentially serious situation. Several problems are associated with early diagnosis of hypertension. Often hypertension is symptomless until it is severe and has caused some damage. Hence, it is often called the "silent killer". Even after the patient is diagnosed, it is sometimes difficult to get him to stick with the medical regimen, particularly if his symptoms were less bothersome than the ones caused by antihypertensive medication. Education and follow up are essential to assist the patient to accept the need for treatment and for provision of encouragement and support needed by the hypertensive patient.

C. Smoking

Cigarette smoking constitutes the most serious environmental hazard related to coronary heart disease. More and more powerful evidence links this habit with increased risk of coronary heart disease and increased mortality from it. It is believed to be the chief cause of excess mortality associated with coronary heart disease. Mortality increases with the degree of inhalation, the number of cigarettes smoked daily and the duration of the habit. Two major factors seem to be linked with dangerous changes in the vasculature of the heart. One factor is the noxious gases inhaled by the smoker, particularly carbon monoxide. Carbon monoxide in the blood binds with the hemoglobin molecule more effectively than oxygen and therefore leads to decreased oxygen-
ation of the blood. This in turn leads to myocardial ischemia. The chemicals inhaled during smoking may also have a noxious effect on the arterial intima contributing to the formation of atherosclerotic plaque. Another factor linked to ischemia of the heart muscle is the peripheral vasoconstriction caused by nicotine which, in normal subjects causes little problem, but in the heart patient, particularly, causes increased ischemia.

Cigarette smoking is a risk factor that could, in theory, be entirely eliminated. In practice, however, giving up smoking involves behavioral change which for some people is extremely difficult. Again, education, various behavior modification techniques and a lot of support are the primary techniques which offer hope in the attempt to decrease incidence of this noxious risk factor.

D. **Glucose Intolerance**

There is a higher incidence of coronary heart disease in diabetics. There are several theories as to why altered glucose metabolism predisposes the patient to the development of coronary heart disease. Insulin may have effects on lipid metabolism and/or may also have effects on the responsiveness of arterial tissue. Also, diabetics frequently have damage to blood vessels which may predispose them to become sclerosed. Diabetes is also linked to a risk factor currently listed as a lesser risk factor and that is obesity which will be discussed separately.

The factors listed in the above section are classified currently as primary risk factors. The listing of risk factors in order of importance has changed even in the last ten years. The factors listed below are not to be thought of as unimportant. They may have been earlier believed to have great importance and have been replaced by more potent factors. There may be some factors which have not been investigated completely and may gain importance. Also, any of these factors in combination either with each other or, especially, with a pri-
mary risk factor may take on much greater importance.

E. Obesity

"The independent contribution of excess weight to the risk of the development of coronary heart disease becomes small indeed. However because of the association between the easily identifiable characteristic of weight and the important factors of blood pressure and serum cholesterol level, reduction in weight is advisable because of a possible favorable effect on the other factors." Obesity is closely linked with serious risk factors in several ways. Obesity usually reflects a diet high in calories, carbohydrates and fats. As mentioned earlier, high fat consumption is linked with elevated lipid levels, a primary risk factor. Also, overweight individuals are more prone to develop diabetes, possibly because they "wear out" their islet cells with excess consumption and therefore excess metabolism of carbohydrates. Diabetes is also a major risk factor. There also seems to be an important link between obesity and a third major risk factor, hypertension. The diet for these patients involves decrease of total fat especially saturated fats and cholesterol. There is an attempt to correct the pattern of general over-eating with a moderation of intake of total carbohydrates, sugars and alcohol.

As with smoking, there is a great potential for change but often, realistically, this a difficult problem to treat because it involves sometimes drastic behavior modification. It also involves trying to change culturally approved eating habits which the person usually has acquired from early childhood.

F. Physical Inactivity

This risk factor is linked with obesity as the two often occur together. It is advisable for the patient undergoing weight reduction to also begin an exercise program. (Exercise will be discussed extensively in another section.) Physical inactivity is linked with coronary heart disease in that physically
active individuals seem to be less prone to develop coronary heart disease while more sedentary lifestyles seem to invite it. The beneficial aspects of increased activity are also included in the chapter on exercise.

G. Stress

Stress may be thought of as the "common denominator of all adaptive reactions in the body both to pleasant and unpleasant stimuli." Physiologically speaking it is a chain of hormonal and neural reactions which help the body to adapt to physical and emotional stimuli. The overall body reaction to stress involves a release of pituitary and adrenal hormones, an increase in blood sugar and changes in blood pressure and temperature. Stress affects the circulatory system by constriction of the arterioles in the skin and kidneys and throughout the body. This vasoconstriction causes the heart to beat faster, with increases in stroke volume and cardiac output. Arterial blood pressure rises.

Stress is being recognized more often as an important factor in the personality of the "coronary prone" individual. The "Type A" personality has received much publicity and generally describes a hard driving, restless, high strung individual who is unable to "sit still", is constantly meeting deadlines and is a perfectionist. This person inflicts stress upon himself constantly and it is constant, as opposed to sporadic, stress that is linked to more serious bodily effects. Russek states that "stressful living, when diet is high in animal fat, not only seems to accelerate atherogenesis, but through it's neurogenic and hormonal influences, contributes to myocardial hypoxia and cardiac electrolyte imbalances...forming the most lethal combination." Recent research shows that "the A pattern significantly enhances prediction of coronary heart disease independent of traditional risk factors." The "Type A" personality is associated with three factors influencing coronary heart disease;
(a) the degree of obstruction of the coronary arteries, (b) biochemical factors—levels of cholesterol and triglycerides and (c) increase in catecholamines associated with arousal of aggression and anger.

Stressful living is also implicated in the increased incidence of coronary heart disease among young people. "Mental, emotional, physical, recreational and spiritual needs of the young are becoming increasingly unfulfilled, both in the academic and home environment despite unprecedented affluence. The resultant stresses undoubtedly are responsible in large measure for the precocious atherosclerosis observed in our young people." 15

Stress as a coronary risk factor is receiving more attention both from the public and from the health profession. It is important to recognize sources of stress for people and to try to help them to live with the stress by setting limits on behavior and including more restful periods into daily life.
The Cardiac Rehabilitation Team

A. Approach

The cardiac rehabilitation team consists of members of the health team who coordinate efforts to help the patient move from sickness to wellness following myocardial infarction. (The program may allow for patients with severe angina or those who have had coronary surgery to participate, depending upon the facilities and personnel available and the physician’s orders.)

The size of the team varies from hospital to hospital. There may be many members or just two or three. Their roles may be highly structured and carefully defined or there may be a very loose, informal structure. The team effort is the important factor, however, in aiding the patient toward total rehabilitation. Rosenberg explains the importance of the cardiac rehabilitation team. "The physician has become a technician with expertise in diagnosis and prescribing treatment. He depends on skills of others to carry out specifics of his treatment plan which may include nursing, dietetics, physical therapy, pharmacy, occupational therapy and education. In general, the physician cannot and should not attempt all these functions. They are not his areas of competency."16 The success of the program depends in part to the coordination of the members and their ability to include the important elements of each part of the program.

Some advantages of the team approach include the following:

1. better comprehensive care
2. better programming - a wide and varied program may be offered
3. compartmentalization is avoided
4. one discipline can fill in for another when there is a deficiency of personnel
5. Cross fertilization of ideas in teaching and research is possible. There are some disadvantages of the team approach. They include:

1. Cost—some hospitals may be unable to finance enough money for all the desired members of the team or the facilities and equipment.

2. Communication—communication may be poor which may lead to misunderstanding among team members and duplication or omission of services.

3. Leadership—poor leadership may lead to disorganization and breakdown in the functioning program.

4. Roles of the individual members of the team in relation to the patient and to one another— the relationships may be ill-defined and can lead to misunderstanding and incoordinated effort.

5. Problem orientation versus role orientation?

With careful planning and coordination, the cardiac rehabilitation team offers the patient a variety of services designed to contribute to his total rehabilitation.

B. Roles

1. Nurse

The role of the nurse in the cardiac rehabilitation program is a complex one. She has a very important role in physical assessment and support. She monitors the patient's condition and implements the medical regimen as prescribed by the physician. This requires in-depth knowledge about the diagnosis, treatment and prognosis of the individual's disease process. She also makes a nursing diagnosis and formulates a nursing care plan. It is important that the nurse consider each patient individually when formulating a plan of care. It is then her responsibility to see that this plan is carried out by the appropriate member of the health team. The nurse carefully observes and documents the patient's progress to assist the physician to determine placement.
into the cardiac rehabilitation program.

The criteria for placement into or advancement in the program is determined by constant physical and psychological assessment and in many cases this includes stress testing. The nurse is in the best position to assess the patient because she is with him 24 hours a day. It is possible for her to identify physical problems and/or maladaptive behaviors which may impede the patient's recovery. If such problems are identified early, hopefully they may be corrected or treated so that the patient may re-enter the cardiac rehabilitation program. Another very important role that the nurse plays in the patient's life during this period is psychological and emotional support. It is her responsibility to provide an atmosphere that is conducive to rest; one that allows the patient to express feelings and vent hostility and frustration. She is usually the main person on the health team who provides a link between the physician and the patient and his family. She is responsible for providing constant explanations about procedures and treatments and is usually the primary person who teaches the patient and his family about his disease and what to expect in the future. She provides the family unit with realistic information concerning their future and helps them to identify needs and formulate realistic goals.

Another primary role which the nurse assumes is that of an educator. This job includes teaching not only the patient but also nursing staff and other team members. The community health nurse has the responsibility of educating the public. Education of the public would include not only behavior modification involving risk factors, but also how to recognize the warning signs of heart attack. The ideal public education program would include teaching first aid preparing paraprofessional persons to man life support units in high risk areas such as factories, office buildings, airports, railroad stations, sports
stadiums and convention halls. This might help decrease the number of deaths occurring immediately following the heart attack.

The patient education program will be discussed in detail in another section.

Probably the most important role the nurse performs as a member of the cardiac rehabilitation team is that of coordinator. She understands the role of each of the other team members and helps coordinate their services into a comprehensive program for the patient. She assesses the quality of the program and assures that there is adequate resources and personnel to cover the different program areas. Especially in smaller hospitals with more limited resources, it may be her job to delegate responsibility or to assume it herself to assure that all of the important functions of the program are being carried out. For example, if it is not possible for a physical therapist to teach the patient range-of-motion exercises, it would be necessary for her to find someone who could or to do it herself. In this sense, the nurse "fills in the gaps" in the cardiac rehabilitation program. As a coordinator, she also reviews the patient’s daily activities to ascertain that he is receiving a therapeutic ratio of activity to rest to prevent fatigue and overwhelming the patient.

The nurse’s role in cardiac rehabilitation is difficult and complex. It is, however, vitally important and contributes immeasurably to the patient’s recovery. It is natural for the nurse to feel overwhelmed when new to this role. However, sometimes nurses don’t seem to shed this "newness" and find it a problem to deal daily with this extended role. Also, if the hospital does not have a formally outlined cardiac rehabilitation program, she may find herself neglecting certain aspects of the job. The reasons for failure of the nurse to fulfill her role are many. Redman, et. al. has listed the reasons why
nurses fail to teach cardiac patients and this list may be expanded to help understand why the nurse fails to coordinate a comprehensive rehabilitation program:

a. lack of time, heavy work load, inadequate staffing—nurses frequently give this excuse, not without justification. However, both formal and informal studies have shown that the nurse is usually somewhat disorganized in her approach and could utilize time more efficiently to fit more things into her day. For example, she might do some teaching while doing the bed bath.

b. lack of knowledge—many nurses fear that they are not prepared to teach, that they do not possess the knowledge necessary to teach effectively. Again, this may be true in some cases. This is not an easy problem to solve. Some solutions may include research into areas the nurse feels weak in, in-service education programs and possibly learning to relegate certain areas of teaching to other personnel. For example, the dietician may visit the patient with a prepared outline for teaching or she might consult with the nurse in order to help the nurse better understand different types of diets. It is essential for the nurse to realize the importance of teaching the patient and to correct areas which prevent her from fulfilling this role.

c. inadequate preparation to teach— it is important for the nurse to understand principles of learning and teaching. The nurse should know about patient readiness for learning as well as how to set goals with the patient. An atmosphere conducive to learning must also be set up— one resembling the student-teacher situation. It is necessary for the patient to see the importance of what is being taught and what is expected of him. Audio, visual and written aids are valuable assets to the teaching process. The nurse needs to outline what is to be taught, record exactly what she teaches each time to preserve continuity. She must also test the patient to determine comprehension.
d. lack of nursing service support—many times a nurse may be reluctant to initiate a teaching program. She may be able to enlist the help of others and certainly should not assume that others won't help just because there is no existing program.

e. poor communication between members of the health team. Individual conferences with members of the health team stresses their importance and may help enlist cooperation. Group sessions may also be useful.

f. belief that sharing knowledge decreases nurse power. Sadly, some nurses feel that knowing more than the patient gives her some type of power over him. She may feel that the patient holds her in awe and she needs this for her self-esteem. This nurse must learn that she will receive more respect from her patient by helping him to live a rewarding life.

g. patient does not require information. The nurse may feel that the patient is not intelligent enough or stable enough to receive information. This is a dangerous and self-defeating assumption.

h. the physician does not allow the nurse to teach. The role of the nurse includes teaching and it is important for the physician to be aware of this. The nurse might discuss this with him and perhaps show him a sample lesson plan for his review. If these measures do not help the situation, she should take her problem to those in charge.18

2. Physician

The role of the physician is one of supervising the patient's medical regimen as well as, in some cases, the cardiac rehabilitation team. He may make rounds with the nurse and they then may hold a team conference to discuss the patient's progress and whether he is to advance or possibly go back in the program. He is also available for consultation to other members of the health team and is
ultimately responsible for determining the patient's level of participation in the program.

3. Physical therapist

This person is responsible for the patient's exercise program. He may visit the patient in the coronary care unit to teach range of motion exercises to be done by himself, the nurse and ultimately the patient. He then follows the patient under the supervision of the physician to establish a program of exercise.

4. Dietician

The dietician supervises the patient's dietary regimen. She may also visit the patient to discuss his diet, determine likes and dislikes, and to help him to continue at home.

5. Recreational therapist

His role is to help the patient to find activities that interest him and are in accord with his activity level. Recreation helps to relieve anxiety, to provide some socializing and to encourage the patient to think that he will have an interesting and full life. This is a psychological boost.

6. Pharmacist

Aside from preparing the patient's medicines, he may also help in the education process by discussing medications with the patient. He is also available for consultation to the nurse.

7. Chaplain

The chaplain provides spiritual support which may be very important to the patient at this time. The nurse should not overlook the chaplain just because the patient does not request to see him. He may be too frightened or overwhelmed and may not want to "bother" the busy nurse. The chaplain may also be invaluable in helping the patient adjust to the home situation.
8. Other

There are many other valuable professionals who may be of great service to the health team and are generally consulted when a particular need is seen by a health team member. These persons include: pulmonary rehabilitation, Public Health Department, Visiting Nurse Association, vocational rehabilitation, community services, and social services.

The number of persons on the health team varies and may include some or all of those listed above. It may be necessary for one member to assume other responsibilities if all of these services are not available. This person is often the nurse.19
The Cardiac Rehabilitation Program

The criteria used for establishing placement in the cardiac rehabilitation program varies from hospital to hospital but representative screening includes the following: (1) Myocardial infarction - uncomplicated; severe angina pectoris; and following open heart surgery; (2) no other disabling diseases; (3) 70 years old or younger.

"The success of the patient's rehabilitation program will depend on the patient's ability to accept the illness and make constructive plans, his physical condition and the limitations imposed by his condition and the expectations of family, friends, and employer in the social situation to which he returns."20

The cardiac rehabilitation program is very important for the individual who is recovering from a myocardial infarction. As the patient gets better physically, he passes through the shock phase of his illness and begins to comprehend what has happened to him. He will usually begin to feel unprepared for his discharge and unsure of his role as he plans to leave the hospital. This makes the institution of a cardiac rehabilitation program vitally important. After the acute phase of the illness, there are three major stages of rehabilitation. Holland identifies them as: (1) continuation of hospitalization, (2) recuperation at home, and (3) rehabilitation. The last phase may last up to three years. She identifies the goal of care as: "the return of a patient realistically to the greatest physical, mental, social, vocational and economic usefulness, having assumed his role in his family and in the competitive realms of society."21

There are five major areas that should ideally be included in a comprehensive cardiac rehabilitation program. They have been summarized in the following way by Hinds:
I. Medical

In addition to the vitally important function of the medical program to treat the critically ill cardiac patient, to prevent complications and to restore him to health, medical supervision helps to determine the capacities, tolerances and limitations of the patient so as to determine placement in the program. Divisions under the medical category include:

A. medical treatment
B. surgical treatment
C. restorative treatment
D. nursing care
E. physical therapy
F. occupational therapy

II. Social

This part of the program is to assess the social effects of disability on the patient, the family and community life and include the following:

A. patient counseling
B. family counseling

III. Psychological

The patient learning to cope with illness goes through the stages of the grieving process: shock and disbelief, denial, anger, bargaining, depression, and acceptance and adaptation. The patient must be helped to work through each stage of this process to help insure the success of the rehabilitation program. Psychological counseling must be done to determine the patient's reaction to his illness and the rehabilitation program. Maladaptive behaviors and adjustment problems will hopefully be detected early and treated before affecting the patient's total rehabilitation. It has been estimated that half of all cardiac patients who are unemployable have psychiatric problems. Perhaps this
will be avoided with careful monitoring of the patient's psychological status.

IV. Vocational

Vocational rehabilitation encompasses the following areas:

A. vocational counseling
B. vocational training
C. vocational retraining
D. trial employment

V. Educational

The goal of the educational program is to prepare the patient for the various aspects of his rehabilitation program and to give him a better understanding of his illness and future role.²³

It is possible to incorporate the major areas of cardiac rehabilitation services into the three major stages of rehabilitation. The outline and objectives have been formulated by J. Holland in *Cardiovascular Nursing: Prevention, Intervention and Rehabilitation*. The discussion under each of these categories is drawn from other sources.

I. Continuation of Hospitalization

The continuation stage begins after the acute stage following myocardial infarction. The patient who is transferred from the coronary care unit is under a great deal of stress as he leaves this intensive care area for the ward. It is especially important for the nurse to prepare the patient for transfer. Continued explanation as well as continued assessment of the patient's physical and mental state are vitally important in helping to determine the patient's level of understanding and adaptation. The objectives of care during this period of rehabilitation include the following:

(1) to assist the patient to understand his illness
(2) to assist him with adaptation
(3) to stimulate him to take part in recovery and rehabilitation
(4) to assist him to make realistic plans for the future
(5) to assist him to accept his illness and limitations
(6) to provide him with support, understanding and guidance

Assessment at this point would include determining the patient's normal pattern of activities, any predisposing risk factors, the stress present in his life, his dietary habits, and his normal coping mechanisms. (See appendix for sample Exercise History).

Four programs which have begun in the coronary care unit will be continued during this period of time. The exercise, activity, recreational and educational programs are coordinated by the nurse and carried out by various members of the health team.

A. Exercise Program

The exercise program is started in the coronary care unit while the patient is still in bed. The exact time when the patient may begin any type of exercise is dictated by the physician. Some of the factors used in the decision include how active the patient was before the M.I., the degree of damage to the heart and any complications. Also age and weight are considered. The presence of other diseases or smoking alcohol or drug use prior to the myocardial infarction are taken into account. Two types of exercises which may be performed at this time include isometric exercises and rhythmic exercises. Isometric exercises are static and produce no change in muscle length. The purpose is to improve the strength of a particular muscle group. Examples include hand grip, quadriceps setting and gluteal setting. Isometric exercises are considered controversial for use by cardiac patients. Their cardiovascular effects include an increase in heart rate and cardiac output and a marked rise in blood pressure. In a person with abnormal cardiac function, isometric exercise may lead
to marked increases in left ventricular and diastolic pressure and therefore may cause left ventricular dysfunction. Also there is more use of the Valsalva maneuver with isometrics, which is contraindicated.

Rhythmic exercises are dynamic or isotonic. They lead to muscle contraction with a change in muscle length. This may be accomplished by active or passive means. The purpose of these exercises is to increase muscle strength and endurance. They also help improve cardiopulmonary and peripheral circulation. The cardiovascular effects include an increase in heart rate and cardiac output but a decreased resistance in the peripheral vasculature and little or no change in blood pressure. Flexion of limbs is a form of rhythmic exercise. When considering exercise, the cardiovascular responses to rhythmic exercises are preferable to those of the isometrics for the cardiac patient.

The exercise program concerned with physical fitness and increasing cardiovascular endurance will be discussed during the rehabilitation phase.

B. Activity Program

For purposes of discussion, activities include all physical activity excluding the exercise program contained in other sections.

From the moment that the patient has passed the crisis phase of the myocardial infarction and has stabilized in the coronary care unit, both he and the staff are concerned with how much he will be allowed to do and what he must avoid. Complete bed rest was for many years the mainstay of early treatment. The goal of this therapy was to rest the heart. But studies show that the heart actually works harder when the patient is totally bedridden than when he is immediately placed into a graduated activity program. There are several disadvantages to complete bed rest. There is an increase in the work load of the heart through an increase in cardiac output, a decrease in cardiac reserve and an increase in the use of the Valsalva maneuver during moving and
straining at stool. Lying flat also promotes thrombus formation through stasis of blood. The patient is less likely to cough and deep breath which may lead to various pulmonary complications. For this and other reasons, many physicians now prescribe "armchair therapy" which allows the patient to be out of bed for specified lengths of time each day. The chair must be comfortable but not soft and should have a high back. Arms and a moveable footrest are also necessary. The patient is expected to rest in this chair as this activity is not synonymous with early ambulation. Associated with use of the armchair, the patient usually uses the bedside commode and he is allowed to feed himself. He still must have much of his care done for him including his bath. There are many advantages to this method of treatment including benefits to the cardiovascular system. Another important benefit is the psychological lift which usually accompanies getting out of bed. Precautions must be taken that the patient understands his limitations. Auxiliary staff such as housekeeping must also recognize these limitations.

The first activities that the patient attempts after his heart attack are activities of daily living. This activity program is prescribed by the physician and supervised by the nurse. Hospital programs are usually described by the number of days post infarction, however the nurse's assessment helps decide the speed at which the patient increases his activity. After pain subsides, the patient is often allowed to sit in a chair. He may be allowed to wash his face, brush his teeth and feed himself. He then progresses to dangling and walking, all gradually increased as the patient's condition allows. Activities are introduced one at a time to prevent overwhelming him. It is important that the patient's pulse and blood pressure be recorded before, during and after the activity. An increase in the heart to more than 120 beats per minute or a fall in the systolic blood pressure great-
er than 20 mm. of mercury indicates that the heart is working too hard. The pate

tient should be monitored and if the nurse notes arrhythmia she should stop the activity. Chest pain is an important symptom for the patient to report. A sample activity program is included in the appendix. Further discussion about activity for discharge will be included in the rehabilitation section.

C. Recreational Program

If the hospital has a recreation therapist or an occupational therapist, this person may be available to help the patient find pastimes which are in accordance with his general activity level. For example, the patient who is allowed to sit up in the chair p.r.n. may be introduced to the game of chess. Often people who are restricted are helped to cope with boredom when a program of activities are presented. This program also helps combat depression and may give the patient an opportunity to vent hostility or frustration. The patient may also have a chance to socialize with other cardiac patients with whom he can identify.

If there is no available recreation therapist, the nurse may assume this role by determining the patient's interests and helping him to find interesting activities.

D. Education Program

The education program begins in the coronary care unit and includes both formal and informal teaching. The well educated patient is much more likely to cooperate with health personnel and much more importantly, is more likely to participate in his treatment plan which will be continued for the rest of his life. Behavioral objectives are stated as desired behaviors or modification of risk factors that are hopefully attained. Every opportunity that may be used for teaching should be. The nurse continually explains to the patient what is being done and why and what he may expect after treatment. Besides
informing the patient, these explanations help to reduce stress and minimize misconceptions. It is important to establish early a comfortable environment and one that is non-threatening to the patient. High levels of anxiety are not conducive to learning. For this reason, teaching in the coronary care unit must be concerned only with immediate needs, while extensive teaching is saved until transfer to the ward.

There are several factors which must be considered when planning a teaching program for an individual. The nurse must determine the patient's motivation and readiness for learning. Besides anxiety, such psychological problems as denial and depression will interfere with the learning process. The patient usually has sufficient motivation because he has just experienced a crisis in his life and he is willing to learn. Readiness may be determined by interest and/or questioning on the patient's part. Next, assessment must be made to determine the level of understanding of the patient. His educational level as well as his societal and cultural backgrounds must be taken into account. (A sample test that may be used as a pre- or post test is included in the appendix.) When the level of understanding is established, a teaching plan is formulated.

Some ways in which the learning process is enhanced include the use of visual aids and handouts to reinforce teaching. The nurse presents facts and demonstrates skills to the patient. She then takes feedback and helps to clarify material. She helps the patient to gain insight and to learn to problem-solve himself. She enhances this by teaching principles and helping him to derive information from them. The educator must continually evaluate the patient's understanding by testing and observing him for desired changes in behavior.

The teaching plan includes all aspects of the patient's life that affect or are affected by his heart condition. This teaching plan may be divided into seven categories:
1. **Definition of a heart attack**

The anatomy and physiology of the heart should be discussed. The heart function should be related both to health and illness. In relation to illness, the atherosclerotic process would be explained. Angina pectoris and myocardial infarction are defined. The nurse would explain how an M.I. is diagnosed and the healing process of the damaged heart.

2. **Risk Factors**

In relation to the atherosclerotic process, there is discussion of risk factors, their role in the atherosclerotic process and their elimination. The following risk factors should be included:

   a. cigarette smoking
   b. hypertension
   c. high cholesterol/animal fat
   d. stress-lifestyle
   e. diabetes
   f. stress
   g. inactivity
   h. obesity

3. **Graduated Activity**

This section of the teaching plan includes the activity plan and guidelines for the patient. The nurse will explain that the patient receives specific instructions from his doctor concerning his activity level. She lists some of the activities for which the patient needs specific guidelines. The patient should have a list of activities detailing when each activity can begin, the duration of the activity and any restrictions associated with it. The activities that should be specified include: sex, driving, housework, hygiene, flying and traveling. An exercise plan for the patient also needs to be specified,
This includes walking, stair climbing, running and sports activities. A carefully planned exercise program aimed at physical fitness is usually prescribed for the patient about three months after the myocardial infarction. It is recognized that each individual has many activities that are important to him that must be evaluated. Hopefully, the patient will be tested to determine the level of activity for these activities that he will be involved with after discharge. Further explanation of testing and determination of energy requirements is found under the exercise section. A table of Energy Requirements of Common Activities is explained in that section and is included in the appendix.

4. Diet

The patient needs careful and thorough explanation of his diet. This explanation includes restrictions associated with the diet and the reasons for them. The likes and dislikes of the patient as well as his economic and cultural status must be taken into account when planning diet. The dietician would be the best person to talk to the patient about diet not only because of her expertise in this area, but also because she may be able to offer the patient sample menus and the names of cookbooks that he may purchase. She may even teach him how to dine at a restaurant with regard to his dietary status. Such concepts as calories and food groups should be explained to the patient. The role of the different food groups, cholesterol, sodium, alcohol and caffeine in the body should be taught.

Modification of diet may be difficult for the patient and the educator needs to make this change as uncomplicated for the patient as possible. It may be necessary for the dietician and the nurse to reinforce diet teaching so that the patient becomes comfortable with it before discharge.

5. Medications

The patient needs detailed explanations concerning the medications that he
will be taking at home. Each drug should be identified and it's basic action explained. The dose, time and side effects should also be included. It may be helpful for the patient to have a chart or written handout to help him keep his medication schedule correct. The pharmacist and/or the nurse may help the patient with this. Re-explanation and reinforcement may be needed and this should be determined so that the patient is able to adhere to the medication regimen at home. He must be made aware of potentially dangerous side effects that should be reported to the physician as well as possible drug interactions that may occur with over-the-counter drugs. The patient's use of these drugs should be determined and discussed in relation to the medications which he will be taking home.

6. Elimination

The patient must be made aware of the dangers of straining, particularly at stool. Explanation of the Valsalva maneuver may be included. The patient should be taught ways to avoid constipation with as little dependency on laxatives as possible. The patient's normal bowel pattern should be assessed and discussed with him so that he may learn good bowel habits.

7. Discharge Planning

The teaching program is hopefully preparing the patient for discharge. Along with the program for graduated activity, the patient needs to know when he is to see the doctor. He should also be familiar with community resources to assist him to recovery and rehabilitation. The patient should understand warning signs that should signal him to call the doctor or to go to the emergency room. He should be familiar with the symptoms of congestive heart failure, angina pectoris and myocardial infarction. It is important for him to evaluate his condition and to recognize abnormal function.

Evaluation of the teaching program should identify areas that are weak and need review. It is important that this be done prior to discharge so that the
patient leaves the hospital with the knowledge that he will need to utilize at home. 24

II. Recuperation

The recuperation phase is concerned with the first six weeks post discharge. Even with good teaching and preparation for discharge, most patients find this to be a traumatic time. Material that was taught and that the patient felt comfortable with in the hospital setting may be poorly retained or forgotten. This material should be reviewed with the patient and his family. The Visiting Nurse Association may also be called in for counseling and review of learning material to help provide continuity. It is important for the nurse and other health team members to maintain a supportive attitude toward the patient to help him cope with his return home. The patient should be made aware of and referred to community agencies such as the American Heart Association, Vocational Rehabilitation and the Community Mental Health services. He should also be put in contact with agencies to help with finances, if necessary.

The patient should have a good understanding of exactly what he can and cannot do. He should learn to take his pulse so that he knows if a particular activity is placing a strain on his heart. During this period the patient should have a list of very specific activities that he can engage in. For the most part, these activities involve little energy expenditure. The patient is convalescing and he must understand this so that he does not overdo. He should have been taught that the heart requires six to twelve weeks to heal and that this process must be completed before he resumes normal activity. While it is important to emphasize this, caution must be used to prevent the patient from becoming an invalid. He must have a feeling of confidence that he is getting better and that resumption of normal activity is possible. If he has
specific guidelines to follow for this first six weeks, he is not afraid that he is either doing too much or too little. An example of a specific instruction sheet that the patient may take home is included in the appendix.

III. Rehabilitation

The rehabilitation phase begins when the patient's heart has healed and he is ready to resume some normal activity. A general guideline is six weeks post discharge, but this depends on the individual's physiologic status including tolerable activity and absence of complications.

The goal of this phase of recovery is, "to prepare the patient physiologically and psychologically to assume major responsibilities for his health maintenance and to resume his roles in the family and community and at work."25

The physician determines the health status of the individual by physical examination and testing. The functional capacity of the heart is determined by stress testing. There are many types of stress tests. They often involve the use of a bicycle or treadmill. One popular type of stress test is the Master's test. It involves the use of two nine inch steps. The patient negotiates the steps for one and one-half minutes. EKG tracings are taken immediately afterward and after two and six minutes. The test is considered positive if there is typical angina pain or ST segment depression greater than 0.5 in any lead on the tracing. The test is stopped when the patient has pain or shows arrhythmia. The stress test gives information about the heart rate, stroke volume, blood pressure, cardiac output and maximum pulse that the patient can tolerate without symptoms. From this, the patient is placed into one of four functional classes as outlined by American Heart Association. Class I (prime) means that the patient has no symptoms with any type of activity. Class I (minimal) through Class III show graded levels of symptoms of congestive
heart failure and angina even at rest. The classification system is included in Tables II and III. This system provides the physician with a guide to the energy expenditure that the patient can tolerate. With this guideline, the physician has a more accurate method of advising the patient as to his level of activity. For example, if the patient can tolerate an energy expenditure of five calories/minute, the physician may give the patient a chart of energy requirements for common activities and tell him exactly where he falls on this chart. For a sample chart, see the appendix. In this way, the patient's activity level is carefully monitored. The patient may be re-evaluated as time goes on to determine possible increases in activity level.

The stress test also helps the health team members to decide when and if the patient can return to work. Most jobs require three calories/minute or less energy expenditure which is within reasonable limits for Class I and some Class II individuals. However, it is very important for the nurse, physician, patient and perhaps the vocational counselor to evaluate the type of job the patient has, the emotional stress it entails and taxing features of it. The pattern of energy expenditure and the availability of rest periods must also be considered. Special features such as travel must be taken into account. If the patient is able and willing to go back to work, he should be encouraged to do so. It is believed that "the majority of patients who are not rehabilitated or do not return to work fail because of emotional reactions to the disease not because of physical dysfunction." Patients, however, are usually eager to return to work. Returning to work helps to restore the patient's self-respect and self satisfaction. Many patients are worried about supporting their families and paying medical expenses and are glad for the opportunity to be employed. The patient must learn to monitor his pulse and to avoid excess tension. He should utilize rest periods. His employer must understand any restrictions
<table>
<thead>
<tr>
<th>Class I Prime (None)</th>
<th>Class I (Minimal)</th>
<th>Class II (Moderate)</th>
<th>Class III (Severe)</th>
<th>Class IV (Very Severe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy expenditure over 7 Calories/min.</td>
<td>Energy expenditure continuous up to 5 Calories/min, intermittent to 6.6 Calories/min</td>
<td>Energy expenditure continuous up to 2.5 Calories/min, intermittent to 4 Calories/min</td>
<td>Energy expenditure continuous up to 2 Calories/min, intermittent to 2.7 Calories/min</td>
<td>Energy expenditure up to 1.5 Calories/min</td>
</tr>
<tr>
<td>No symptoms with any type of activity</td>
<td>No symptoms with ordinary activity</td>
<td>Slight symptoms with ordinary activity; none at rest</td>
<td>Less than ordinary activity causes symptoms; none at rest</td>
<td>Symptoms even at rest</td>
</tr>
<tr>
<td>Walking, climbing stairs freely, and all activities of daily living do not produce symptoms</td>
<td>Walking, climbing stairs, and usual activities of daily living do not produce symptoms</td>
<td>Walking on level, climbing one flight of stairs (average pace), and usual activities of living do not produce symptoms</td>
<td>Walking more than one block on level or climbing one flight of stairs (average pace), or usual activities of daily living produce symptoms</td>
<td>Performance of any of activities of daily living beyond personal toilet or its equivalent produce increased discomfort</td>
</tr>
<tr>
<td>Continuous (3 min or longer), very severe (rapid action of musculature) physical exertion, hurrying, hill-climbing, severe or competitive recreation do not produce symptoms</td>
<td>Intermittent (2 min or less), severe physical exertion, hurrying, hill-climbing, active recreation, and marked emotional stress do not produce symptoms</td>
<td>Emotional stress, hurrying, hill-climbing, active recreation, or similar physical activity produce slight symptoms</td>
<td>Emotional stress, hurrying, hill-climbing, active recreation, or similar activities produce marked symptoms</td>
<td>Symptoms increase with emotional reaction; any physical activity increases discomfort</td>
</tr>
<tr>
<td>Signs of congestive heart failure are not present</td>
<td>Signs of congestive heart failure are not present</td>
<td>Signs of congestive heart failure are not present</td>
<td>Signs of congestive heart failure may be present, and if so, are usually relieved by therapy</td>
<td>Signs of congestive heart failure, if present, are usually resistant to therapy</td>
</tr>
</tbody>
</table>

From: Administration for the Effective Control of Cardiovascular Disease: Two Complimentary Studies. Hinds, J., p.152
Table III.

![Graph showing functional classification of cardiovascular disease]

Upper limits:

- I: 5.6-6
- II: 2.5-4
- III: 2-2.7
- IV: to 1.5

CCU, Home, Work, Planned Fitness Program

0 3 8 14 26 Weeks

From: Administration for the Effective Control of Cardiovascular Disease: Two Complimentary Studies, Hinds, J. p.153
on the employee's performance. If the patient is unable to return to former employment because of hesitancy on the employer's part or excess demands, he should be referred to the State Department of Rehabilitation so that he may be matched to another occupation. For many patients, return to work is the end goal of their rehabilitation and every effort must be made to help them to attain this goal.

When the myocardium has healed and it is determined by the physician that the patient is ready, he may begin a physical fitness program. "The association between high physical activity levels and low coronary heart disease incidence, morbidity and mortality is seemingly maintained. Preventive and therapeutic exercise programs seem to offer some protection against coronary heart disease when comparison is made between recurrence rate, incidence rates, mortality and morbidity in the exercised persons versus the known data in those whose who exercise is minimal. Exercise, is, if not proved therapy, at least a prudent adjunct to the management of coronary heart disease."^27

The patient must have a "prescription" for his exercise program that tells him exactly what he can do, at what intensity and duration and how often it is to be done. The patient takes his pulse and learns to exercise until he has anginal pain. He may even be taught to "walk through" or slow down the pace of the activity until mild angina is relieved. Most programs emphasize that there must be a warm-up as well as a cool-down period included in the session. For example, the patient may have a warm-up period of 10-15 minutes where he loosens up his muscles and raises the temperature of the muscle. This enhances O2 metabolism and increases capillary blood flow. The patient then exercises to raise his pulse rate to the prescribed rate for 15-20 minutes. He checks his pulse every couple minutes. The cool-down period lasts for 5-10 minutes, as the patient gradually lessens his activity. This prevents sudden pooling
of blood in the lower extremities which could lead to inadequate cardiac and cerebral circulation. The patient should complete three 20 minute or two 30 minute sessions weekly. This type of exercise is known as aerobic. This is contrasted with anaerobic exercise which involves short bursts of high level performance leading to quick exhaustion with lactic acid buildup and an oxygen debt.

The exercise program for the post myocardial infarction patient must be carefully supervised. Resuscitation equipment should be available. There have been some reports of sudden death, arrhythmias and M.I. during exercise. Other disadvantages include: jogger's heel, exacerbations of osteoarthritis and persistent muscle pain. These effects are far outnumbered by beneficial effects of a planned exercise program. The exercise program makes the patient more active and improves his vital capacity and the velocity of ventricular contraction. There may also be some decrease in blood pressure caused by decreased peripheral vascular resistance and this may enable the doctor to decrease the dose of antihypertensive medications the patient is taking. This may help the patient by decreasing the severity of certain side effects associated with these medications. Collateral circulation of the heart is improved with exercise with an increase in the coronary vascular tree. Another benefit associated with increased activity is loss of weight. There is also evidence that blood lipid levels are lowered. Psychological benefits include an increase in the sense of well-being, an increase in the ability to cope with decreased fear of recurrent M.I. and death. There may be a decreased need for tranquilizers and sleep medications.

The patient on an exercise program needs special instructions about medications. He may need nitroglycerin before exercising and the physician should be asked about this. It is also possible that the patient will eventually
need less nitroglycerin as his heart's circulation improves. As the condition of the heart improves, it is possible that there will be a decreased frequency of arrhythmia and he may need less anti-arrhythmic medication. If he is taking anticoagulants, he should be warned not to engage in contact sports or any activity that may lead to falls or bruises.

The exercise program can have many benefits for the cardiac patient. Enselberg states that "It appears that most patients can undergo training, but there are a few who cannot. ... (those with) unusually low thresholds for pain or the... ominous arrhythmias... it cannot be denied that training programs seem to be safe and helpful. Even if the major effect is psychological, this alone would justify the continuance and further study of such programs."28

Conclusion

A comprehensive cardiac rehabilitation program is very beneficial for the patient. The rehabilitated patient is able to resume his role in the family and his community. He is confident about his capabilities and understands his limitations. Throughout this process, the individual needs support from the entire health team as well as his family and society. With this help and support, he is able to move from sickness to the highest level wellness that he is able to attain.
Appendix I.

EXERCISE HISTORY FORM

Name

Address

1. Job description

2. Job activity level  __ sedentary  __ active  __ vigorous

3. Throughout your adult life, do you feel you have been
   __ sedentary (sitting and walking mostly in your work)?
   __ physically active at least 1-2 times weekly?
   __ a weekend/vacation exerciser?
   __ physically active more often?

4. Are you very active now?  __ same as above  __ less than above  __ more than above?

5. Does exercising (including climbing stairs) give you any of the following problems?
   __ chest pains  __ shortness of breath  __ leg aches
   __ pressure over the heart  __ a tired-out feeling

6. During or after exercise does your heart  __ race?  __ beat irregularly?

7. How long is it before you regain normal breathing?
   __ a minute or two  __ a few minutes  __ several minutes

8. Do you have any injuries or bone-muscle disabilities that might interfere with exercising? If yes, describe.

9. How would you like to start a regular exercise program?
   __ would enjoy it  __ would do it for my health  __ not interested

10. Are you interested in
    __ a group exercise program  __ a solo program  __ a home program?

11. When would you find the time to exercise?
    __ before breakfast  __ during lunch hour  __ after work  __ after dinner

12. Can you adapt your normal work/home chores to include exercising opportunities?
    __ climbing stairs  __ gardening/yard chores  __ daily housecleaning
    __ walking long distances  __ woodchopping  __ other
(Exercise History Form, Cont.)

13. How would your exercising affect your family/friends?
   ____ they would join in   ____ timing might be a problem   ____ they would not be involved

14. Are you able to purchase equipment, if necessary?
   ____ have a bicycle  ____ can afford to joingexercise group
   ____ can afford up to $100  ____ can afford to join a private health club

15. What exercises interest you?
   ____ hiking  ____ bowling  ____ dancing  ____ jumping rope
   ____ swimming  ____ bicycling  ____ playing an organized game, such as __________

Exercise history questions like these will focus in on your patient's experience, desire, and ability to exercise.

FROM: Nursing Update, October 1974, p. 10.
Appendix II.

Energy Requirements of Common Activities (Cal/min.). These values are only very approximate, but they do give a relationship between one activity and another. Thus, this chart is to be used as a guide only.

<table>
<thead>
<tr>
<th>OCCUPATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Watch repairing</td>
<td>1.6</td>
</tr>
<tr>
<td>Typing</td>
<td>1.8</td>
</tr>
<tr>
<td>Driving tractor</td>
<td>1.9</td>
</tr>
<tr>
<td>Painting, sitting</td>
<td>2.0</td>
</tr>
<tr>
<td>Gardening, light</td>
<td>2.1</td>
</tr>
<tr>
<td>Armature winding</td>
<td>2.2</td>
</tr>
<tr>
<td>Cobbling</td>
<td>2.2</td>
</tr>
<tr>
<td>Hammering nails</td>
<td>2.5</td>
</tr>
<tr>
<td>Using hand tools</td>
<td>2.5</td>
</tr>
<tr>
<td>Radio assembly</td>
<td>2.7</td>
</tr>
<tr>
<td>Drive car or truck</td>
<td>2.8</td>
</tr>
<tr>
<td>Sewing at machine</td>
<td>2.9</td>
</tr>
<tr>
<td>Upholstering</td>
<td>3.0</td>
</tr>
<tr>
<td>Saw, power hand</td>
<td>3.1</td>
</tr>
<tr>
<td>Planing wood, soft</td>
<td>3.4</td>
</tr>
<tr>
<td>Sweep or rake</td>
<td>3.4</td>
</tr>
<tr>
<td>Mow lawn, power</td>
<td>3.8</td>
</tr>
<tr>
<td>Brick laying</td>
<td>4.0</td>
</tr>
<tr>
<td>Plastering</td>
<td>4.0</td>
</tr>
<tr>
<td>Tractor ploughing</td>
<td>4.2</td>
</tr>
<tr>
<td>Assembly line work</td>
<td>4.5</td>
</tr>
<tr>
<td>Pump tire</td>
<td>5.0</td>
</tr>
<tr>
<td>Wheel barrow, 115 lbs.</td>
<td>5.0</td>
</tr>
<tr>
<td>Horse Ploughing</td>
<td>5.9</td>
</tr>
<tr>
<td>Saw soft wood</td>
<td>6.3</td>
</tr>
<tr>
<td>Mow lawn by hand</td>
<td>7.7</td>
</tr>
<tr>
<td>Digging</td>
<td>8.0</td>
</tr>
<tr>
<td>Felling tree</td>
<td>8.0</td>
</tr>
<tr>
<td>Shoveling earth</td>
<td>8.5</td>
</tr>
<tr>
<td>Splitting wood</td>
<td>9.0</td>
</tr>
<tr>
<td>Planing wood, hard</td>
<td>9.1</td>
</tr>
<tr>
<td>Pull, hard</td>
<td>10.0</td>
</tr>
<tr>
<td>Tending furnace</td>
<td>10.2</td>
</tr>
<tr>
<td>Climb ladder</td>
<td>10.4</td>
</tr>
<tr>
<td>Chop with ax, pick or sledge hammer</td>
<td>10.8</td>
</tr>
<tr>
<td>Chopping trees</td>
<td>12.0</td>
</tr>
<tr>
<td>Lift more than 100 lbs.</td>
<td>16.0</td>
</tr>
</tbody>
</table>

SELF CARE

<table>
<thead>
<tr>
<th>SELF CARE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest, supine</td>
<td>1.0</td>
</tr>
<tr>
<td>Sitting</td>
<td>1.2</td>
</tr>
<tr>
<td>Standing, relaxed</td>
<td>1.4</td>
</tr>
<tr>
<td>Feeding self, sitting</td>
<td>1.4</td>
</tr>
<tr>
<td>Conversation</td>
<td>1.4</td>
</tr>
<tr>
<td>Dressing, undressing</td>
<td>2.3</td>
</tr>
<tr>
<td>Propulsion wheel chair</td>
<td>2.4</td>
</tr>
<tr>
<td>Washing hands, face, standing</td>
<td>2.5</td>
</tr>
<tr>
<td>Walking slowly, 1 mile-24 min</td>
<td>3.5</td>
</tr>
<tr>
<td>Bedside commode</td>
<td>3.6</td>
</tr>
<tr>
<td>Dressing, washing, shaving</td>
<td>3.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXERCISES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking slowly, 1 mile in 24 min.</td>
<td>3.5</td>
</tr>
<tr>
<td>Cycling, 5.5 mph, 1 mile in 11 min.</td>
<td>4.5</td>
</tr>
<tr>
<td>Straight leg raising</td>
<td>4.8</td>
</tr>
<tr>
<td>Swimming 20 yds/min</td>
<td>5.0</td>
</tr>
<tr>
<td>Walking briskly, 1 mile in 20 min.</td>
<td>5.0</td>
</tr>
<tr>
<td>Walking (military)</td>
<td></td>
</tr>
<tr>
<td>1 mile in 16 min.</td>
<td>5.6</td>
</tr>
<tr>
<td>Rowing, alone</td>
<td>6.0</td>
</tr>
<tr>
<td>Swimming 30 yd/min</td>
<td>7.0</td>
</tr>
<tr>
<td>Walking fast, 1 mile in 12.5 min.</td>
<td>8.0</td>
</tr>
<tr>
<td>Up &amp; down 2 flights of stairs</td>
<td></td>
</tr>
<tr>
<td>in 1 min.</td>
<td>8.5</td>
</tr>
<tr>
<td>Master two step test</td>
<td>8.5</td>
</tr>
<tr>
<td>Deep knee bends 30/min</td>
<td>9.0</td>
</tr>
<tr>
<td>Push-ups, 30/min.</td>
<td>9.0</td>
</tr>
<tr>
<td>Running 1 mile, 11 min.</td>
<td>11.0</td>
</tr>
<tr>
<td>Cycling 13 mph, 1 mile in 4.5 min.</td>
<td>11.0</td>
</tr>
<tr>
<td>Walking 5 mph, 1 mile in 12 min.</td>
<td>11.0</td>
</tr>
<tr>
<td>Running 1 mile, 9 min.</td>
<td>14.0</td>
</tr>
<tr>
<td>Running, 1 mile, 7.5 min.</td>
<td>17.0</td>
</tr>
</tbody>
</table>

From: Hinds, J., p. 154
Appendix III.

Cardiac Rehabilitation Test

Choose one answer for the following:

1. Atherosclerosis is:
   a. chest pain
   b. a clot in an artery supplying blood to the brain
   c. a buildup of cholesterol and other material inside the arteries
   d. an inflamed sac around the heart.

2. The length of time for the heart to heal after a heart attack is:
   a. one week
   b. two to four weeks
   c. two to three months
   d. six months

3. Cholesterol is best described as:
   a. a fatty substance found in many foods and produced by the body
   b. a fatty material found only in egg yolk, liver, and shrimp
   c. a form of triglycerides
   d. a substance that contributes to an increase in collateral circulation

4. The most important aspect of your diet is:
   a. to eat no more than three eggs per week
   b. to avoid all animal fat
   c. to reach your ideal weight and maintain that weight
   d. to maintain an average cholesterol intake of 300 mg or less daily

5. Which of the following is highest in polyunsaturated fat?
   a. dry roasted peanuts
   b. broiled red snapper
   c. grilled sirloin steak
   d. fried chicken

In the following questions, circle all of the answers which are correct:

6. Circle each of the terms below which mean the same as a "heart attack":
   a. coronary thrombosis
   b. coronary occlusion
   c. a "coronary"
   d. myocardial infarction

7. Which of the following statements about smoking are true?
   a. There is no risk in smoking cigarettes if you don't inhale.
   b. Smoking is not a health hazard for women.
   c. Everyone will gain weight when they quit smoking.
   d. In middle-aged men who are heavy cigarette smokers, the heart attack rate is twice as high as in nonsmokers.

8. Circle the groups of symptoms which are commonly associated with the pain of a heart attack.
   a. diarrhea and headaches
   b. fainting and pallor
   c. coughing and difficulty talking
   d. nausea, sweating, and shortness of breath
(Cardiac rehabilitation test, cont)

9. After discharge from the hospital, I can help around the house by:
   a. moving the furniture to clean around
   b. washing the windows
   c. bringing in the groceries
   d. either cooking a meal or washing dishes afterward

10. After the scar has formed over the damaged portion of my heart and I have resumed activities, I should avoid:
    a. yard work in very cold or very hot weather
    b. sexual relations
    c. situations that make me very angry, tense, or afraid
    d. cigarettes

11. Which of the following concerning high blood pressure are true?
    a. People only get high blood pressure if they have had a heart attack or are over forty.
    b. You may have high blood pressure and not know it.
    c. One only has to take medication for high blood pressure until the doctor says his blood pressure is controlled.
    d. The way to take blood pressure pills depends on the way you feel.

12. For which of the following should you notify your doctor or go to the nearest emergency room?
    a. fainting
    b. a very slow or very fast heart rate.
    c. increased shortness of breath
    d. angina lasting longer than 15 minutes and not responding to three nitroglycerin at five-minute intervals.

13. Angina may be located in many parts of the body, including the throat, jaw, elbow or wrist. Which of the following accurately describes anginal pain?
    a. burning, choking
    b. aching and dull
    c. a sudden sharp pain that last one to two seconds
    d. squeezing or constricting

14. Dietary changes my family should make are:
    a. Cut down on foods high in cholesterol.
    b. No change is necessary, the diet is only for someone with heart disease.
    c. Reduce total intake of fat.
    d. Substitute skimmed milk for whole milk and cream.

True or False
Circle only one letter for each question.

T F 1. Treatment for a heart attack is aimed at giving the heart time to mend itself.

T F 2. A myocardial infarction (M.I.) can be the result of complete blockage of a coronary arter.

T F 3. Filters or low tar and nicotine cigarettes make cigarettes safe.
(Cardiac rehabilitation test, con't)

T  F  4. Just because your mother had high blood pressure doesn't mean that you are going to get it.

T  F  5. Lung cancer is the only serious disease associated with smoking.

T  F  6. Coconut oil is a polyunsaturated fat.

T  F  7. Everyone who has a heart attack will have angina afterward.

T  F  8. People only have high blood pressure or are hypertensive occasionally— it goes away by itself.

T  F  9. Regular exercise may aid the development of collateral circulation to the heart muscle.

T  F 10. Like poultry and fish, veal may be served for my diet more than beef, pork or lamb.

T  F 11. Risk of heart disease is reduced by limiting calories and fat in your diet.

T  F 12. Nitroglycerin should be taken for angina only if it persists for 10 minutes or more.

T  F 13. People with high blood pressure have an increased incidence of stroke.

T  F 14. Regular walking and jogging are excellent exercises for your heart, and you may do either of these as much as you like.

T  F 15. If you work under stress and with tensions, then you will contract hypertension or high blood pressure.

_______________________________
Taken from: "Inpatient Cardiac Rehabilitation", Johnston, Heart and Lung pp. 107-8.
Appendix IV.

UNIVERSITY OF COLORADO MEDICAL CENTER
CARDIAC REHABILITATION PROGRESSIVE ACTIVITY PROGRAM
ACUTE MYOCARDIAL INFARCTION

Date of event: Name:
Type/location of event:

<table>
<thead>
<tr>
<th>Acute Phase 1-4 days</th>
<th>Coronary Care Unit</th>
<th>1-2 Mets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DATE</td>
<td>H.R.</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete bed rest until pain remits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Orientation to Rehab. program</td>
<td></td>
<td></td>
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<tr>
<td>2. Bedside commode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Feed self</td>
<td></td>
<td></td>
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<tr>
<td>4. Active foot exercises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Partial A.M. care (wash hands, face, brush teeth)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. May sit in chair at bedside for bed making</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. May stand to be weighed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. O.T. activity</td>
<td></td>
<td></td>
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<tr>
<td>9. Dangle for feeding and A.M. care</td>
<td></td>
<td></td>
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<tr>
<td>10. Sit in chair (15-30 min.) up to 3 times daily</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Semiactive Phase 5-10 days</th>
<th>Transfer to ward</th>
<th>2-3 Mets</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY</td>
<td>DATE</td>
<td>H.R.</td>
</tr>
<tr>
<td>1. Walk to bathroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Up in chair 3-4 times daily as tolerated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sponge bathe self (seated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Walk in room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. O.T. work simplification/activity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Convalescent Phase 11-14 days</th>
<th>Ward</th>
<th>3-4 Mets</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY</td>
<td>DATE</td>
<td>H.R.</td>
</tr>
<tr>
<td>1. Continue all other prior activities</td>
<td></td>
<td></td>
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<tr>
<td>2. Continue walking in hall as tolerated</td>
<td></td>
<td></td>
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<tr>
<td>3. Stairs before discharge as needed</td>
<td></td>
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</tbody>
</table>

Progressive Activity will be individualized according to patient's needs and condition.
CONTRAINDICATIONS: Shock, CHF, Ventricular arrhythmias, angina
Appendix V.

Instruction Sheet—sample

The First Weeks

For the first weeks at home, continue to be as active as you were on the last day in the hospital. You can do the following things:

1. Get up and get dressed every day.

2. Walk daily. Walk as much as you were walking in the hospital. You may walk outside when the weather is nice but walk on level ground. Plan where you will walk before you go. Avoid steps and hills; they make your heart work much harder than walking on the level ground. Avoid walking against the wind because your heart works harder and beats faster then. In the winter, walk in late morning or early afternoon during the warmest part of the day. In the summer, do your walking in the morning or evening when it is cool. Walk after a rest period or when you are not already tired from another activity. If you have chest discomfort or shortness of breath, stop and sit down on the steps or curb, take nitroglycerin if you have some and wait until you feel OK again. Tell your doctor about this pain when you see him again.

3. If your bedroom is up a flight of stairs, your doctor may suggest that you climb them only once a day and that you take only a few steps at a time and stop and rest.

4. Avoid doing anything which tenses your body

Examples:
   a. Straining when have a bowel movement (ask your doctor about a laxative)
   b. Lifting anything heavy—children, groceries, or suitcases.
   c. Pushing or pulling anything heavy.
   d. Trying to open a stuck window or unscrew a stuck jar lid.

5. Activities you can do:
   a. Cooking one meal a day.
   b. Washing dishes and cleaning up after another meal.
   c. Tidying up the bed but not changing the sheets.
   d. Washing clothes—put them in the washer but have someone else pull them out and carry them and hang them on the line.
   e. Talking with friends as long as they don’t tire you.
   f. Walk on flat surface.
   g. Shave and shower.
   h. Shoot pool.
   i. Throw softball (underhand).
   j. Ride in car (not driving).
   k. Go to relaxing movie or out to dinner (without cocktail).
   l. Go to grocery store with wife.

6. Activities you should not do:
   a. Vacuuming.
   b. Sweeping.
   c. Heavy cleaning.
   d. Drive.
   e. Lift weights or do other isometrics.
   f. Rake leaves.
   g. Hoe.
   h. Work in attic or basement.
   i. Wash car.
   j. Play golf or tennis.
(Activities, con't.)

k. Watch excitable television or movie.
l. Play basketball or football.
m. Ride a bike.
n. Go bowling.

You may be able to do these things after you have been home

Check with your doctor.

After the first two weeks

1. You may go to church.

2. You may go to the grocery store for a few things.

3. Ask your doctor when you may:
   Drive the car
   Return to work
   Go fishing
   Go to the movies
   Go to a ball game
   Roll up your hair

4. You may cut the lawn with a self-propelled mower or riding mower. Do this with care and in cool weather.

5. When your doctor says you may go back to work, try to arrange to go back part time at first and then slowly increase your working time.

FOOTNOTES


3. Hind, J., p. 35.


10. Hinds, J., p. 84.


(Footnotes, con't.)


22. McIntyre, H., p. 69.


24. Holland, J., pp. 177-209.

25. Ibid, p. 188.


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