ARRHYTHMIAS ASSOCIATED WITH AMBULATION FOLLOWING CORONARY ARTERY BYPASS SURGERY

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CHAPTER 1

INTRODUCTION

Arteriosclerosis is the leading cause of death in the United States. Coronary artery bypass (CAB) surgery is used frequently and successfully to treat coronary arteriosclerosis by providing an adequate supply of blood to the myocardium. In recent years, with improved preoperative evaluation, proper patient selection, and increased technical experience, CAB surgery has been performed with a surgical mortality rate as low as 1% to 2% (Wukasch, Cooley, & Hall, 1979). For the same reasons, morbidity has also decreased.

The most frequent complication occurring after CAB surgery is arrhythmias (Ashraf & Neptune, 1974). The most frequent arrhythmias are atrial fibrillation and premature ventricular contractions (PVCs) (Rose, Glassman, & Spencer, 1975). Etiologies for these arrhythmias are attributed to metabolic, cardiac, pulmonic, or pharmacologic origins.

However, one aspect that could be a contributing factor to these arrhythmias has not been cited and, in general, has received very little attention in the literature. This aspect is ambulation. Early ambulation postoperatively has been encouraged to provide rapid recovery of the respiratory system (Futral, 1977), prevent incidence of lower extremity venous thrombosis (Miller, Lies, & Carretta, 1976), and prevent periarthritis of shoulders (Hodgman & Cosgrove, 1976). However, exactly what early ambulation means has not been explicated. Furthermore, no studies have been published to indicate when the optimal time for ambulation should begin after CAB surgery.

Since the time ambulation should start after CAB surgery is often a nursing decision, more information as to when and how the patient should be progressed would be beneficial to the nurse in making the decision. A decision based on more scientific data and information would be beneficial to the patient and could possibly decrease the probability of associated arrhythmias. Ultimately, the quality of patient care would be enhanced.

Problem of Study

The problem of the study is: Do patients ages 35 to 65 who are ambulated 32 hours after coronary artery bypass surgery have a greater number of different types of arrhythmias and more frequent ectopic beats for 3 minutes postambulation than those ambulated 56 hours after surgery?

Justification of Problem

During the early days of modern surgery, patients were kept in bed after clear laparotomies for periods of 3 weeks or more. Rest of injured parts and of diseased bodies was considered one of the oldest and most valuable of all methods of treatment.

The first surgeon to break from this conventional treatment was Ries, a gynecologist. Ries (1899) observed that one of his patients had a wound which healed well in spite of the patient having walked across the room the night after surgery. Ries then began to order patients out of bed in 24 to 48 hours after vaginal hysterectomies and soon extended this practice to laparotomies. From that time, early ambulation gained many supporters.

Newburger (1943) published a collective review of observations on early postoperative ambulation after surgery using 189 references. The majority were overwhelmingly in favor of early ambulation and its favorable results. These were as follows: asthenia is avoided; the morale of the patient is improved; economy is provided to both patient and hospital through more rapid convalescence, discharge, and return to work; simplification of postoperative care is attained; pulmonary complications are reduced four-to-five fold; hollow viscus atony is prevented; and thrombosis and embolism are reduced.

A symposium at a meeting of the American Medical Association ("Symposium," 1944) addressed the evils of bed rest as a method of treatment. The effects of bed rest on patients with various types of diseases were discussed, including patients with cardiovascular, obstetric, surgical, orthopedic, and psychiatric problems.

Rusk (1947) reported the results of a study undertaken in Army Air Force hospitals in 1942. Because of a general shortage of time and men, it was not feasible to wait for leisurely convalescence. Reconditioning was started as early as possible following acute disease or injury. Some results were: hospitalization time was reduced, hospital readmissions were reduced, sick leaves were almost eliminated, and the morale of the patients was improved.

By the mid to late 1940s, early ambulation after general surgery became the accepted treatment of patients. In his surgery textbook, Elman (1951) advocated early ambulation. He defined early termination of bed rest and ambulation as getting the patient up and walking him the first, or at the latest, the second day after surgery.

Another historical account of patients progressing from prolonged bed rest to early ambulation is that of patients sustaining myocardial infarctions (MIs). Mallory, White, and Salado-Salgar (1939) published a study on the speed of healing of a myocardial infarction. From this study, they concluded that patients with small- to moderate-sized myocardial infarctions should remain on bed rest for one month and follow with a month of "very carefully graded convalescence." They felt that advising less than 3 weeks of bed rest was unwise and further added that prolonged bed rest was equally unwise.

Levine and Lown (1952) reported a study breaking the accepted treatment of prolonged recumbent immobilization. Recognizing the hazards of immobilization, as well as the beneficial effects of the sedentary position on the heart, they proposed an "arm chair treatment" for patients having MIs. The majority of the patients were out of bed during the first 2 days and were allowed to remain in the chair until they experienced fatigue. By the end of the first week, they spent the larger portion of the day in a chair.

The patients fed themselves and were permitted bedside commode or toilet privileges. A few steps were allowed by the end of the third week and hospitalization ended after the fourth week. They reported an overall mortality of 9.9% with no complications attributable to the "arm-chair" treatment.

Despite the favorable results from this study, little change occurred in the standard treatment, and 3 to 4 weeks of immobilization continued to be the rule (Gilchrist, 1960). Then, Harpur, Conner, Hamilton, Kellett, Galbraith, Murray, and Sallow (1971) demonstrated that there was little difference in the outcome of two groups of patients: one treated with 7 days of bed rest and the second treated with 21 days of bed rest. The group mobilized earlier fared no worse than the second group in regard to mortality, complications, ventricular aneurysm, or return to work.

More recently, Thornley and Turner (1977) published a study supporting the safety of rapid mobilization of patients within 2 to 4 days in uncomplicated cases of myocardial infarction. Patients with uncomplicated MIs were allowed to sit in a chair after 2 days in bed. On the third day they were allowed to take a few steps around the bed; and, thereafter, they were permitted to walk freely until fully mobile. The authors concluded that rapid mobilization and early discharge after an MI should now be standard practice and that there was no need of further evidence to support its safety.

The history of mobilization and ambulation following CAB surgery and open heart surgery, in general, has not been as carefully documented. However, "early ambulation" has been encouraged for patients having CAB surgery for the following reasons: protection against thrombosis (Austen & Skinner, 1972), prevention of periarthritis of the shoulders (Hodgman & Cosgrove, 1976), promotion of rapid recovery of the respiratory system (Futral, 1977), and as a treatment to prevent or decrease ankle swelling on the ipsilateral side of saphenous vein removal (Ochsner & Mills, 1978).

Although vague, the trend seems to be that the ambulatory process should begin on the second postoperative day or 48 hours after surgery (Friedman, 1974; Garrett, 1977; Ochsner & Mills, 1978). Futral (1977) advocated beginning the process with bedside dangling; whereas, Garrett (1977) began with chair-sitting for one hour. Garrett (1977) stated that mobilization is progressed after the patient first sits in the chair for one hour. Then, sitting and walking exercises are given twice daily by the physiotherapist. The patient is fully mobile by the fifth postoperative day. However, Futral (1977) advocated an earlier ambulation process. He stated that the chest tubes are removed after 24 hours and then "progressive ambulation" begins with bedside dangling.

From this information presented on ambulation, it is clear that there are no easy or simple answers available to the nurse concerning the issue of ambulation after CAB surgery. However, the nurse is often responsible for making the decision as to when a patient should ambulate after CAB surgery. The nurse frequently encounters other similar situations where a decision needs to be made and no clear answers are available. Thus, decision making is a major aspect of the nursing process.

Decisions must be made when a patient's need is determined and when a nursing action is selected to meet that need. Inherent in the role of the professional nurse is the expectation that she will make intelligent, independent decisions about patient care problems. Since problem solving is the crux of professional practice and decision making the hallmark of a profession, decision theory is certainly relevant to the practice of nursing (Bailey & Claus, 1975).

Decision theory, broadly defined, is a term used to apply to those methods for solving problems in which uncertainty plays a crucial role (Jedamus & Frame, 1969). A decision-making situation consists of the following steps: (a) recognition of a situation that calls for a decision in which action should be taken, (b) identification and development of alternative courses of action, (c) evaluation of the alternatives, (d) choice of one of the alternatives, and (e) implementation of the selected course of action (Newman, 1971).

Decision making can be viewed from two frameworks--closed and open. Decision making is considered closed when a decision maker faces a known set of alternatives and selects a course of action by a rational selection process. Decision making is considered open when the decision maker does not know all the goals and feasible alternatives and is influenced by other factors. However, open and closed decision models are not mutually exclusive (Alexis & Wilson, 1967).

In a closed system, the decision maker is assumed to be logical and methodical and seeks to maximize in the situation. He considers the possible consequences of actions open to him, arranges the consequences by his preference, and chooses the course of action which leads to the best or most preferred consequence (Alexis & Wilson, 1967). A closed system does not allow for intra- or interpersonal dynamics to intervene in the decision making.

In an open system, a more realistic view of the decision maker is emphasized. He is viewed as a complex mixture of his culture, his personality, and his aspirations. He cannot recognize and weigh the many alternatives that may be available. The outcomes and their relations to alternatives are not always predetermined. The decision maker does not maximize but seeks to find a solution to satisfy an aspiration level (Alexis & Wilson, 1967).

Grier (1976) stated that decisions made in an open system such as nursing practice cannot be considered rational since all the variables of patient care cannot be completely known. However, Grier added that nursing decisions can be more objective and systematic if a limited number of outcomes are identified and if nursing actions are chosen which are adequate, if not the best, for achieving patient care goals.

Thus, a fund of knowledge is vital to the decision-making process. Knowledge is necessary to evaluate alternative courses of action. A decision depends on the analysis, interpretation, and evaluation of knowledge that is available to the decision maker (Miller, 1967).

From the information presented, it is obvious that nursing practice is an open system and that decisions are made accordingly. The variables and factors influencing the outcome of a patient who is ambulated soon after CAB surgery are numerous. However, from previous studies and knowledge, the nurse is able to be systematic and objective in making decisions about the appropriate care for the patient. At various times the nurse realizes that further knowledge is needed to make a better decision in regard to patient care. At this time, more information is needed as to the optimal time to ambulate patients after CAB surgery. It could be that patients having CAB surgery should be ambulated no differently than patients having general surgery. Or possibly, they should be ambulated more conservatively than general surgery patients and more vigorously than MI patients.

Conceptual Framework

In the perioperative and postoperative periods of coronary artery bypass surgery, many factors contribute to the occurrence of cardiac arrhythmias. According to one proposition, a contributing factor could be the effect of sympathetic activity on the automaticity of certain latent pacemaker cells in the heart (Wit, Rosen, & Hoffman, 1974). A second proposition relates myocardial cation shifts due to ischemia as a contributing factor in the genesis of arrhythmias (Iyengar, Charrette, Iyengar, & Lynn, 1975). The proposition concerning automaticity will first be explained in more detail.

Automaticity is that property responsible for the normal spontaneous rhythmicity of the heart and for the genesis of certain arrhythmias. Cells which possess this property are normally restricted to the sinus node but can also appear in certain areas of the atria (probably the internodal tracts and the interatrial band), in portions of the upper and lower margins of the atrio-ventricular (A-V) node, and in the His-Purkinje system (Marriott & Myerburg, 1978). Ectopic beats that are not coupled at a fixed interval to a preceding beat can be attributed to enhanced automaticity in such specialized conduction tissue sites (Moe, 1972). Automaticity normally does not occur in myocardial cells of the atria or ventricles.

Both automatic, or pacemaker, cells and nonautomatic myocardial cells are electrically active cells although each possesses certain different properties. All electrically active cells of the heart have the ability to maintain an electrical potential across the cell membranes. This electrical potential, or resting transmembrane potential, is primarily due to the difference in intracellular and extracellular potassium concentrations across the cell membrane (Moe, 1972). When an impulse or stimulus occurs of sufficient magnitude to lower the resting transmembrane potential to a critical level, called the threshold potential, which is that membrane voltage at which the cell "fires," these cells will depolarize in an all-or-none fashion.

The property that distinguishes the automatic cells from the nonautomatic cells is slow, spontaneous depolarization. While the nonautomatic cell requires a stimulus to raise its resting transmembrane potential towards its threshold potential, and depolarizes rapidly, the automatic cell slowly and spontaneously depolarizes itself until it reaches its threshold potential (Marriott & Myerburg, 1978).

The rate of impulse formation by an automatic cell is determined primarily by two properties: the speed at which spontaneous depolarization carries resting transmembrane potential to threshold potential and the level of threshold potential (Marriott & Myerburg, 1978).

When the speed at which spontaneous depolarization raises resting membrane potential to threshold potential increases, then the rate of impulse formation increases and automaticity is enhanced (Moe, 1972). The speed of spontaneous depolarization in certain automatic cells can be increased with the release of catecholamines by sympathetic nervous activity. Catecholamines, therefore, enhance the automaticity of certain pacemaker cells resulting in single ectopic atrial or ventricular impulses or sustained atrial or ventricular rhythms (Wit et al., 1974).

Sympathetic nervous activity is stimulated by several conditions in an attempt to control the demands made upon the cardiovascular system. One such condition is physical exercise. Exercise results in increased sympathetic activity causing a decrease in the blood flow to the kidneys, the splanchnic area, and the uninvolved muscles. At the same time, blood flow is increased to the coronary arteries and to the exercising muscles. Vasodilatation of the exercising muscles combined with the increased activity increases venous return to the heart contributing to an increased cardiac output (Schlant & Hurst, 1978).

In the heart, the sympathetic fibers reach the entire atria and ventricles as well as the sinus and A-V nodes. In general, sympathetic stimulation increases atrial and ventricular contractility, increases the heart rate, and speeds the spread of excitation through the A-V node, and to a lesser degree, the ventricles (Schlant & Hurst, 1978).

Sympathetic nervous activity is also stimulated by neural reflexes from stretch receptors in the carotid sinus and aorta. For example, when there is a change from the supine to the upright position, a fall in the systolic pressure results. This fall is sensed by mechanoreceptors in the carotid sinus which relay the information to the vasomotor centers. Increased sympathetic activity results which increases venous tone, constricts arterioles, and increases the heart rate (Schlant & Hurst, 1978).

The second proposition previously mentioned relating ischemic induced myocardial cation shifts as a contributing factor in the occurrence of cardiac arrhythmias will be explained in more detail. Intermittent or continuous aortic cross-clamping and anoxic cardiac arrest are used in CAB surgery. Such anoxic conditions can lead to myocardial damage or impairment which plays a significant role in the incidence of arrhythmias.

The arrested heart requires energy to maintain its various energy-dependent subcellular systems. The major systems are the sodium- (Na+) potassium- (K+) pumps in the cell membrane, the calcium (Ca++) pump of the sarcoplasmic reticulum, and the mitrochondria. A relatively constant intracellular composition of electrolytes is normally maintained. However, ischemia can induce massive intra-myocardial shifts of electrolytes. The principal cations that are subject to shifts during anoxia are K+, Na+, Ca++, and magnesium (Mg++). The altered distribution of these electrolytes has an effect on the cellular metabolism, the sodium pump, electrophysiology, and mitochondrial function (Iyengar et al., 1975).

When coronary artery circulation is interrupted during CAB surgery, a loss of intracellular K+ and intracellular Na+ results. Augmented sodium permeability from a damaged cell membrane may cause increased myocardial excitation. Intracellular potassium depletion increases myocardial vulnerability to arrhythmias by prolonging the duration of repolarization (Christy & Clements, 1978). However, it is difficult to know the exact role of myocardial potassium shifts in the genesis of arrhythmias because serum potassium levels do not reflect the intracellular potassium content (Iyengar et al., 1975).

The effect of ischemia on the cation shifts may possibly explain why the heart is more vulnerable to sympathetic stimulation 32 hours after surgery versus 56 hours. This proposition has not been addressed directly in the literature. However, it seems credible that a certain amount of time is required for the cation shifts to return to normal and that any unnecessary sympathetic stimulation occurring when the shift is abnormal could induce arrhythmias. Therefore, it would be helpful to know when the optimal time for ambulation is after CAB surgery to avoid unnecessary sympathetic stimulation as well as to enhance postoperative recovery.

Assumptions

The following assumptions were made for the purposes of this study:

1. Ambulation is important in the recovery of a patient after CAB surgery.

2. Sympathetic nervous stimulation is a response to ambulation after CAB surgery.

3. Sympathetic nervous activity increases the workload of the heart.

4. Sympathetic nervous stimulation can be a contributing factor in the genesis of arrhythmias.

5. Cation shifts occur in myocardial cells during CAB surgery.

6. Abnormal cation shifts in myocardial cells can be a contributing factor in the genesis of arrhythmias.

Hypotheses

For the purposes of this study, the following hypotheses were proposed:

1. Patients ages 35 to 65 who are ambulated 32 hours after coronary artery bypass surgery will have a greater number of different types of arrhythmias than those ambulated 56 hours after surgery.

2. Patients ages 35 to 65 who are ambulated 32 hours after coronary artery bypass surgery will have more frequent ectopic beats than those ambulated 56 hours after surgery.

Definition of Terms

For the purposes of this study, the following terms were defined:

1. Ambulated--the patient is assisted by a registered nurse (RN) while walking about 50 feet (25 feet to and 25 feet back) at the designated time (either 32 or 56 hours after surgery).

2. Coronary artery bypass surgery--a surgical procedure in which the saphenous vein is removed from the leg, is reversed, and is then sutured from the aorta to the coronary artery bypassing an obstructive lesion. This will be validated by the physician's operative note on the patient's chart.

3. Arrhythmias--an abnormality in the rate, regularity, or site of origin of the cardiac impulse or a disturbance in conduction of the impulse such that the normal sequence of activation of atria and ventricles is altered. The abnormality can be classified as atrial, junctional, or ventricular and is measured by an electrocardiogram (ECG) strip taken for 3 minutes postambulation. Each ECG strip is interpreted independently by three RNs. If a unanimous decision is not reached, then two cardiologists are consulted and the majority interpretation rules.

4. Ectopic beat--a heart beat arising from a focus other than the sinus node as measured by a 3 minute postambulation electrocardiogram strip.

Limitations

The following conditions could have influenced the conclusions of this study:

1. The number of bypass grafts each patient received.

2. The location of the occlusion of the coronary arteries necessitating bypass.

3. The previous myocardial damage incurred.

4. The number of previous MIs.

5. The activity that occurred when transferring out of the unit and possibly on the division.

6. The patient's internal stress level and ability to cope with hospitalization and surgery.

7. The level of serum electrolytes.

Summary

In summary, arrhythmias are the most frequent complication occurring after CAB surgery. There is a possibility that early ambulation (32 hours after surgery) is related to more arrhythmias and more frequent ectopic beats than ambulation 56 hours after surgery. If this is not the case, then early ambulation might be preferred because of its benefits for the patient.

The decision of when and how to progressively ambulate postoperative CAB patients is often a nursing decision. The more information obtained about ambulation after CAB surgery, the more effective will be the decision made by the nurse.

CHAPTER 2

REVIEW OF LITERATURE

It is expected that the professional nurse will make intelligent and independent decisions concerning patient care. One aspect of patient care in which nurses caring for patients after coronary artery bypass (CAB) surgery must make a decision is the time that ambulation should begin for these patients. In order to make in intelligent decision, the nurse should have an understanding of the physiologic effects of exercise, the effects of exercise and sympathetic nervous activity on arrhythmias, the CAB procedure, and common arrhythmias observed after CAB surgery. This chapter will present these four topics starting with the physiologic effects of exercise.

Physiologic Effects of Exercise

During exercise, working muscles have an increased need for oxygen. To satisfy this need, an increase in cardiac output and a redistribution of blood flow to active tissue results (Bishop, Peterson, & Horowitz, 1976). This normal cardiac response to exercise is achieved by the integrated effects of an increase in the frequency of contraction, an increase in venous return, adrenergic stimulation, and the operation of the Frank-Starling mechanism (Braunwald & Ross, 1979).

The increase in cardiac output appears to be mediated by a moderate increase in stroke volume and a large increase in heart rate. Heart rate may increase threefold; whereas, stroke volume increases considerably less and even decreases with extreme increases in heart rate (Schlant, 1978). The tachycardia that occurs during exercise is dependent partly on sympathetic nervous stimulation and circulating catecholamines and is also due to vagal inhibition (Bishop et al., 1976; Braunwald, & Ross, 1979).

Exercise results in increased blood flow to the exercising muscles by sympathetic vasodilatation and local autoregulation. In addition, sympathetic mediated constriction of the vessels to the kidney, splanchnic area, and uninvolved muscles occurs shifting blood toward the central circulation (Schlant, 1978). These effects combined with the pump action of the working skeletal muscles and the respiratory muscles increase venous return, further contributing to an increased cardiac output (Berne & Levy, 1967). The arterial systolic blood pressure often increases 40 to 60 mm Hg during moderate or severe exercise; while diastolic blood pressure changes little or decreases slightly (Schlant, 1978).

To elucidate the role of adrenergic nervous activity in the cardiovascular response to exercise, the effects of isoproterenol and beta-adrenergic blockade have been studied (Dodge, Lord, & Sandler, 1960; Epstein, Robinson, Kahler, & Braunwald, 1965; Ross, Linhart, & Braunwald, 1965). An infusion of isoproterenol, a sympathomimetic amine drug, produces a cardiac response similar to that occurring during supine exercise (Braunwald & Ross, 1979). This response is characterized by a reduction in vascular resistance as well as by large increases in cardiac output and heart rate, with only slightly changes in stroke volume (Dodge et al., 1960; Ross et al., 1965). Isoproterenol also reduces ventricular end-diastolic and end-systolic dimensions and increases contractility (Braunwald & Ross, 1979). Beta-adrenergic blockade reduces the endurance for strenuous activity, the heart rate, cardiac output, mean arterial pressure, left ventricular minute work, and maximal oxygen uptake; and it increases the arteriovenous oxygen difference and the central venous pressure slightly (Epstein et al., 1965). Epstein et al. (1965) concluded that sympathetic nervous stimulation of the heart plays a significant, although quantitatively limited, role in mediating the normal response to exercise in man.

The view that the Frank-Starling mechanism affects the cardiac response to exercise has been debated (Bishop et al., 1976). The Frank-Starling mechanism indicates that increases in stroke volume are mediated by an increase in end-diastolic fiber length (Braunwald & Ross, 1979). Rushmer, Smith, and Franklin (1959) were unable, however, to associate an increase in diastolic size of the ventricle with an increase in stroke work during exercise. Braunwald and Ross (1979) stated that the increase in end-diastolic volume may not be evident during exercise because the tachycardia and increased sympathetic activity normally occurring during exercise contribute to the reduction of end-diastolic dimensions. After treatment with a beta-adrenergic blockade, exercise no longer reduces end-diastolic dimensions. In these situations, the Frank-Starling mechanism cannot increase stroke volume sufficiently to compensate for the lack of adrenergic activation. Thus, the Frank-Starling mechanism is effective in maintaining a normal cardiac output during exercise in the presence of sympathetic stimulation (Braunwald & Ross, 1979).

To adequately meet the working muscles' needs for oxygen during exercise, many factors must come into play. These factors include an increase in the frequency of contraction, an increase in venous return, adrenergic stimulation, and the operation of the Frank-Starling mechanism. Although all factors are needed, the sympathetic nervous system seems to play the most significant role in mediating the normal response to exercise in man. The sympathetic nervous system and exercise also have a role in the etiology of arrhythmias. The effects of sympathetic nervous activity and exercise on arrhythmias will now be discussed.

The Effects of Exercise and Sympathetic Nervous Activity on Arrhythmias

Exercise may precipitate ventricular ectopic activity in a small percentage of normal individuals and in a higher percentage of patients with cardiovascular disease (Sheps, Ernst, Briese, Lopez, Conde, Castellanos, & Myerburg, 1977). In their study, McHenry, Bisch, Jordan, and Corya (1972) demonstrated that arrhythmias, usually transient and in the form of unifocal ventricular or supraventricular premature complexes, are very common during strenuous exercise testing in men without clinical evidence of heart disease. The arrhythmias occur most commonly during the last minute of maximal exercise or during the first 30 seconds of recovery and are usually observed at a heart rate of 150 beats per minute or greater. Conversely, patients with cardiovascular disease are more likely to have premature ventricular contractions (PVCs) at exercise heart rates below 150 beats per minute. Furthermore, these patients are more prone to demonstrate frequent or multifocal PVCs or ventricular tachycardia. The incidence of PVCs increases with age in both the normal patients and those with cardiovascular disease (McHenry et al., 1972).

Blackburn, Taylor, Hamrell, Buskirk, Nicholas, and Thorsen (1973) conducted a study with sedentary high risk middle-aged men free of manifested cardiovascular disease and produced similar results: the frequency of exercise-induced PVCs, the total number of PVCs, and the proportion of men with any PVCs increased during a progressive exercise test. However, after an 18 month program of progressive conditioning exercise, analyses among subjects who adhered well to the program revealed that the proportion of men with ectopic beats diminished as well as the frequency of PVCs per man. The researchers suggested that long-term conditioning exercise has a favorable effect on the incidence of arrhythmias.

Kennedy, Caralis, Khan, Poblete, and Pescarmona (1977) extended their electrocardiogram (ECG) monitoring to 24 hours before and after treadmill testing to determine if maximal exercise treadmill testing influences the occurrence of ventricular arrhythmias in the hours after exercise. The quality and quantity of ventricular arrhythmias detected during identical chronological 2-, 4-, and 20- or more hour periods, before and after testing in each patient were compared, revealing no statistically significant difference in any patient group. The researchers concluded that in ambulatory ischemic heart disease patients (New York Heart Association Class I-II) and normal subjects, maximal treadmill testing does not significantly affect the occurrence of ventricular arrhythmias in the hours after exercise.

Fletcher and Cantwell (1977) reported five cases of ventricular fibrillation in a medically supervised exercise program during 6 years of experience in cardiac rehabilitation. Ventricular fibrillation, believed to be responsible for the majority of sudden deaths, may occur during strenuous physical activity.

The sleep-wakefulness cycle represents a diurnal variation in behavioral and neural activity (Lown & Verrier, 1976). Changes in heart rate during sleep are mediated by both sympathetic and parasympathetic neural outflow. Lown, Tykocinski, Garfein, and Brooks (1973) monitored patients for 24 hours and compared the occurrence of PVCs during sleep and in the awake state. In 78% of 45 patients who exhibited PVCs while they were awake, there was a significant decrease in ventricular ectopic activity associated with sleep. The authors suggested that the reduction in the frequency of ventricular ectopic activity may be related to the decrease in sympathetic tone that occurs in sleep.

Lown, DeSilva, and Lenson (1978) explored the effect of psychologic stress testing in 19 patients with advanced grades of ventricular arrhythmias to determine if psychological factors are a risk for ventricular arrhythmias. The psychological stress testing consisting of mental arithmetic, reading from colored cards, and recounting emotionally charged experiences induced a significant increase in PVCs in 11 of 19 patients. The researchers concluded that objective psychologic tests may precipitate ventricular arrhythmias in susceptible patients.

Corr, Witkowski, and Sobel (1978) studied the effects of myocardial ischemia and regional sympathetic nerve stimulation on the incidence of malignant arrhythmias. The researchers used regional myocardial cyclic adenosine 3',5'-monophosphate (cyclic AMP) content as an index of the combined local effects of (a) efferent sympathetic nerve discharge, (b) release of myocardial catecholamines due to ischemia, and (c) circulating catecholamines. They found that increases in cyclic AMP in ischemic zones preceded corresponding increases in the frequency of PVCs. They also discovered that propranolol, a beta-adrenergic blockade, inhibited the increases in cyclic AMP and reduced the frequency of PVCs in animals without ventricular fibrillation. In animals with ventricular fibrillation, compared to animals with PVCs only, cyclic AMP was significantly elevated in the normal and ischemic zones. Corr et al. (1978) suggested that the changes in regional adrenergic stimulation of the heart may contribute to the perpetuation of ventricular arrhythmias and to the genesis of ventricular fibrillation early after the onset of myocardial ischemia.

D'Agrosa (1977) reported the results of stimulation of the left sympathetic nerves in dogs. He found that the sympathetic nerve stimulation produced augmentation in cardiac contraction, augmentation of cardiac rate and force, and junctional and ventricular arrhythmias. D'Agrosa (1977) further discovered that the arrhythmias were prevented either by blocking the beta receptors with propranolol or by preventing the neural release of norepinephrine with bretylium tosylate. He concluded that the arrhythmias were probably the result of enhanced automaticity in the atrioventricular (A-V) juction area and in the ventricles produced by stimulating the sympathetic nerve fibers.

Lown and Verrier (1976) hypothesized that certain hearts are electrically unstable, primarily from myocardial ischemia. Furthermore, they hypothesized that neural factors, specifically the activation of the sympathetic nervous system, can change the excitable properties of the myocardium and can trigger ectopic activity in the normal heart and ventricular fibrillation in the electrically unstable heart. Axelrod, Verrier, and Lown (1976) reported increased vulnerability to ventricular fibrillation when the left anterior descending coronary artery in closed-chested dogs was abruptly occluded and again when the occlusion was released. This study supports the hypothesis that myocardial ischemia is associated with an electrically unstable heart.

Another study (Verrier, Thompson, and Lown, 1974) focused on the effects of the autonomic nervous system on the myocardial threshold for ventricular fibrillation. This study demonstrated that stimulation of the stellate ganglions, way stations in the sympathetic neural discharge from the brain to the heart, in addition to sequential pulsing of the normal ventricle of dogs with twice-threshold stimuli produced an incidence of 60% more ventricular fibrillation than the sequential pulsing of the normal ventricle alone. These studies support the hypothesis that sympathetic nervous stimulation of the electrically unstable heart can lead to ventricular fibrillation.

In summary, sympathetic nervous activity and exercise play a definite role in the genesis of arrhythmias. Exercise in the form of treadmill testing is associated with an increase in arrhythmias, particularly premature ventricular contractions (PVCs). Sympathetic nervous activity represented by the sleep-wakefulness cycle, psychological stress testing, cyclic AMP, direct manipulation of the left sympathetic nerves in dogs, and the stimulation of the stellate ganglions is also associated with an increase in the incidence of arrhythmias. Furthermore, sympathetic nervous stimulation of the heart that is electrically unstable can lead to more lethal arrhythmias, particularly ventricular fibrillation.

To better understand the heart's diseased condition when undergoing coronary artery bypass (CAB) surgery, some criteria for having the surgery will be stated. Also, to enhance one's understanding of what the heart is subjected to during CAB surgery, the actual surgical procedure will be described. A detailed description of the surgical procedure helps one understand the degree of mechanical and physiologic trauma occurring to the heart during CAB surgery.

Coronary Artery Bypass Surgery

Arteriosclerosis of the coronary arteries is the most frequent cause of coronary occlusion. When the atherosclerotic obstruction is severe enough, an imbalance between myocardial oxygen supply and demand results. This condition is referred to as coronary artery disease or ischemic heart disease. The symptomatic phase of this disease presents most commonly with angina pectoris, acute myocardial infarction, or sudden death (Braunwald, Cohn, & Ross, 1980).

Coronary artery bypass (CAB) surgery is widely used in the treatment of coronary artery disease. The objectives of CAB surgery include the relief of angina pectoris (King & Hurst, 1980), improvement of exercise tolerance, improvement of ventricular function (Braunwald, et al., 1980), prevention of myocardial infarction, and improvement of life expectancy (Proudfit, 1980).

In current practice, the following factors are usually considered in arriving at a decision to advise CAB surgery: (a) symptomatic status and age of the patient, (b) coronary anatomy as demonstrated by coronary arteriography, and (c) ventricular function as determined by left ventricular angiography and hemodynamics (Braunwald et al., 1980). A major indication for surgery is an incapacitating state of angina pectoris (Ochsner & Mills, 1978). Although age is not a limiting factor, patients older than 65 years are not considered as good a risk as younger patients (Hurst & King, 1980; Ochsner & Mills, 1978).

The ideal surgery candidate has severe stenosis (80% or greater) in the proximal portions of at least two of the three major coronary arteries (Braunwald et al., 1980). However, severe stenosis of the main left coronary artery is an indication for surgery regardless of symptoms (Ochsner & Mills, 1978). Finally, the best results are obtained in patients with normal ventricular function or at most a single area of impaired myocardial contractility (Braunwald et al., 1980).

A more detailed account of the CAB procedure will now be presented. A median sternotomy incision is made to open the chest and expose the heart, Simultaneously, the saphenous vein is removed from the leg. Heparin 300 units or 3 mg. per kilogram of body weight is administered (Stiles, Tucker, Lindesmith, & Meyer, 1976). Extracorporeal circulation or cardiopulmonary bypass, an artificial device for temporarily replacing the heart and lungs, is then instituted.

Total cardiopulmonary bypass provides a nearly motionless heart which aids the precision with which the coronary arteries are incised and sutured (Stiles et al., 1976). The cardiopulmonary bypass pump comprises two standard roller pumps used in association with a disposable bubble oxygenator. The oxygenator has a built-in heat exchanger to allow for hypothermia. The oxygenator is primed with 5% dextrose in 0.11 Normal saline or acetated Ringer's solution (Stiles et al., 1976).

The use of Plasmalyte or Normosol-R, isotonic solutions buffered to a pH of 7.40, have also been recommended as priming solutions (Ochsner & Mills, 1978). Solutions such as 25% Mannitol, 25% salt-poor albumin, or 5% albumin may be added to the priming solution (Ochsner & Mills, 1978). A mixed dilution of the extracorporeal and corporeal circulation so that the hematocrit is not less than 21% is the goal (Ochsner & Mills, 1978). The mean perfusion pressure is maintained between 50 and 85 mm Hg (Ochsner & Mills, 1978). At the completion of by-pass, all blood is drained from the oxygenator and the tubing into sterile plastic bags and is returned to the patient by intravenous drip (Stiles et al., 1976).

Cannulation of the superior and inferior vena cava is used to collect the entire systemic venous return to the heart and deliver it to the oxygenator, usually by gravity drainage (Cooley & Norman, 1975). A single right atrial cannula can also be used for venous return to the oxygenator (Stiles et al., 1976). Cannulation of the ascending aorta is the preferred technique for the return of the oxygenated blood to the heart (Cooley & Norman, 1975).

When the patient is on cardiopulmonary bypass, the aorta is then cross-clamped to provide anoxic arrest of the heart. Coronary blood flow ceases and the heart is more pliable thereby enhancing the precise technical maneuvers needed in suturing the distal anastomoses (the vein graft to the coronary arteries) (Ochsner & Mills, 1978). To prevent or minimize myocardial injury during cross-clamping of the aorta, certain principles are usually followed: (a) the period of ischemia is limited, (b) hypothermia is instituted, and (c) myocardial distention is avoided (Ochsner & Mills, 1978). There are numerous techniques currently used to provide myocardial protection.

Systemic hypothermia by means of the oxygenator's heat exchanger is widely encouraged (Craver, Sams, & Hatcher, 1978; Ochsner & Mills, 1978; Stiles et al., 1976); however, the degree of hypothermia varies from 25°C (Ochsner & Mills, 1978) to 28-30°C (Craver et al., 1978). Topical cooling of the heart with an isotonic solution chilled to 4-7°C is also used frequently (Craver et al., 1978; Ochsner & Mills, 1978; Stiles et al., 1976).

Presently, myocardial protection with chilled metabolic inhibitor solutions, or cardioplegia solutions, is gaining support. This solution is injected into the aortic root after the aorta is cross-clamped and at varying intervals thereafter, until all distal anastomoses are completed. The mixtures of cardioplegia solutions seem to vary from institution to institution, but most have two attributes in common. The solutions are chilled to nearly freezing (4°C) and they contain a substance or agent to paralyze the heart (Ochsner & Mills, 1978). Many institutions use potassium cardioplegia solutions which also contain dextrose and sodium bicarbonate (Craver et al., 1978; Ochsner & Mills, 1978; Stiles et al., 1976). A cardioplegia solution containing procaine amide and magnesium is also used (Bleese, Doring, Kalmer, Pokar, Polonius, Steiner, & Rodewald, 1978). Some advantages of this solution are the stabilization of membrane potential by inhibiting sodium permeation, the prevention of myocardial action potentials, and the uncoupling of excitation-contraction (Bleese et al., 1978).

After the distal anastomoses are completed, the aortic clamp is removed. However, some surgeons remove the aortic clamp after each distal anastomosis to allow for perfusion of the coronary arteries (Craver et al., 1978; Ochsner & Mills, 1978). If the heart does not spontaneously defibrillate after the cross clamp is removed, then direct-current cardioversion is employed. The proximal anastomoses to the ascending aorta are usually performed with a partial occlusion clamp on the ascending aorta after the aortic cross-clamp is released (Cooley & Norman, 1975). The patient is then separated from cardiopulmonary bypass, 2 mg. of protamine for each 1 mg. of total heparin is given, the chest is closed, chest tubes are inserted, and the patient is transferred to the intensive care unit (ICU).

From this description of the CAB procedure and the criteria for performing the surgery, it is apparent that an already diseased heart is subjected to an enormous amount of mechanical and physiologic trauma. As described, this trauma includes the disruption of normal blood flow in the body and transient cessation of blood flow to the coronary arteries. Mechanical trauma includes the incisions made to the coronary arteries, and to the vessels for instituting cardiopulmonary bypass, as well as from defibrillation of the heart. Physiologic trauma includes systemic and local hypothermia, ischemia to the heart, the colloid and crystalloid fluids used as priming solutions, and the cardioplegia solutions injected into the coronary arteries. It is obvious that such traumatic conditions can lead to myocardial damage or impairment which play a significant role in the incidence of arrhythmias.

Arrhythmias Frequently Encountered After Coronary Artery Bypass Surgery

As previously stated, arrhythmias are the most frequent complication occurring after CAB surgery. Angelini, Feldman, Lufschnowski, and Leachman (1974) reported that arrhythmias occurred in 45% of patients after CAB surgery usually in the first 3 postoperative days. Although this study attempts to associate early ambulation with the incidence of arrhythmias, other associations and etiologies will now be discussed. Many factors acting together probably play a role in inducing arrhythmias: surgical trauma, anesthetic agents, endogenous and exogenous catecholamines, tracheal stimulation, drugs, hypoxia, electrolyte and acid-base abnormalities, and the underlying heart disease (Angelini et al., 1974). The arrhythmias to be described are premature atrial contractions (PACs), supraventricular tachycardia, atrial fibrillation, junctional rhythm, and premature ventricular contractions (PVCs).

Premature atrial contractions are often seen in the absence of heart disease although atrial disease is a predisposing factor for PACs (Marriott & Myerburg, 1978). Emotion, fatigue, alcohol, tobacco, or coffee may precipitate PACs in the healthy person (Marriott & Myerburg, 1978). In disease, PACs are related to pericarditis, congestive heart failure, sinus node injury, atrial ischemia or infarction, pulmonary embolus, and digitalis intoxication (Futral, 1977). When single or infrequent, PACs do not interfere with left ventricular function, do not decrease the blood flow to any of the vital organs, and rarely produce symptoms other than the feeling of a skipped beat (Sokolow & McIlroy, 1979). However, frequent PACs may decrease cardiac output and may predispose to atrial tachyarrhythmias (Sokolow & McIlroy, 1979).

Supraventricular tachycardias include all tachyarrhythmias whose site of impulse formation or re-entry circuit is above the bifurcation of the common bundle (Marriott & Myerburg, 1978). It is often difficult if not impossible to distinguish atrial from atrioventricular (AV) junctional tachycardia and since the significance, prognosis, and treatment are similar for both, they will be addressed together (Marriott & Myerburg, 1978).

Supraventricular tachycardia is common both in normal and in diseased hearts. In normal hearts, it is thought to result from central nervous system-mediated sympathetic influences (Sokolow & McIlroy, 1979). Also, tobacco, coffee, stimulant drugs, and alcohol have been implied as causal factors (Sokolow & McIlroy, 1979). In diseased hearts, atrial tachyarrhythmias are associated with an anatomically abnormal sinus node and focal abnormalities of the atrial myocardium at postmortem examination (James, 1978). These abnormalities include focal infarction within the sinoatrial (SA) node or at the atrionodal margin, disease of the sinus node artery, for example, arteritis of embolism, and pericarditis with damage to the epicardial margin of the node (James, 1978).

Supraventricular tachycardia is also associated with rheumatic heart disease and is commonly caused by digitalis intoxication (Marriott & Myerburg, 1978). Palpitations may be the only symptom of supraventricular tachycardia, but if heart disease is present, the patient may complain of weakness, dizziness, anginal pain, or dyspnea (Sokolow & McIlroy, 1979). If the heart is already disabled, congestive heart failure, pulmonary edema, or shock may result (Marriott & Myerburg, 1978).

Atrial fibrillation is one of the most common cardiac arrhythmias seen in clinical practice (Glenn, Liebow, & Lindskog, 1975). It can be paroxysmal or chronic. As many as one-third of patients may develop paroxysmal atrial fibrillation after pulmonary surgery, and it commonly occurs following cardiac surgery (Sokolow & McIlroy, 1979). Rose et al. (1975) reported a study of 15 patients having CAB surgery in which 6 of these developed atrial fibrillation. Futral (1977) reported that atrial fibrillation is the most common tachyarrhythmia seen in CAB patients in his institution. Paroxysmal attacks usually last hours or days but almost never longer than 2 or 3 weeks (Sokolow & McIlroy, 1979). Atrial fibrillation may be precipitated by a premature atrial contraction (PAC) occurring in the vulnerable period of the atrial cycle (Marriott & Myerburg, 1978). Atrial enlargement favors the development of atrial fibrillation (Marriott & Myerburg, 1978).

Atrial fibrillation occurs rarely in healthy persons, but is usually associated with one of four diseases: rheumatic heart disease, hypertension, ischemic heart disease, or thyrotoxicosis (Marriott & Myerburg, 1978). Less commonly, it is associated with atrial septal defect, chronic lung disease, constrictive pericarditis, myocardial infarction, or heart failure (Marriott & Myerburg, 1978). Rarely, atrial fibrillation is the consequence of administration of anesthesia, potassium deficiency, or digitalis intoxication (Sobel & Braunwald, 1977).

The untoward effects of atrial fibrillation depend on the rapidity of the ventricular rate, on the prior state of the affected heart, on the duration of the dysrhythmia, and on the absence of effective atrial contraction (Sobel & Braunwald, 1977). Diminished cardiac output and heart failure may occur. Stagnation of blood in the atria predisposes to peripheral or pulmonary emboli (Sobel & Braunwald, 1977).

Atrioventricular junctional rhythm is an arrhythmia occasionally seen after CAB surgery. The AV junction includes fibers adjacent to the AV node in the low right atrium, the AV node itself, and the His bundle. Cells in the AV node do not appear to initiate impulse formation spontaneously (Sobel & Braunwald, 1977). When the sinus impulse fails to reach the AV junction because of sinoatrial block, digitalis, or vagal stimulation, the rate is usually 40-60 beats per minute, and is considered an escape rhythm (Marriott & Myerburg, 1978). However, when the rhythm results from enhanced AV junctional automaticity due to digitalis intoxication, rheumatic fever, or inferior myocardial infarction, the rate is faster (60-100 beats per minute) and is called accelerated AV junction rhythm (Marriott & Myerburg, 1978). The circulation is usually adequate but may be compromised by a ventricular rate less than 50 beats per minute (Sobel & Braunwald, 1977).

Premature ventricular contractions have been reported as the most frequently encountered arrhythmia after CAB surgery (Futral, 1977), as well as in clinical practice (Marriott & Myerburg, 1978; Sokolow & McIlroy, 1979). As with other arrhythmias, PVCs are present in both health and disease. In the absence of heart disease, PVCs may be due to excessive use of tobacco, coffee, tea, or alcohol, and may result from emotional stress (Sobel & Braunwald, 1977). The role of the central nervous system is important because excitement, anxiety, or fear increases autonomic adrenergic stimuli to the heart and may induce increased automaticity in the Purkinje fibers, leading to PVCs (Sokolow & McIlroy, 1979).

Premature ventricular contractions are so common in healthy persons that their presence has no diagnostic significance unless they are unusually frequent, related to exercise, originate from the left ventricle, occur during the vulnerable period, are multifocal, or occur in pairs of salvos (Sobel & Braunwald, 1977). Potential causes in disease states are heart disease, heart failure, overdigitalization, sympathomimetic drugs, vagal stimulation, potassium depletion, hypocalcemia, hypoxia, anesthesia (especially cyclopropane), infectious diseases, and exercise (Marriott & Myerburg, 1978).

Frequent PVCs may diminish the efficiency of the heart with an already impaired cardiac reserve. Moreover, PVCs may herald the onset of ventricular tachycardia, especially when the PVCs occur close to or during the vulnerable period at the end of the previous systole (Sobel & Braunwald, 1977). Ventricular tachycardia is the most serious tachycardia because it is one step away from ventricular fibrillation. Ventricular fibrillation is lethal, unless converted, because effective ventricular contraction and circulation cease (Sobel & Braunwald, 1977).

Arrhythmias are the most frequent complication occurring after CAB surgery. Factors related to CAB surgery that contribute to the inducement of arrhythmias are: surgical trauma, anesthetic agents, endogenous and exogenous catecholamines, tracheal stimulation, drugs, hypoxia, electrolyte and acid-base abnormalities, and the underlying heart disease. The following arrhythmias frequently seen after CAB surgery were presented in more detail: premature atrial contractions (PACs), supraventricular tachycardia, atrial fibrillation, junctional rhythm, and premature ventricular contractions (PVCs).

Summary

This chapter presented the knowledge base that the professional nurse must understand in order to make intelligent decisions regarding ambulation after CAB surgery. The physiologic effects of exercise as well as the effects of exercise and sympathetic nervous activity on arrhythmias were discussed. Aspects of CAB surgery, such as criteria for the surgery and the surgical procedure were presented. Finally, commonly occurring arrhythmias after CAB surgery were explored with their etiologies and effects on cardiac function.

CHAPTER 3

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

This chapter discusses the setting, population, and the methods utilized in collecting and analyzing the data. This study is classified as quasi-experimental according to Polit and Hungler's (1978) criteria. A quasi-experimental study lacks one of three properties that characterizes an experimental study. A true experiment involves: (a) manipulation, that is, the experimenter does something to at least some of the subjects; (b) control, where one or more controls is placed over the experimental situation, including the use of a control or comparison group; and (c) randomization, in which subjects are assigned to a control or experimental group on a random basis.

A quasi-experiment can lack the random assignment or control group component; however, manipulation of an independent variable must take place. There was a comparison between two groups in which the independent variable of each group was manipulated in a different way. The subjects were randomly assigned to their respective groups; however, random selection did not occur.

The design, which is an adaptation from Kerlinger (1973), could be depicted as follows:

$$R \quad \frac{X_1}{X_2} \quad \frac{Y_1 Y_2}{Y_1 Y_2} \quad \begin{matrix} \text{(Group I)} \\ \text{(Group II)} \end{matrix}$$

R = random assignment of subjects to experimental groups,

X_1 = independent variable manipulated by ambulation 32 hours postop,

X_2 = independent variable manipulated by ambulation 56 hours postop,

Y_1 = measure of the dependent variable, different types of arrhythmias,

Y_2 = measure of the dependent variable, frequency of ectopic beats.

Setting

This study was conducted in a 14-bed thoracic intensive care unit (ICU) and a 32-bed step-down unit in a large private Southwestern medical center in a metropolitan city. Approximately 700 open heart surgeries are performed in this institution per year.

Population and Sample

The population from which the sample was drawn was the group of patients admitted to the hospital mentioned above who were scheduled to receive CAB surgery. Their surgery was performed by one of five thoracic surgeons in private practice who collectively average about 12 open heart surgeries per week.

The sample consisted of those patients who met the following criteria for inclusion in the study and agreed to participate in the study. To be included in the study, the patient:

1. Was between the ages of 35 and 65 years
2. Returned to thoracic ICU after surgery by 12:30 p.m.
3. Exhibited none of the following complications:

(a) no existing significant arrhythmias, for example, more than six PVCs per minute, atrial fibrillation, more than 10 PACs per minute, paroxysmal atrial tachycardia, or junctional rhythm

(b) did not require mechanical ventilation support at the time of mobilization (24 hours after surgery)

(c) did not require vasopressors for the maintenance of blood pressure

(d) did not have evidence of a perioperative infarct, for example, ECG changes, significant cardiac enzyme elevations (especially creatine phosphokinase [CPK] myocardial [MB] isoenzymes), or a positive myocardial scan

4. Did not complain of dizziness at the time of ambulation.

A convenient non-probability sampling technique was used in which random sampling does not occur. The sample was comprised of 15 patients who underwent coronary artery bypass surgery. Eight patients were assigned to ambulate 32 hours after surgery and seven were assigned to ambulate 56 hours after surgery. Thirty-five patients who met the criteria for the study were asked to participate in the study. Five patients refused for various reasons. Two patients had previously had bypass surgery. The wives of two patients did not want their husbands to participate. The fifth patient expressed fears of dying during surgery and did not want to participate. Of the 30 patients who agreed to participate in the study, 15 patients failed to meet the criteria for inclusion in the study after surgery. A record was kept of the group to which each subject was assigned and the reason for removal (Appendix A).

The method for obtaining informed consent was as follows. The patients scheduled for CAB surgery by the previously designated surgeons were chosen from a reservation list in the thoracic ICU. Pertinent information was then gathered from the patient's charts to determine if they met the criteria for inclusion in the study (Appendix B). One day before the scheduled surgery, the patients who met the criteria were approached by the researcher and the study was verbally explained (Appendix C). Any questions were answered. If the patient agreed to participate, he signed the written consent form (Appendix D) and retained a copy. However, if the patient chose not to participate, he was thanked for his time and no further solicitation took place.

After permission was granted, the subject was assigned to either Group I or Group II. However, the subject was not informed of which group he was assigned until after surgery when his nurse informed him of his activity schedule for the day. The assignment occurred by choosing an envelope from a group of envelopes that contained slips of paper with an equal number of Group I and Group II written on them. Eight subjects were assigned to Group I and 7 to Group II. The subjects assigned to Group I followed the schedule for ambulation 32 hours after surgery. Group II subjects followed the schedule for ambulation 56 hours after surgery.

Protection of Human Subjects

The protection of human subjects was provided as follows. Permission to conduct the study was first secured from the Human Research Review Committee (Appendix E), Texas Woman's University, the hospital (Appendix F), and the surgeons (Appendix G). Patients who met the criteria for inclusion in the study were approached, the study was verbally explained (Appendix C), and their written permission (Appendix D) to be involved was requested. The patients were informed of the potential risks and benefits of the study. They were informed that their care would not be affected should they choose not to participate in the study. They were informed that they could withdraw from the study at any time they so desired. They would be dropped from the study whenever it was not in the best interest of their health to continue. They were informed that they had the right to ask questions concerning the study. Their anonymity was protected by using a number for identification.

Instruments

The instrument used to measure the response to ambulation was a two- or three-lead chest ECG with a three-minute strip. This is an instrument commonly used for measuring the presence or absence of arrhythmias in the coronary care unit and in the thoracic intensive care unit.

The three-minute ECG strips were examined by three intensive care certified RNs (one of which was the researcher). The same three nurses interpreted the ECG strips throughout the study. Each RN independently interpreted the ECG strip for the presence or absence of arrhythmias.

When the arrhythmia was an ectopic beat, then the number of ectopic beats per strip was counted. For example, when PVCs and PACs were both present, then the number of PVCs was counted, as well as the number of PACs. Upon reaching a decision, each nurse presented her interpretation of the ECG strip, the type of arrhythmia(s), if present, and the number of ectopic beats. When a unanimous decision was initially reached, then the results were compiled for the data analysis. However, when the decision was not unanimous, then two cardiologists were consulted for their interpretations. The majority of the five interpretations ruled and the results were then compiled for the data analysis.

A data collection tool (Appendix B) was used to collect pertinent information about the patient. The following demographic data were collected to describe the subjects in the study: sex, age, race, date of last MI, number of MIs, number of bypass grafts, and sympathetic type medications. The following information was collected to determine if the patient met the criteria for inclusion in the study: date and time of arrival in ICU, pre- and postoperative ECG interpretations, CPK, MB fraction, lactic dehydrogenase (LDH), serum glutamic oxaloacetic transaminase (SGOT), and myocardial scan.

Data Collection

The data were collected in the following manner. The registered nurses in the thoracic ICU assisted in the activity schedule of the patients and in the collection of data while the patients were in the ICU. An orientation class was presented to the ICU nurses by the researcher 2 to 4 weeks before the study began. The nurses were given an explanation of the study and a detailed description of their role in following the activity schedule and in collecting the ECG strips (Appendix H).

The following activity schedule for the patients in Group I was carried out by the thoracic ICU nurses assigned to those particular patients or by the researcher. A detailed activity schedule (Appendix I) for each patient was placed at the front of the patient's chart and a note was made on the nursing Kardex to refer the nurse to this schedule. The researcher's phone number was included on this sheet should questions arise.

Group I patients were dangled on the side of the bed for 15 minutes or as tolerated 24 hours after admission to the thoracic ICU (which is the end of surgery). If tolerated (no significant arrhythmias), they sat in the bedside chair 6 hours later where they remained for about 30 minutes or as long as tolerated. Two hours later, they were ambulated with assistance from one or two RNs for a total distance of 50 feet. After ambulation, they were reattached to their ECG monitor and a 3-minute postambulation ECG strip was taken. This strip was analyzed as described for the types of arrhythmias and the frequency of ectopic beats. Group I patients were no longer observed.

The following activity and ambulation schedule for the patients in Group II was carried out by the ICU nurses while the patients were in the ICU or by the researcher. Once a patient had been transferred to the stepdown unit, all of the activity and ambulation schedule was carried out by the researcher.

Group II patients were dangled for 15 minutes or as tolerated 24 hours after surgery. If tolerated, they sat in the bedside chair 6 hours later and remained up for 30 minutes or as long as tolerated. They remained in bed until the following morning. On the second postoperative day, all Group II patients assumed approximately the same time schedule in regard to their activity for breakfast and lunch. At 8 a.m. they stood to be weighed and were out of bed for breakfast for 30 minutes or as long as tolerated. If they remained in the unit, they sat up in the chair for lunch at about 12 noon. However, if they transferred to the step-down unit, then the transfer by wheelchair (by the ICU nurse) was used as the activity instead of sitting in the chair for lunch. Group II patients remained in bed after lunch (or transfer) until 54 hours postoperative when they sat in the chair for 30 minutes or as tolerated. Two hours later, they ambulated with assistance from the researcher for a total distance of 50 feet. After ambulation, they were attached to an ECG monitor where a 3-minute postambulation strip was taken. This strip was analyzed as described for the types of arrhythmias and the frequency of ectopic beats. Group II patients were not longer observed.

Treatment of Data

The Fisher exact probability test was used to analyze the data compiled for each hypothesis. An alpha level of .05 was used. The Fisher exact test was used because most of the cells had frequencies smaller than 5. The Fisher exact test is appropriate for 2 x 2 tables (Ipsen & Feigl, 1957).

CHAPTER 4

ANALYSIS OF DATA

This quasi-experimental study was conducted to determine if patients ambulated 32 hours after CAB surgery had a greater number of different types of arrhythmias and more frequent ectopic beats than those ambulated 56 hours after surgery. This chapter presents a description of the participants included in the study. The results and interpretations of the findings are presented and discussed.

Description of Sample

The sample in this study was comprised of 15 subjects who underwent coronary artery bypass surgery (Appendix K). Thirty-five patients had initially been asked to participate in the study. Five patients refused to participate and 15 patients were unable to complete the study for various reasons (Appendix A). There were 13 males and 2 females in the sample. All of the subjects in this sample group were Caucasian.

The age distribution ranged from 36 to 65 years with a mean of 53 years and a standard deviation of 7.99

years. Table 1 illustrates the age distribution of the participants in the study.

Table 1

Sample Distribution by Age

Age Range	No. in group	Percentage
35-44 years	1	7
45-44 years	8	53
55-65 years	6	40
Total	15	100

The mean age of the subjects in the 32 hour ambulation group was 51 years and ranged from 36-65 years. The mean age in the 56 hour ambulation group was 55 years and ranged from 49-62. Table 2 compares the ages of the subjects in the 32 hours group with that of the subjects in the 56 hour group. Using the Mann-Whitney U analysis method, the probability that there was a difference between groups in regard to age was $\underline{p} < .303$ and was not statistically significant at the .05 level.

Five of the subjects in the sample had never experienced a myocardial infarction (MI). Nine subjects had experienced one previous MI. One subject had two previous

Table 2

Age Comparison between 32 Hour Ambulation and 56 Hour Ambulation Group

	32 hour ambulation	56 hour ambulation
No. of subjects	8	7
Range	36-65 years	49-62 years
Mean	50.9 years	55.3 years

MIs. Table 3 reveals the incidence of previous MIs in this sample group.

Table 3

Sample Distribution by Previous MI

No. of MIs	No. of Subjects	Percentage
0	5	33
1	9	60
2	1	7
Total	15	100

In the 32 hour ambulation group, one subject had never had a MI, six subjects had one previous MI, and one subject had two previous MIs. In the 56 hours ambulation group, four subjects had never experienced an MI and three subjects had one previous MI. Table 4 compares the incidence of previous MIs in the subjects in the 32 hour ambulation group with the subjects in the 56 ambulation group. Using the Fisher exact probability test, the probability that there was a difference between the groups in regard to previous MIs was $\underline{p}$ = .100 and was not statistically significant at the .05 level.

Table 4

MI Comparison between 32 Hour Ambulation and 56 Hour Ambulation Group

No. of MIs	32 hour ambulation	56 hour ambulation
0	1	4
$\geq$ 1	7	3
Total	8	7

For the sample, time on the cardiopulmonary bypass pump varied from 31 minutes to 121 minutes. The mean time on the pump was 69.2 minutes with a standard deviation of 25 minutes. Table 5 compares the mean bypass pump time between the subjects in the 32 hour ambulation group with the subjects in the 56 hour ambulation group. The subjects in the 32 hour group had a mean pump time of 76.8 minutes; whereas, the subjects in the 56 hour group had a mean pump time of 60.7 minutes. Using the

Mann-Whitney U analysis method, the probability that there was a difference in regard to pump time was $p < .229$ and was not statistically different between groups at the .05 level.

Table 5

Pump Time Comparison between 32 Hour Ambulation and 56 Hour Ambulation Group

	32 hour ambulation	56 hour ambulation
Mean	76.8 min.	60.7 min.
No. of subjects	8	7

The number of obstructed coronary arteries bypassed varied from one to five as shown in Table 6. During the CAB procedure, two subjects had one bypass graft, two subjects had two bypass grafts, five subjects had three bypass grafts, five patients had four bypass grafts, and one subject had five bypass grafts.

In the 32 hour ambulation group, one subject had two bypass grafts, three subjects had three bypass grafts, three subjects had four bypass grafts, and one had five bypass grafts. In the 56 hour ambulation group, two subjects had one bypass graft, one subject had two by-pass grafts, two subjects had three bypass grafts, and

Table 6

Sample Distribution by Bypass Grafts

No. of bypass grafts	No. in group	Percentage
1	2	13.3
2	2	13.3
3	5	33.3
4	5	33.3
5	1	6.8
Total	15	100.0

two subjects had four bypass grafts. Table 7 compares the number of bypass grafts in the subjects in the 32 hour group with the subjects in the 56 hour group. Using the *t*-test method, the probability that there was a difference in regard to bypass grafts was $p = .127$ and was not statistically different at the .05 level.

For the sample, a total of 46 bypass grafts was used. Fourteen of these grafts were to the left anterior descending; 11 were to the posterior descending branch of the right coronary; 7 were to the main circumflex; 7 were to the diagonal branch of the left anterior descending; 4 were to the right coronary, 2 to the obtuse marginal branch of main circumflex, and 1 was to the groove branch

Table 7

Bypass Graft Comparison between
32 Hour Ambulation and 56
Hour Ambulation Group

No. of bypass grafts	32 hour	56 hour
1	0	2
2	1	1
3	3	2
4	3	2
5	1	0
Total	8	7

of the main circumflex. Table 8 illustrates this distribution.

Table 8

Distribution of Bypass Grafts Anatomically

Location of Grafts	No. of Grafts	Percentage
Left anterior descending	14	30.4
Posterior descending	11	23.9
Main circumflex	7	15.2
Diagonal branch	7	15.2
Right coronary	4	8.6
Obtuse marginal branch	2	4.3
Groove branch	1	2.1
Total	46	100.0

Findings

The Fisher exact probability test was used to analyze the data compiled for the first hypothesis. The first hypothesis stated that patients ambulated 32 hours after CAB surgery would have a greater number of different types of arrhythmias than those ambulated 56 hours after surgery. The incidence of different types of arrhythmias between groups is shown in Table 9. Appendix J presents the type of arrhythmia and the frequency of ectopic beats exhibited by each subject. The probability that there was a difference between the 32 hour group and 56 hour group in regard to frequency of different types of arrhythmias was $p = .231$ and was not statistically significant at the .05 level.

Table 9

Comparison of Frequency of Arrhythmias between 32 Hour Ambulation and 56 Hour Ambulation Group

No. of Types of Arrhythmias	32 hour	56 hour
0	7	4
≥ 1	1	3
Number of Subjects	8	7

The first hypothesis formulated for this study was not supported. Therefore, the subjects ambulated 32 hours after CAB surgery did not have a greater number of different types of arrhythmias than those ambulated 56 hours after surgery.

Fisher's exact probability test was used to treat the data compiled for the second hypothesis. The second hypothesis stated that patients ambulated 32 hours after CAB surgery would have more frequent ectopic beats than those ambulated 56 hours after surgery. The frequency of ectopic beats between the two groups is shown in Table 10. The probability that there was a difference between the 32 hour group and 56 hour group in regard to the frequency of ectopic beats was $\underline{p} = .231$ and was not statistically significant at the .05 level.

Table 10

Comparison of Ectopic Beats between 32 Hour Ambulation and 56 Hour Ambulation Group

No. of ectopic beats	32 hour	56 hour
0	7	4
≥ 1	1	3
Number of Subjects	8	7

The second hypothesis formulated for this study was not supported. The subjects ambulated 32 hours after CAB surgery did not have more frequent ectopic beats than those ambulated 56 hours after surgery.

Summary

Statistical analyses utilized in this study did not support the two hypotheses formulated for this study at the .05 level. The first hypothesis stated that patients ambulated 32 hours after CAB surgery would have a greater number of different types of arrhythmias than those ambulated 56 hours after surgery. The second hypothesis stated that patients ambulated 32 hours after CAB surgery would have more frequent ectopic beats than those ambulated 56 hours after surgery.

This quasi-experimental study comprised of 15 subjects, 8 ambulating 32 hours after surgery and 7 ambulating 56 hours after surgery, revealed that subjects ambulated 50 feet 32 hours after CAB surgery did not have more different types of arrhythmias nor did they have more frequent ectopic beats than those ambulated 56 hours after surgery. Demographic data were included to show sample distribution by age, number of previous myocardial infarctions, cardiopulmonary bypass pump time, number of bypass grafts, and location of bypass grafts.

CHAPTER 5

SUMMARY OF THE STUDY

This study was conducted to determine if patients ambulated 32 hours after coronary artery bypass (CAB) surgery had a greater number of different types of arrhythmias and more frequent ectopic beats than those ambulated 56 hours after surgery. This chapter summarizes the study and discusses the findings, conclusions, implications, and recommendations.

Summary

A convenient non-probability sampling technique was used to select the 30 subjects who initially met the criteria for inclusion in this quasi-experimental study and agreed to participate in the study. These subjects were randomly assigned to ambulate either 32 hours or 56 hours after CAB surgery. Postoperatively, 15 patients were dropped because they failed to meet the criteria for inclusion in the study. Eight of the remaining 15 subjects ambulated 32 hours after surgery and 7 ambulated 56 hours after surgery.

After following a controlled schedule of dangling at the bedside and sitting in the bedside chair, 8 subjects ambulated a distance of 50 feet 32 hours after surgery, and 7 subjects followed a similar schedule but ambulated 56 hours after surgery. The activity was carried out with the assistance of the thoracic intensive care unit (ICU) nurses or the researcher. Post-ambulation, as soon as the subject was back in bed and reattached to an electrocardiogram (ECG) monitor, a 3 minute ECG strip was run. Each ECG strip was analyzed by three ICU certified RNs to identify any existing arrhythmias and to determine the frequency of ectopic beats. Three of the 15 ECG strips were analyzed by two cardiologists when the nurses failed to reach a unanimous decision about the type of arrhythmia. In these situations, the majority opinion was accepted.

The two hypotheses formulated for this study were not supported by the statistical analysis of the data at the .05 level. Therefore, it was determined in this study that the patients ambulated a distance of 50 feet 32 hours after CAB surgery did not have a greater number of different types of arrhythmias nor more frequent ectopic beats than those ambulated 56 hours after surgery.

Discussion of Findings

Several explanations concerning the methodology can be offered as influencing the findings of this study. Also, a question concerning the criteria for inclusion in the study is raised in relation to the findings.

In this study, subjects were ambulated a total distance of 50 feet either 32 or 56 hours after CAB surgery. Some of the subjects in the 32 hour ambulation group and a majority of the subjects in the 56 hours ambulation group stated that they could have easily walked further. In the review of literature, one of the research studies serving as a theoretical background for this study involved treadmill testing. McHenry, Bisch, Jordan, and Corya (1972) demonstrated that arrhythmias are very common during strenuous exercise testing in men without clinical evidence of heart disease at heart rates of 150 beats per minute or greater. Conversely, it was demonstrated that patients with cardiovascular disease are more likely to have arrhythmias below 150 beats per minute.

In relating this information to the present study, it is possible that ambulating the subjects a distance of 50 feet was not enough exercise to activate the sympathetic nervous system of sufficient magnitude to induce arrhythmias. With this thought in mind and using heart rate as one indicator of sympathetic nervous stimulation, the heart rates of the 15 ECG strips were compiled. The mean heart rate was 105 beats per minute with a range of 80 to 150 beats per minute. A correlation between the heart rate and the incidence of arrhythmias and ectopic beats was not evident. For example, one subject with a heart rate of 80 had an arrhythmia; whereas, the subject with the heart rate of 150 did not. Nevertheless, an explanation for the findings could be that the subjects in this study were not exercised to the point that sympathetic nervous activity induces arrhythmias.

A second explanation for the findings of this study can also be gleaned from the treadmill study of McHenry et al. (1972). McHenry et al. (1972) reported that arrhythmias occur most commonly during the last minute of maximal exercise or during the first 30 seconds of recovery. In this study, monitoring did not even occur until almost 30 seconds after recovery from ambulation. It was not feasible to monitor the subjects in this study while they were ambulating; however, one must consider that this method of monitoring may have affected the findings of the study.

Thirdly, it seems reasonable to question whether the subjects who exhibited certain arrhythmias before ambulation should have been dropped from the study. In this study, subjects who at any time postoperatively exhibited more than six premature ventricular contractions (PVCs), more than 10 premature atrial contractions (PACs) per minute, or atrial fibrillation were dropped from the study. It is highly possible that some of these subjects could have been ambulated as early as 32 hours postoperatively without any significant exacerbation or worsening of their arrhythmias. Therefore, removing these subjects from the study probably had some affect on the findings of the study.

Conclusions and Implications

According to the findings of this study, the following conclusion was made for this study sample. Patients can be ambulated a distance of 50 feet as early as 32 hours postoperatively without associated significant arrhythmias when they are between the ages of 35 and 65 years, exhibit no significant postoperative arrhythmias, and do not have evidence of a perioperative myocardial infarction.

This study has implications for nursing practice. It has specific implications for the nurse involved with CAB surgery patients in the early postoperative period, whether she/he is a staff nurse, head nurse, supervisor, or clinical nurse specialist. The nurse should be made aware that patients having CAB surgery can experience the benefits of early postoperative ambultion (32 hours) without exhibiting associated significant arrhythmias. The nurse should be reminded that the benefits from early ambulation include: protection against thrombosis and embolism, promotion of rapid recovery of the respiratory system, improvement in morale, and prevention or decrease in ankle swelling on the ipsilateral side of saphenous vein removal. Furthermore, the nurse should realize that failing to ambulate CAB patients as early as is safely possible prevents them from a rapid recovery and may, in fact, contribute to other problems associated with immobility.

In general, the nurse in all areas of nursing practice, including clinical, research, education, and administration, should be more acutely aware of the importance that activity and ambulation play in the recovery of patients postoperatively. The nurse should continue in her role as problem solver and decision maker, being alert for any relationships that might exist between ambulation and other factors that might suggest need for further research.

Recommendations for Further Study

The following recommendations are suggested based on the findings of this study.

1. Further study should be undertaken using Holter monitoring instead of the 3-minute postambulation strip.

2. Further study should be undertaken using parameters to measure sympathetic nervous activity to determine the distance one could ambulate without significant arrhythmias.

3. Further study should be undertaken including patients in the sample who exhibit frequent PACs and PVCs.

4. A descriptive study should be undertaken to determine the times that other hospitals begin ambulating patients after CAB surgery.

5. A study should be undertaken to determine an activity schedule for patients experiencing a myocardial infarction around their CAB surgery.

APPENDIX A

Patients Dropped From the Study

Patient letter	Assigned Group	Reason for dropping
A	II	Ventricular bigeminy
B	II	Myocardial infarction
C	II	Myocardial infarction
D	I	Myocardial infarction
E	II	Atrial fibrillation
F	II	Frequent PACs (18/min.)
G	II	Refused
H	II	Frequent PVCs (>6/min.)
I	II	Myocardial infarction
J	I	Atrial bigeminy
K	I	Atrial trigeminy
L	I	Myocardial infarction Frequent PVCs (>6/min.)
M	II	Ventricular bigeminy
N	I	Myocardial infarction
O	II	Frequent PACs (>10/min.)

APPENDIX B

PATIENT INFORMATION

Subject No.________ Age____ Race______ Sex________

Date of last MI________________ No. of MIs________________

Date of surgery___________ Time of arrival in ICU_________

Preop. ECG____

Cardiopulmonary bypass pump time____________________

Number and location of bypass grafts________________

Postop ECG (for 24 hours)________________________

Lab values ______________ CPK_________MB Fraction_________
Date Time
LDH_________SGOT________________

______________ CPK_________MB Fraction_________
Date Time
LDH_________SGOT________________

Myocardial scan____________________________________

APPENDIX C

ORAL PRESENTATION

I will verbally explain the following to patients who meet the delimitations of the study:

My name is Donna O'Bryan. I am a registered nurse and a graduate student in nursing at Texas Woman's University. I am conducting a study to investigate how patients respond to walking 32 and 56 hours after coronary artery bypass surgery. Both schedules are presently used in various Dallas hospitals, and I would like to determine if one is more effective for the patient than the other. As part of your routine postoperative care, you will walk with the assistance of an RN a total of 50 feet either the first or the second night after surgery.

If you choose to participate, you may experience the following risks: possible fatigue, weakness, dizziness, discomfort from incisions, a fast heart beat, or an irregular heart beat. These sensations and occurrences are not uncommon in patients having open heart surgery.

Some potential benefits from participating could be: improved lung function, a decrease in the likelihood of clots forming in your veins, a decrease in ankle swelling in the leg from which the vein was removed, and a boost in your morale. Also by participating, you will help nurses and doctors know when the optimal time is to begin walking for patients having this type of surgery.

If you choose to participate, you can withdraw at any time during the study that you desire. You are free to ask any questions about the study that you desire. Your identity will be protected by using a number for identification rather than your name. Also, if at any time it is not in the best interest of your health to continue, then you will be removed from the study. If you choose not to participate, your care will not be affected or altered in any way.

APPENDIX D

Consent Form
TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING

Consent to Act as a Subject for Research and Investigation:

1. I hereby authorize Donna O'Bryan R.N. and the staff nurses in the thoracic intensive care unit to investigate how patients respond to walking a total distance of 50 feet 32 and 56 hours after coronary artery bypass surgery.

2. The investigation listed in paragraph one has been explained to me by Donna O'Bryan R.N.

3. (a) I understand that the investigation described in paragraph one involves the following possible risks or discomforts: possible fatigue, weakness, dizziness, discomfort from incisions, a fast heart beat, or an irregular heart beat. I also understand that these sensations and occurrences are not uncommon in patients having open heart surgery.
   (b) I understand that the investigation described in paragraph one may have the following benefits to myself and/or others: improved lung function, help prevent the likelihood of clots forming in my leg veins, help prevent swelling in the leg that had the vein removed, and improvement in morale. In the future, it would help nurses and doctors know when is the optimal time to start mobilizing and walking patients after coronary artery bypass surgery.
   (c) I understand that: No medical service or compensation is provided to subjects by the university as a result of injury from participation in research.

4. An offer to answer all of my questions regarding the study has been made. If alternative procedures are more advantageous to me, they have been explained. I understand that I may terminate my participation

in the study at any time. Also, if at any time, it is not in the best interest of my health to continue, then I will be removed from the study.

______________________________ ______________________________
Subject's Signature Date

APPENDIX E

TEXAS WOMAN'S UNIVERSITY

Human Research Committee

Name of Investigator: Marian Madonna O'Bryan Center: Dallas

Address: 4670 Amesbury #1080 Date: 12/13/79

Dallas, Texas 75206

Dear Ms. O'Bryan:

Your study entitled "Arrhythmias Associated with Ambulation following Coronary Artery Bypass Surgery" has been reviewed by a committee of the Human Research Review Committee and it appears to meet our requirements in regard to protection of the individual's rights.

Please be reminded that both the University and the Department of Health, Education and Welfare regulations require that written consents must be obtained from all human subjects in your studies. These forms must be kept on file by you.

Furthermore, should your project change, another review by the Committee is required, according to DHEW regulations.

Sincerely,

Estelle D. Kurtz

Chairman, Human Research
Review Committee

at Dallas.

APPENDIX F

TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING

AGENCY PERMISSION FOR CONDUCTING STUDY*

THE ______________________________

GRANTS TO Donna O'Bryan
a student enrolled in a program of nursing leading to a Master's Degree at Texas Woman's University, the privilege of its facilities in order to study the following problem.

If there is any relationship between the frequency and type of arrhythmias and the time that a patient is ambulated after coronary artery bypass surgery.

The conditions mutually agreed upon are as follows:

1. The agency ~~(may)~~ (may not) be identified in the final report.
2. The names of consultative or administrative personnel in the agency ~~(may)~~ (may not) be identified in the final report.
3. The agency (wants) ~~(does not want)~~ a conference with the student when the report is completed.
4. The agency is (willing) ~~(unwilling)~~ to allow the completed report to be circulated through interlibrary loan.
5. Other ______________________________

Date: 1/22/80

Signature of Agency Personnel

M Donna O'Bryan
Signature of Student

Beth C Vaughan-Wrobel RN. Ed.D.
Signature of Faculty Advisor

*Fill out & sign three copies to be distributed as follows: Original - Student; First copy - Agency; Second copy - TWU College of Nursing.

Appendix G

PHYSICIAN PERMISSION

I give my permission for Donna O'Bryan, a graduate nursing student at Texas Woman's University, to use my patients in her study to determine if there is any relationship between the frequency and type of arrhythmias and the time that a patient is ambulated after coronary artery bypass surgery.

______________________ ______________________

Physician Date

Appendix H

INSERVICE

1. Background of the study.
2. Purpose of the study.
3. Theoretical framework briefly explained.
4. Activity schedule for each group explained.
5. Instructions on where to find activity schedule and how and where to chart activity, tolerance, and arrhythmias.
6. Instructions on when and how to collect the ECG strip and where to place it.
7. Reiterate adhering to schedule. Suggest asking another staff member for assistance or call researcher, if too busy.
8. Discuss the staff nurses' attitudes toward the study. For example, trying to make the activity seem like a normal part of the routine care; not talking about the study in front of the patient; not assuming immediately that an arrhythmia is associated with the ambulation because can't really tell until all the data is in; and do not discuss the study with the patient.
9. Elicit feedback. Answer questions.

APPENDIX I

GUIDELINES FOR NURSES

Attached is an activity schedule for this patient. He is a subject in a research study; therefore, it is important that this schedule be followed as closely as possible. Please follow these guidelines:

1. Before the scheduled activity, obtain a clear monitor ECG reading (if necessary, change the patches or wires).

2. Carry out the designated activity.

3. Chart the time and duration of the activity and how the patient tolerated it (i.e., any dizziness, fainting, arrhythmias).

4. If the patient does complain of dizziness or faints or has any of the following arrhythmias-->6 PVCs per minute, >10 PACs per minute, atrial fibrillation, paroxysmal atrial tachycardia (PAT), or junctional rhythm, secure an ECG strip and notify the researcher. (These subjects will be removed from the study.)

5. After ambulating the patient, immediately reattach him to the monitor and run a three-minute ECG strip. (Try to make it as clear as possible.) Place this strip in the envelope at the front of the chart.

6. Thank you for your help and cooperation. Without it, the study could not be carried out.

ACTIVITY SCHEDULE FOR GROUP I

I. ________ ________ Dangle on bedside for 15 minutes
Date Time or as long as tolerated.

Time____________ Duration________________________

How tolerated____________________________________

____

II. ________ ________ Sit in bedside chair for 30 minutes
Date Time or as long as tolerated.

Time____________ Duration________________________

How tolerated____________________________________

____

III. ________ ________ Assist patient with ambulation
Date Time to______________________________

Time____________ Duration________________________

How tolerated____________________________________

____

ACTIVITY SCHEDULE FOR GROUP II

I. ________ ________ Dangle on bedside for 15 minutes
Date Time or as long as tolerated.

Time____________ Duration________________________

How tolerated____________________________________

____

II. ________ ________ Sit in bedside chair for 30
Date Time minutes or as long as tolerated.

Time____________ Duration________________________

How tolerated____________________________________

____

III. Leave in bed until the morning. Do not dangle or weigh on the 11-7 shift.

IV. ________ ________ Stand to weigh, then sit in the
Date Time bedside chair for 30 minutes or as long as tolerated.

Time____________ Duration________________________

How tolerated____________________________________

____

V. a. ________ ________ If not transferring out of the
Date Time unit, sit in the bedside chair for 30 minutes or as long as tolerated.

Time____________ Duration________________________

How tolerated____________________________________

____

V. b. ________ Date ________ Time If transferring out of the unit, do not sit the patient in the chair.

Time (of transfer)____________Duration__________

How tolerated____________________________________

____

VI. ________ Date ________ Time Sit in bedside chair for 30 minutes or as long as tolerated.

Time_____________ Duration__________________________

How tolerated____

____

VII. ________ Date ________ Time Assist patient with ambulation 25 feet and back.

Time_____________ Duration__________________________

How tolerated____

____

APPENDIX J

Data on Type of Arrhythmias and Frequency of Ectopic Beats

Patient No.	Group No.	Type of Arrhythmia	No. ectopic beats
1	2	PVC	2
2	1	--	0
3	2	--	0
4	1	--	0
5	1	PAC	1
6	1	--	0
7	1	--	0
8	1	--	0
9	1	--	0
10	2	--	0
11	2	PVC PAC	1 2
12	2	PAC	1
13	2	--	0
14	2	--	0
15	1	--	0

APPENDIX K

Patient Number	Assigned Group	Age	Sex	No. of Previous MIs	Heart Rate	Bypass pump time (mins.)	No. of by-pass grafts	Location of grafts
1	II	58	M	1	100	56	4	P.D., Cx. LAD, Diag.
2	I	65	M	1	90	52	3	Diag., P.D., Cx.
3	II	62	M	0	100	105	3	LAD, Diag., P.D.
4	I	46	M	1	120	89	4	LAD, RCA, Cx., Diag.
5	I	63	M	1	80	81	4	RCA, G.B. Cx., LAD
6	I	46	M	1	100	85	3	LAD, Diag., P.D.
7	I	36	M	1	110	57	5	P.D., LAD Cx.1,2,3.
8	I	47	M	0	90	44	2	LAD, P.D.
9	I	49	M	1	90	121	3	LAD, O.M., P.D.
10	II	52	M	0	150	66	4	LAD, P.D., RCA, Cx.
11	II	49	M	1	130	74	3	LAD, P.D., Diag.
12	II	62	F	0	90	31	1	LAD
13	II	52	M	1	130	43	1	LAD
14	II	52	F	0	80	50	2	LAD, RCA
15	I	55	M	2	120	85	4	LAD, C ., Diag., P.D.

Group I: Ambulate 32 hours postop
Group II: Ambulate 56 hours postop

M: Male
F: Female

LAD: left anterior descending
Cx: circumflex
Diag.: diagonal
P.D.: posterior descending

GB: groove branch
RCA: right coronary
O.M.: obtuse margin

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