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Gender differences in presenting symptoms, treatment, and outcome in myocardial infarction

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GENDER DIFFERENCES IN PRESENTING SYMPTOMS, TREATMENT, AND OUTCOME IN MYOCARDIAL INFARCTION

by

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ABSTRACT

Gender Differences in Presenting Symptoms, Treatment, and Outcome in Myocardial Infarction

by

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The purposes of this study were to compare the presenting symptoms, treatment, and outcome between men and women with MI. The study sample consisted of 300 patients (N = 300) who were diagnosed with MI in a county hospital in the Southwest area of the United States.

Chest pain, shortness of breath, sweating, and left arm pain were the most common symptoms reported by both genders. Men had more chest pain than their women counterparts (p = .022). No significant difference was found in the cardiac enzyme levels between both genders. Men had more Q wave changes during MI than women (p = .019). Women suffer MI two and a half years later than men (p = .004). Oxygen, nitrates, morphine sulfate, and heparin were the most common treatments given to men and women. Men received more morphine sulfate (p = .013) and betablockers (p = .011) than women in the emergency department. No significant difference was found in the coronary diagnostic and therapeutic procedures or outcome between both genders.

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CHAPTER I

INTRODUCTION

Problem statement

Recent studies in medical and nursing literature (Micevski, 1996 and Penque, et al., 1998) suggest that men and women present with different symptoms of myocardial infarction (MI). Furthermore, gender differerences in the treatment of MI and mortality outcome have been reported. However, the existing literature on gender differences in presenting symptoms, treatment, and outcome of MI is limited. The difference in the presenting symptoms, treatment, and outcome of MI in men and women needs to be further evaluated so that prompt and appropriate treatment will be provided to women as well as men experiencing an MI. This study seeks to add credibility to the existing literature on gender differences in presenting symptoms of MI.

Background of the problem

Coronary heart disease (CHD) is the single largest killer of men and women in the United States (American Heart Association, 1999). More men and women die from heart disease each year than from any other cause of death including cancer, accidents, pneumonia/influenza, and lung diseases (American Heart Association, 1999). Although recent CHD studies have included women, more information is needed regarding this deadly disease in relation to women.

Women in the 1990s are dying of heart disease more often than men (American Heart Association, 1999). Recent research studies have indicated that mortality in women

is higher than in men following MI. Marrugat et al. (1998) studied mortality differences following MI in men and women. Their findings indicated that mortality after acute MI is greater in women than in men. A recent study by Vaccarino et al. (1999) reported similar findings and concluded that women have higher rates of death during hospitalization than men following MI.

The American Heart Association (1999), the national standard source for cardiovascular disease, describes the common symptoms of MI. It does not address gender differences in the presenting symptoms of MI. The common symptoms of MI are uncomfortable pressure, fullness, squeezing, or pain in the center of the chest, pain that spreads to shoulders, neck, or arms, chest discomfort with lightheadedness, fainting, sweating, nausea, or shortness of breath. These symptoms are presented in most cardiovascular texts. Health care providers utilize these symptoms as guidelines for diagnosing MI.

However, recent studies show that gender differences in presenting symptoms of MI exist. A recent study by Penque et al. (1998) noted that more women reported dyspnea, loss of appetite, and back pain than men. Chest pain was the common symptom reported by either gender. This finding is consistent with the results reported by Micevski (1996) who studied gender differences in the presenting symptoms of MI. In Micevski's study, chest pain was the common symptom reported by both men and women. Men presented more often with diaphoresis and complaints of left and right arm pain; whereas, women presented more frequently with back pain/discomfort.

Differences between men and women in their presenting symptoms may affect the treatment and evaluation of MI. Studies have reported the presence of a gender bias in the treatment and evaluation of patients with MI. Bergelson & Tommaso (1995) studied the differences in the clinical evaluation and treatment between men and women who presented with CHD. Their results indicated that women hospitalized with a coronary

diagnosis were less likely to undergo coronary arteriography than men. They further concluded that subjective interpretation of the symptoms and conditions prevented women from having coronary arteriography. Women who did undergo cardiac arteriography were more likely to be older. The latter finding was supported by Dellborg and Swedberg (1993) who noted that coronary angiography was performed more often in men than women during hospitalization. They concluded that women were older when referred for cardiac catheterization, coronary angioplasty, or coronary artery bypass surgery. Pharmacologic treatment for patients with MI was also given significantly less often in women than in men.

In light of these issues, the need for further investigation on the differing symptoms of MI, treatment, and outcome in men and women is imperative. Mallory (1997) stated that if symptoms of MI remain unrecognized, patients may delay seeking medical treatment, and this could complicate their condition, possibly contributing to congestive heart failure.

Significance of the problem

It is of the utmost importance to educate nurses and other health care professionals as well as the public regarding the possible existence of gender differences in the presenting symptoms, treatment, and outcome in MI. Failure to recognize gender differences in the symptoms of MI can contribute to a delay in treatment and a higher mortality in women. Nurses play an important role in promoting health and in preventing and detecting diseases. The recognition of the signs and symptoms of patients with MI is imperative so that prompt and proper intervention, treatment, and management will be provided.

Purpose of the study

There are three purposes of this study. These are a) to compare the presenting symptoms of women and men who were diagnosed with MI in a county hospital in the

Southwest area of the United States b) to compare the treatments received by women and men with MI in the emergency department and c) to compare the outcome between women and men who were diagnosed with MI during hospitalization.

CHAPTER II

REVIEW OF RELEVANT LITERATURE

Introduction

The literature on gender differences in presenting symptoms of myocardial infarction (MI) is quite sparse. These studies have not addressed the impact of gender differences in presenting symptoms on treatment and outcome of MI. Recent studies have focused on gender differences in treatment, management, and mortality of MI. This literature review addresses research studies and provides rationale and support for the present study. This chapter addresses coronary heart disease and the presenting symptoms of MI in general; impact of MI on women; gender differences in the presentation, treatment, management, and mortality of MI. The latter portion of the chapter identifies gaps in the literature and will provide a summary of the chapter.

Coronary Heart Disease

Since 1900, cardiovascular disease has been the leading cause of death each year in America (American Heart Association, 1999). One form of cardiovascular disease that leads to MI is coronary heart disease. Coronary heart disease (CHD) is caused by atherosclerosis, a narrowing of the vessel, due to the formation of lipid-laden lesions of the coronary arteries (McCance & Huether, 1998). This contributes to the interference of blood flow to the heart and can eventually result in MI, what is commonly known as a heart attack.

Myocardial Infarction

Myocardial infarction results from CHD – blood vessel disease in the heart (American Heart Association, 1999). This definition of MI by the American Heart Association, a national organization for cardiovascular diseases and stroke, is commonly accepted and utilized in the literature. McCance and Huether (1998) define MI as the end point of CHD. MI occurs when there is prolonged ischemia to the heart muscle causing irreversible cellular death (Lewis & Collier, 1992). The diagnosis of MI depends on the physiological symptoms, presence of electrographic changes, and elevated cardiac enzymes.

Presenting Symptoms of Myocardial Infarction

The presenting symptoms of MI vary widely. The American Heart Association (1999) reports the signs and symptoms of MI with no distinction between women and men. These are uncomfortable pressure, fullness, squeezing, or pain in the center of the chest, pain that spreads to shoulders neck or arms, chest discomfort with lightheadedness, fainting, sweating, nausea, or shortness of breath. McCance and Huether (1998) describe the common symptoms of MI as chest pain that is heavy or crushing, chest pain with nausea and/or vomiting, diaphoresis, shortness of breath, or radiation to neck, jaw, back, or left-arm. Patients may complain of a feeling of weakness, severe indigestion, shortness of breath, or chest discomfort (Lewis & Collier, 1992). Others may complain of chest pain lasting more than twenty minutes and not relieved by nitroglycerin or rest, and it is characterized as deep, unrelenting pressure, ache, and squeezing sensation with nausea and/or vomiting, and diaphoresis (Fruth, 1991).

Myocardial Infarction in Women

Knowledge about the natural history of CHD in women was limited until recent years (Thomas & Braus, 1998). More women are dying of heart disease than from breast or lung cancers (American Heart Association, 1999). The mortality rate in women

following MI continues to be greater than for men. Marrugat et al. (1998) investigated the mortality in women following their first MI. A sample of 331 women and 1,129 men diagnosed with first MI, from 1992 through 1994, in four teaching hospitals in northeastern Spain was studied. They concluded that older women had more lethal and severe first MIs. The 28-day mortality rates were significantly higher among women (18% for women, 8.3% for men; $p < .001$). The 6-month mortality rates were 25% in women and 10.8% in men with a significant level of < .001. A recent study was conducted by Vaccarino, et al., (1999). A sample of 384,878 subjects (n = 155,565 women, n = 229,313 men) who were enrolled in the National Registry of Myocardial Infarction Two (NRMI2) between the years of 1994 and 1998 was utilized in the study. The mortality rates were examined according to age group. They reported that younger women have higher rates of death after MI. The mortality rate during hospitalization was 16.7% among women and 11.5% among men. The mortality rate for women less than 50 years of age was more than twice as high than for men with a significant level of <. 001.

The diagnosis of MI secondary to CHD presents a greater challenge in women. Recent evidence shows that women present different symptoms of MI. Perhaps this accounts for the less aggressive treatment received by women in the emergency departments who present with atypical symptoms of MI. A study was made to test this hypothesis. Heston et al. (1992) studied the evaluation and management of 445 patients (n = 246 women, n = 199 men) in ten emergency departments in St. Louis all of whom presented with acute chest pain. A record review was utilized in the study. Chi-square and *t*-tests indicated that men were initially evaluated by the physicians in the emergency department 30 minutes faster than women. Also, the initial electrocardiogram was performed 30 minutes earlier for men than for women. Steingart et al. (1991) investigated the management approach used with women who had MI. A sample of 389 women and 1,842 men was utilized in the study. They found that physicians pursue a less aggressive

approach in treating women with MI despite their increased cardiac disability. This study shows that emergency department physicians did not diagnose women as quickly as men who presented with symptoms of MI, thereby delaying appropriate and early medical intervention critical to their successful treatment and outcome.

Gender Differences in the Presentation of MI

Recent studies show the presence of gender differences in the clinical presentation of MI. Micevski (1996) studied the differences in the presenting symptoms of MI in 115 men and 115 women. Chi-square and *t*-tests showed that chest pain was the common symptom reported by both men and women. Men presented more often than women with diaphoresis ($p < .0001$) and with complaints of right arm pain ($p < .03$); whereas, women presented more frequently with back pain/discomfort ($p = .01$). The limitation of this study was the use of a small sample population.

A study conducted by Penque et al. (1998) also examined the differences in presenting signs and symptoms of MI on 98 patients (n = 51 women, n = 47 men). Structured interviews and chart audits were utilized in the study. Using descriptive statistics and chi-square analysis, they found existing differences between women and men. Women were more likely to present with back pain, paroxysmal dyspnea, and loss of appetite than men. The limitations of their study were the use of convenience sampling and again, a small sample.

Meischke, Larsen, and Eisenberg (1998) investigated gender differences in acute myocardial infarction symptom presentation. A sample consisted of 4,497 patients (n = 1,527 women, n = 2,970 men) diagnosed with acute myocardial infaction.These patients were consecutively included in the study. Their findings showed that gender differences in symptom presentation do exist. A chi-square analysis indicated that men reported chest pain and diaphoresis more often than women. Women reported more shortness of breath, nausea, and vomiting than men. The weaknesses of this study are the method used for

coding of symptoms and the unequal sampling of women and men with MI.

Gender Differences in Treatment and Management of MI

Recent studies show women and men who present with MI are treated and managed differently. Women were less likely to be referred for coronary angiography, percutaneous transluminal coronary angioplasty (PTCA), and coronary arterby bypass graft (CABG). Steingart et al. (1991) examined the difference in the management of coronary artery disease between men and women. A total of 2,231 subjects (n = 389 women, n = 1,842 men) with acute myocardial infarction were enrolled in the Survival and Ventricular Enlargement (SAVE) study. The SAVE trial was conducted at 112 hospitals in the United States and Canada. Patients were enrolled in the study from January 1987 to January 1990. Chi-square analysis and multiple logistic regression showed that women were less likely to be referred for cardiac catheterization than men. Also, women underwent CABG less often than men. The study was conducted in more than one hospital and had a large sample population. These latter factors give strength to the study findings. Dellborg and Swedberg (1993) did a similar study. They examined the difference in treatment between men (n = 1,022) and women (n = 493) with MI. The *t*-test results showed that coronary angiography was performed significantly more often in men than in women ($p < 0.001$).

Research studies documented issues regarding coronary revascularization between men and women. Women who are referred for coronary revascularization such as PTCA and CABG tend to be older and sicker (Eysman & Douglas, 1993). Khan, et al. (1990) investigated the differences in referral for CABG between men and women. A total of 2,297 patients (n = 482 women, n = 1,815 men) were consecutively selected in the study. Data were collected using chart review. Two-sample *t*-tests and chi-square analysis indicated that women were referred for CABG later in the course of their disease than men. Women were significantly older than men (68.2 compared with 64.0 years, $p <$

0.001). A limitation is that the authors did not examine the course and outcome of women and men who were not referred for CABG.

Maynard et al. (1992) examined the differences in treatment and outcome of acute myocardial infarction in 4,891 patients (n =1,659 women; n = 3,232 men) in the Seattle metropolitan area between the years of 1988 and 1990. A record review was utilized in the study. Chi-square and *t*- test analyses showed that women were less likely to undergo cardiac catheterization, to have PTCA, or to have CABG than men.

Gender Differences in Evaluation for MI

As mentioned previously, Heston et al. (1992) studied the evaluation and management of 246 women and 199 men in ten emergency departments. They reported that women were evaluated and managed less aggressively than men. Their findings indicated that men were seen and assessed by emergency department physicians 30 minutes faster than women.

Gender Differences in Pharmacological Treatment

The issue of gender bias in pharmacological treatment of MI in women and men has also been investigated. Dellborg and Swedberg (1993) examined a total of 1,515 patients (n = 493 women, n = 1,022 men) diagnosed with MI in a community hospital in Sweden between 1989-1991. Using the *t*-test, they found that men were more likely to receive thrombolytic drugs (34% vs 24%), intravenous nitroglycerin (41% vs 33%), and intravenous betablockers (36% vs 27%) than women. However, inotropic drugs such as dobutamine and dopamine were given more often to women (14% vs 8%) than to men.

Ryan et al. (1996) reported that early administration of thrombolytic therapy on patients with AMI results in improved left ventricular systolic function and survival. However, gender differences occur in the administration of thrombolytic therapy. Yarzebski et al. (1996) conducted a study on thrombolytic therapy on 1,680 men and 1,205 women with confirmed acute MI. Data were collected from 16 hospitals in 1986,

1988, 1990, and 1991. Their findings showed that thrombolytic use in men increased by 127% from 1986 to 1991 and continued to increase after that period. In contrast, thrombolytic use in women increased from 3.2 % in 1986, 12.8% in 1988, 22.2 % in 1990, and then declined to 19.0 % in 1991 and did not increase further.

Gender Differences in Mortality

In addition to treatment differences, there is also documentation of increased mortality for women compared to men with MI. As mentioned previously, Khan et al. (1990) studied in-hospital mortality rates for women (n = 482) and men (n = 1,815) who had CABG. The findings of the study showed that women had higher mortality rates than men following CABG (4.6 % for women and 2.6 % for men). Maynard et al. (1992) also investigated this issue on 4,891 patients (n = 1,659 women and 3,232 men). They reported that hospital mortality after CABG was higher for women than for men (16 % for women and 11 % for men before age adjustment). These authors reported that even after age adjustment, the risk of hospital mortality following CABG was still higher for women.

Vacarrino et al. (1998) studied the impact of gender and age with respect to short-term mortality after MI. They found that the mortality rate of women who were younger than 75 years old was twice than that of men in the same age group. No differences were found in mortality between women and men who were over 79 years of age following MI. A weakness of this study is its small sample size of 52 women and 45 men. A more recent study conducted by Vaccarino et al. (1999) investigated differences in early mortality after MI in men and women. This study utilized a large sample consisting of 384,878 subjects who had experienced MI (n = 155,565 women, n = 229,313 men). The study was conducted between 1994 and 1998. Using bivariate analyses, the study findings were similar to the authors' previous study. The overall mortality rate during hospitalization was higher among women (16.7 %) than among men (11.5 %). These

researchers reported that the mortality of women younger than 50 years of age was more than twice that for men. This research reveals that not only older women have higher mortality rates following MI, but also younger women have significantly higher mortality rates than men.

A recent study conducted by Hochman et al. (1999) examined gender differences in presentation and outcome on 12,142 patients (n = 3,662 women, n = 8,480 men) with acute coronary syndromes. Multivariate logistic regression and chi-square tests showed that women had more complications than men during hospitalization and a significantly higher mortality rate ($p < .001$) than men at 30 days (6% vs 4%).

Gaps in the Literature

A review of the literature indicates that there are only a few recent studies that address gender differences in the presenting symptoms, treatment, and outcome of MI. These studies utilized small or uneven sample population and did not address whether the differences in the presenting symptoms of MI in men and women have an impact on the treatment and outcome. Additional studies on gender differences in presenting symptoms, treatment, and outcome of MI would add credibility to the existing literature.

Summary

The review of the literature demonstrates that CHD is the leading cause of death in women and in men (American Heart Association, 1999). Studies on the presenting symptoms of MI between women and men were reviewed. The American Heart Association (1999), McCance & Huether (1998), Lewis & Collier (1992), and Fruth (1991) reported the signs and symptoms of MI with no distinction between women and men. In contrast, Micevski (1990); Penque et al. (1998); and Meischke et al. (1998) reported the presence of gender differences in the presenting symptoms of MI. They

noted that women presented with backpain, dyspnea, loss of appetite, nausea, and vomiting; whereas, men presented more often with diaphoresis, complaints of right arm pain, and chest pain. The need for further research on the differences in symptoms of MI has been noted.

Studies on the differences in treatment for MI between women and men have also been reviewed. Numerous studies have been noted regarding gender bias in coronary revascularization between women and men. Hsia (1993), Steingart et al. (1991), Dellborg & Swedberg (1993), and Maynard et al. (1992) reported that women were less likely to be referred for coronary angiography than men; women underwent PTCA and CABG less often than men. Dellborg & Swedberg (1993) and Ryan et al. (1990) noted that not only coronary revascularization treatment differs in women and men, but also gender bias in the pharmacological treatment was also noted. Men were more likely to receive thrombolytic drugs, nitroglycerin, and betablockers than women.

Studies on gender differences in patients' outcome with MI during hospitalization were also discussed. Khan et al. (1990) and Maynard et al. (1990) reported that women had higher hospital mortality rates than men following CABG. Women had more complications and had higher mortality rates than men following MI as reported by Vacarrino et al. (1998) and Hochman et al. (1999). A more recent study by Vacarrino et al. (1999) was also reviewed. They noted that not only older women have higher mortality rates following MI, but also younger women have significantly higher mortality rates than men.

CHAPTER III

FRAMEWORK

Introduction

This study utilizes the Neuman's Systems Model. This conceptual model has a wholistic focus and is ideal for guiding this study. The two major concepts of the Neuman's Systems Model are stressors and the reactions to such stressors. According to Neuman (1995), the person has a certain "degree of reaction" to any given stressor at any given time. This conceptual model, developed by Dr. Betty Neuman in 1972, is presently recognized and frequently used within the discipline of nursing. This chapter discusses the conceptual framework, application of the Neuman Systems Model, propositions, hypotheses, variables of the study, definition of variables, and concludes with a chapter summary.

Conceptual Framework

In the Neuman's Systems Model, the client or client system (patient) is viewed as multidimensional and wholistic. The client is composed of five simultaneously interacting variables. These variables are physiological, psychological, sociocultural, developmental, and spiritual factors. The client is represented by a series of broken rings surrounding the basic core structure (Neuman, 1995). The basic core structure consists of all survival factors and is protected by the flexible line of defense and the lines of resistance. (See Figure 1). These lines of resistance surround the core structure and serve

as a protective mechanism for the client system's integrity. The client's usual state is represented by a solid line called the normal line of defense. The lines of resistance are activated when the normal line of defense is disrupted by environmental stressors, such as MI, which causes irreversible damage to the heart muscle. When the normal line of defense is disrupted, reactions (symptoms) occur such as chest pain or nausea /and vomiting. Neuman (1995) identifies the flexible line of defense as dynamic, and it serves as a protective buffer for preventing stressors from penetrating the normal line of defense.

Environment is defined as "all internal and external factors or influences surrounding the identified client or client system" (p.30). According to Neuman (1995), the client may be influenced either positively or negatively by environmental forces. These environmental forces are called stressors, and they can penetrate the flexible and normal lines of defense. Stressors are classified as intrapersonal, interpersonal, and extrapersonal. Many environmental factors contribute to the development of MI, such as a high cholesterol diet or a stressful job. Myocardial infarction is an example of intrapersonal stressor. Information regarding the symptoms of MI shared by the nurses to the patients is an example of an interpersonal stressor. Loss of a job due to physical disability secondary to MI is an example of extrapersonal stressor.

Health is a state of optimal wellness or system stability (Neuman, 1995). Optimal wellness or stability indicates that all a person's needs are being met. According to Neuman, optimal wellness is the condition in which all five variables are in harmony with the whole system, which determines the resistance of a person to any stressor.

Nursing is concerned with all variables affecting the patient's response to stress. Nursing interventions focus on primary, secondary, and tertiary preventions (Neuman, 1995). According to Neuman (1995), these three levels of prevention are important to the patient prior to, during, and following the event of MI. (See Figure 1). A patient with MI may also require an intervention in all three areas of prevention simultaneously.

As illustrated in Figure 1, the goal of primary prevention is to strengthen the patient's flexible line of defense and to protect the normal line of defense or usual state. This is accomplished by educating the health care professionals and the public based on the findings of this study. The goal of secondary prevention is to strengthen the lines of resistance by providing appropriate treatment of symptoms to all patients with MI in order to attain optimal wellness and stability. Interventions in secondary prevention require prompt assessment that includes recognizing the different symptoms of MI in men and women and providing appropriate treatment. "If secondary prevention as intervention fails to reconstitute the patient, death occurs as a result of failure of the basic structure to support the intervention" (p.34). Tertiary prevention is used for wellness maintenance. The goal of tertiary prevention is "to maintain an optimal wellness level" (Neuman, 1995). Educating patients who have had MI regarding the symptoms of the disease, lifestyle changes that will prevent or reduce their chance of having a second MI, and cardiac rehabilitation, following MI are examples of tertiary prevention.

Application of the Neuman Systems Model

MI is a stressor that affects the patient's physiological, psychological, sociocultural, developmental, and spiritual being; causing system instability. The patient's flexible and normal lines of defense have been disrupted by MI as manifested by their presenting symptoms (stress reaction) such as chest pain; nausea; shortness of breath; diaphoresis; and chest pain with radiation to jaw, neck, arms, shoulders, and back; the presence of electrographic changes; and elevated cardiac enzyme levels. (See Figure 2). Recognition of symptoms and treatment of MI will stabilize the patients physiologically and psychologically, thus preventing a negative impact on their sociocultural, developmental, and spiritual beings.

Nurses and other health practitioners need to recognize the differing symptoms of women and men who are experiencing MI so that faster and more appropriate treatment

will be provided. Treatment of symptoms such as “immediately giving oxygen, sublingual nitroglycerin, analgesia, and aspirin will improve the patient’s left ventricular systolic function and survival ” (Ryan et al., 1996). If symptoms are recognized, and if appropriate treatments and procedures are provided, patients are protected from further illness or death.

Propositions

The present study proposes that women and men respond to the stressors of MI differently. This study also proposes that gender differences exist in treatment and outcome of MI. Because the differences in presenting symptoms of MI can affect the treament and outcome of patients, this research proposes that the recognition of the different responses to stressors in women and men with MI can lead to a faster and more appropriate treatment. These factors can influence the high mortality rates in women.

Hypotheses

The following hypotheses direct this study.

1. There is a gender difference in the presenting symptoms of patients with MI in the emergency department.

2. There is a gender difference in the cardiac enzyme levels and electrographic changes on patients with MI who present to the emergency department.

3. There is a gender difference in the mean age of patients who experience their first MI.

4. There is a gender difference in the treatment received by patients with MI in the emergency department.

5. There is a gender difference in the outcome of patients with MI during hospitalization.

6. There is a gender difference in the coronary diagnostic and therapeutic procedures on patients with MI during hospitalization.

Definitions of Variables

The following definitions are used in the study for the selected variables.

Myocardial Infarction

The conceptual definition of MI is "prolonged ischemia to the heart muscle causing irrevesible cellular death" (Lewis & Collier, 1992). The operational definition of MI is the discharge diagnosis of MI on the patient's chart.

Gender

Conceptually, gender is defined as a person's sex. Operationally, gender is the recorded letter (M for male, F for female) for the subject in the study.

Cardiac Enzymes

Conceptually, cardiac enzymes are the enzymes contained within the heart muscle cells that are released when the heart muscle is damaged (Pagana & Pagana, 1990). The operational definition of cardiac enzymes is the documented results of CKMB fractions greater than 4 ng/dL for both men and women as recorded in the laboratory results section of the patient's chart. CKMB values are based on the facility's protocol where the study was conducted.

Electrocardiographic Changes

Conceptually, electrocardiographic changes are the changes in the electrical activity of the heart. The operational definition of electrographic changes is the documented evidence of pathologic Q wave, changes in ST segments, or changes in T waves as recorded in the patient's chart by the emergency department physician.

Presenting Symptom

Conceptually, the presenting symptom is the symptom that causes the individual

to seek medical attention and that leads to a diagnosis of MI (Micevski, 1996). Operationally, presenting symptoms are the symptoms of MI described by the American Heart Association (1999) such as uncomfortable pressure, fullness, squeezing, or pain in the center of the chest, pain that spreads to shoulders, neck, or arms, chest discomfort with lightheadedness, fainting, sweating, nausea, or shortness of breath. Presenting symptoms as described by Micevski (1996) include intrascapular pain, jaw pain, back pain or discomfort, abdominal pain or discomfort (Micevski, 1996)).

Treatment

The conceptual definition of treatment is the intervention provided to patients at presentation for treatment of MI in the emergency department to attain system stability or wellnes and energy conservation (Neuman, 1995). The operational definition of treatment is the documented use of oxygen, aspirin, nitrates, morphine sulfate, thrombolytics, heparin, beta-blockers, and ace inhibitors on patients experiencing an MI.These are recorded in the emergency department sheet, nurses' notes, and physician's order sheet.

Outcome

The conceptual definition of outcome is the result or effect of an event (Ehrlich et al., 1980). The operational definition of outcome is the documented length of stay in the hospital or death.

Coronary Diagnostic and Therapeutic Procedures

The conceptual definition of coronary diagnostic and therapeutic procedures is the intervention provided to patients with MI during hospitalization. Operationally, coronary diagnostic and therapeutic procedures are coronary angiogram, percutaneous transluminal coronary angioplasty (PTCA), and coronary artery bypass garft (CABG) as documented in the physician's progress notes, history and physical sheet, and nurse's notes.

Summary

This chapter presented the Neuman's Systems Model. This nursing model served as the conceptual framework for this study. Application of the Neuman Systems Model to the present study, propositions of the study, and the six hypotheses were addressed. The chapter concluded with the definition of variables.

CHAPTER IV

METHODS AND PROCEDURES

Introduction

The purposes of this study are three fold a) to compare the presenting symptoms of women and men who are diagnosed with MI b) to compare the treatments received by women to those received by men who were diagnosed with MI in the emergency department and c) to compare the difference in outcome of women and men during hospitalization. This chapter includes a discussion of the research design, study sample, measurement strategies, data collection procedure, and statistical analyses.

Research Design

The research design that was utilized in this research study is comparative descriptive design. This particular design was appropriate for the study because the characteristics of the subjects were described but were not manipulated by the researcher. Further, there was no research treatment or intervention involved in the study, no causality examined; and the differences in variables (presenting symptoms of MI and treatments) between the two groups (women and men) were investigated.

Sample

The target population in this study encompassed both women and men diagnosed with MI. The accessible population consisted of women and men with a confirmed

diagnosis of MI who were admitted to a county hospital in the Southwest area of the United States during the years of 1998-2000.

The sampling criteria included women and men admitted in the emergency department via ambulance or through the emergency department's triage area to rule out MI or unstable angina and who had a discharge or final diagnosis of MI. Other criteria for the study included patients between the ages of 35 to 65 years old and who had their first MI. Patients who died in the hospital following MI were also included in the study. Patients who have had a previous MI were excluded from the study. Based on the information obtained from the facility's medical records department where the study was conducted, the age range for the majority of patients who have their first MI is between 35-65 years old. Patients over 65 years old were excluded in this study because they tend to have other accompanying diseases that may have an influence on MI.

Power analysis was used to estimate the study's sample size. To control for Type II error, an 80% power level is desirable (Burns & Grove, 1997). If power is high, it strengthens the meaning of the findings (Polit, 1996). A sample of 300 patients (n = 150 women, n = 150 men) was needed to achieve a power of .80 with an alpha set at .05 in a 2-tailed test. This number of patients in the sample allowed for a small effect size (Polit, 1996). There was a sufficient number of patients that were included in the study. The facility where the study was conducted admits approximately 600-700 patients with MI a year. The subjects in the study were selected randomly by choosing every other subject from the hospital's computer listing. The study design was strengthened by this sampling method.

Permission to conduct this study was obtained from the researcher's thesis committee, the Department of Nursing, and the Human Subjects Rights' Committee for The University of Nevada, Las Vegas (UNLV). Written approval to conduct the study was obtained from the facility's Nursing Administration. The consent forms were

approved by the Director of Nursing, the Director of Staff Development, and the Director of Health and Information Systems and was submitted to the UNLV's Human Subjects Rights' Committee. To ensure patient confidentiality, patients' names were not used in the present study; letters and number codes were used instead. (See Appendix D).

Measurement Strategies

The Gender MI Data Collection Tool (GMIDCT) was compiled by the author to collect data in the present study. The GMIDCT consists of four sections: demographics, cardiac markers, presenting symptoms, and treatment received. (See Appendix C).

Demographics:

The first part of the GMIDCT are the demographics. This includes the patient's identification code, gender, date of admission, date of discharge, age, and death.

Cardiac Markers:

This is the second part of the GMIDCT. Cardiac markers include electrographic changes and cardiac enzymes. The electrographic changes are measured by the presence or absence of Q wave changes, ST segment changes, and T wave changes. Cardiac markers include the recorded value of CKMB fraction. CKMB values are based on the facility's protocol where the study was conducted.

Presenting Symptoms:

The third part of the GMIDCT is the presenting symptoms of MI. The presenting symptoms include uncomfortable pressure, fullness, squeezing, pain in the center of the chest, pain spreading to shoulders, pain in the neck, pain in right arm, pain in left arm, nausea, sweating, shortness of breath, fainting, chest discomfort with lightheadedness, intrascapular pain, right jaw pain, left jaw pain, mid upper back pain/discomfort, lower back pain/discomfort, and abdominal pain/discomfort.

This section of the data collection tool is based on Micevski's (1996) Presenting

Symptoms' Data Collection Tool for MI and Mallory's (1997) American Heart Descriptors of MI. Consent has been obtained from the authors to use these tools (See Appendix D). Micevski's (1996) data collection tool demonstrated content-related validity and Mallory's (1997) data collection tool demonstrated inter-rater reliability.

Treatment Received

The fourth part of the GMIDCT is the treatment received or not received by women and men experiencing MI in the emergency department. This includes oxygen, aspirin, nitrates, morphine sulfate, thrombolytics, heparin, betablockers, and ace inhibitors. Interviews with four practicing emergency department physicians confirmed that these treatments are most commonly given in the emergency department for MI patients. In addition, these treatments are based on the most recent national guidelines for the management of patients with acute myocardial infarction as developed by the American College of Cardiology/American Heart Association's Task Force Committee on Management of Acute MI (Ryan et al., 1996).

Coronary Diagnostic and Therapeutic Procedures

The fifth part of the GMIDCT is the coronary diagnostic and therapeutic procedures received by patients with MI. The coronary diagnostic and therapeutic procedures include coronary angiogram, PTCA, and CABG.

The GMIDCT was reviewed by one cardiologist, four practicing emergency department physicians, and one clinical nurse specialist, with a specialty in cardiology.

Procedure for Data Collection

The researcher reviewed the randomly selected patients' charts in the hospital's medical records department. Records from January 1, 1998 to July 1, 2000 were examined. The following procedures were used for data collection. First, patient information was entered in the hospital's computer by the medical records' supervisor.

Information that was entered in the computer included patient's medical diagnosis, using the number code for MI; gender; age; date of admission; and date of discharge. Second, upon entering the information, the medical records' supervisor obtained a computer printout, which she then gave to the researcher. Third, the researcher randomly selected the patients by choosing every other subject from the hospital's computer printout list until 300 patients (150 women and 150 men) were obtained. The random selection process began by using a coin flip. The coin head was labeled number 1 and the coin tail was labeled number 2. The researcher obtained the tail after the coin flip, the count started on patient number 2. The reseacher then chose every other subject from the computer printout list until 300 subjects (150 women and 150 men) were obtained. Fourth, after random selection, the researcher coordinated with the medical records' staff to obtain patients'charts. Fifth, the charts retrieved by the medical records' staff were given to the researcher to be examined.

A total of twenty charts a day were reviewed. No more than twenty charts were examined at a time to decrease error in data collection. A research assistant was utilized to assist with data collection. This research assistant was a licensed registered nurse who had a specialty in cardiology and who had a background in research study. Inter-rater reliability was established by having the research assistant read the same charts (10 charts) that the researcher had already examined to ensure the information obtained from the charts was correct.

The demographics were collected from the patient's chart as listed on the paramedic's sheet, history and physical sheet, and hospital's "face" sheet. Cardiac enzymes were obtained from the laboratory section of the patient's chart. Information on the electrocardiogram was obtained from history and physical sheet or physician's progress notes. Presenting symptoms were collected from the history and physical sheet, nurse's notes, or physician's progress notes. Information on treatment received was

collected from emergency department sheet, physician's order sheet, and nurse's notes.

Statistical Analyses

Hypotheses

The following hypotheses provided a direction for the analysis of study data.

1. There is a gender difference in the presenting symptoms of patients with MI in the emergency department.

Frequency distributions and chi-square analysis were used for hypothesis one. Frequency distributions organize the data allowing for examination. Further, they are used to examine errors in coding and computer programming (Burns & Grove, 1997). By using frequency distribution, the researcher was able to identify which symptoms of MI occured most often in men and women, which symptoms were common to both groups, who had more symptoms, and how many subjects there were in total. Before analyzing the data, it was checked for error using frequency command in the Statistical Package for the Social Sciences (SPSS) program. Chi-square analysis was appropriate for this hypothesis because the data were categorical (nominal level). Chi-square tests for the differences in frequencies of observed data and compares them with the expected frequencies (Burns & Grove, 1997). The presenting symptoms were listed as present or not present. The observed frequencies in each group were compared with the frequencies expected. A critical value and a level of significance (set at .05) was included and was obtained in order to support that a statistical difference existed between men and women in their presenting symptoms. A 2 x 2 chi-square table was used.

2. There is a gender difference in the cardiac enzyme levels and electrographic changes on patients with MI who present to the emergency department.

The *t*-test for independent groups was chosen for hypothesis two because the outcome data and cardiac enzyme levels, were at interval level. This test analyzes the

difference between two means (Polit, 1996). The difference between the means of women and men were analyzed regarding cardiac enzyme levels. A significance of .05 was established.

Chi-square analysis was selected for hypothesis two because the data, electrographic changes, were at nominal level. The electrographic changes were listed as present or not present. The observed frequencies in each group were compared with the expected frequencies. A resulting chi-square co-efficient with a .05 level of significance or less would indicate that a difference exists between women and men in their electrographic changes.

3. There is a gender difference in the mean age of patients who experience their first MI.

The *t*-test analysis was also chosen for hypothesis three. The difference between the means for each group was analyzed regarding age. A significance level of .05 was established.

4. There is a gender difference in the treatment received by patients with MI in the emergency department.

Frequency distribution was appropriate for hypothesis four. This method gave information on the total number of treatments, types of treatment received by men and women, and who received the most treatments. Chi-square analysis was also chosen for hypothesis four because the data were categorical (nominal level data). The treatments were listed and were measured as given or not given. The frequencies in each group were compared with the expected frequencies. A resulting chi-square co-efficient with a .05 level of significance or less would indicate that there is a difference between women and men regarding the treatments they received. Again, a 2 x 2 chi-square was used for each treatment.

5. There is a gender difference in the outcome of patients with MI during hospitalization.

The *t*-test for independent groups was appropriate for hypothesis five because the length of days until discharge was at the interval level. A significane of .05 was established. In addition, a chi-square was computed regarding the outcome of death, living discharge, and gender.

6. There is a gender difference in the coronary diagnostic and therapeutic procedures on patients with MI during hospitalization.

Frequency distribution was used for hypothesis six. Again, by using this method, the researcher was able to identify the total number of coronary diagnostic and therapeutic procedures, the types of procedure, which procedures were performed more frequently, which procedures were common to both groups, and who received the common procedure.

The above mentioned statistical analyses were performed by the researcher on the computer using the SPSS software. The data was summarized with a discussion of the results for each hypothesis. The results were presented in tables and figures.

Methodological Limitations

The limitations of this study included the following a) the sample was drawn from only one hospital in one geographic area which limited its generalizability; b) the patient's documented complaints (presenting symptoms) may have been influenced by the interviewer's bias prior to or at the time of hospitalization; c) hospital records may have not reflected actual information.

Summary

This chapter discussed the proposed research design and sampling procedures.

Measurement strategies, data collection procedures, and proposed data analysis for each of the six hypotheses were also addressed. The chapter concluded with a discussion of methodological limitations.

CHAPTER V

DATA ANALYSIS

Introduction

This chapter summarizes the results of the study and its findings. Statistical analysis used in addressing the six hypotheses which directed this study are presented. The Statistical Package for the Social Sciences (SPSS) software was the program used to analyze the study data using frequency distributions, chi-square tests, and *t*-tests.

Description of Sample

The population sample consisted of 300 patients (N = 300) who were diagnosed with MI. The sample had equal representation of women (n = 150) and men (n = 150). Data were collected through chart review in a county hospital in the Southwest area of the United States from January 1, 1998 to July 1, 2000. The age of the sample population ranged from 27 to 65 years old. The mean age was 53.7 years old with a standard deviation of 7.65 years. The median age was 47 years old and the mode was 55 years old. (See Figure 3).

Reliability Analysis

The data collection tool that was utilized in the present study was compiled by the author. The Gender MI Data Collection Tool (GMIDCT) is based on Micevski's (1996) Presenting Symptom's Data Collection Tool for MI and Mallory's (1997) American

Heart Descriptors of MI. Mallory's data collection tool demonstrated an inter-rater reliability of .90.

Inter-rater reliability was established for the GMIDCT by having a research assistant read a total of ten charts that the researcher had already reviewed and coded. A comparison of the agreements obtained between the researcher and the research assistant on the coding form with number of possible agreements was calculated. A score of 97.3% agreement was obtained. This presented support for inter-rater reliability of the GMIDCT.

Results of the Hypotheses

The following are the results of analysis pertaining to each hypothesis.

Hypothesis 1

"There is a gender difference in the presenting symptoms of patients with MI in the emergency department."

The first hypothesis was analyzed using frequencies. Chest pain was a common symptom on presentation as well as shortness of breath, sweating, and left arm pain for both men and women in the emergency department. However, men presented with chest pain more often than women (92% vs 83.3%). Women tended to present with nausea more frequently than men (40% vs 30.9%). Women also demonstrated a more frequent presence of mid upper back pain more often than men (10.7% vs 5.3%). (See Table 1).

To examine the difference of each of the presenting symptoms between men and women, a chi-square analysis was utilized. The only significant difference in symptoms between men and women was chest pain ($X^2 = 5.210$, p = .022). The symptoms that are close to significance were nausea ($X^2 = 2.859$, p = .091) and mid upper back pain ($X^2 = 2.899$, p = .089). (See Table 2).

Hypothesis 2

"There is a gender difference in the cardiac enzyme levels and electrographic changes on patients with MI who present to the emergency department."

The *t*-test was used to examine the difference between the two groups. The mean cardiac enzyme level for women was 32.57 with a standard deviation of 72.45. The mean cardiac enzyme level for men was 42.32 with a standard deviation of 107.76.
No significant difference in the cardiac enzyme levels was indicated between women and men with MI (t = .920, p = .358). (See Table 3). Mann Whitney *U*-test was also performed for hypothesis two. No significant difference was found in the cardiac enzyme levels between men and women (Z = -1.010, p = .313).

Electrographic changes were analyzed using frequencies. Men presented with Q wave changes more often than women (21.3% vs 11%). (See Table 4). A chi-square analysis was computed to examine the difference in electrographic changes between men and women. The only significant difference in the electrographic changes between men and women was the Q wave (X^2 = 5.488, p = .019). There was no significant differences in T wave (X^2 = .059, p = .807) or ST segment (X^2 = .887, p = .346) on the electrocardiograph. (See Table 5).

Hypothesis 3

"There is a gender difference in the mean age of patients who experience their first MI."

T-test results (t = -2.880, p = .004) indicate that there is a significant gender difference in the mean age of patients who experience their first MI. The mean age for women was 54.99 years old with a standard deviation of 7.57 years. The mean age for men was 52.47 years with a standard deviatin of 7.55 years. (See Table 6).

Hypothesis 4

"There is a gender difference in treatment received by patients with MI in the emergency department."

Hypothesis four was analyzed using frequencies. Oxygen, nitrates, heparin, aspirin, and morphine sulfate were the common treatments given to both genders. However, men tended to receive morphine sulfate more often than women (47.0% vs 33.3%) in the emergency department. Men also received betablockers more often than women (24.0% vs 12.7%). Furthermore, men received aspirin more frequently than women (50.0% vs 40.7%). Nitrates were given to men more frequently than to women (90.7% vs 84.0%). (See Table 7).

A chi-square analysis was employed to examine the difference in treatment for MI received by men and women in the emergency department. A significant difference was found between the two groups. Morphine sulfate and betablockers were given more often to men than to women (X^2 = 6.108, p = .013; X^2 = 6.434, p = .011). (See Table 8).

Hypothesis 5

"There is a gender difference in the outcome of patients with MI during hospitalization."

Length of stay was analyzed using frequencies and *t*-test. The average length of stay for men in the hospital was 6.48 days. The median was 5 days with a standard deviation of 3.61 days. The maximum length of stay in the hospital for men was 25 days. The mean length of stay for women was 7.17 days. The median was 5 days with a standard deviation of 6.09 days. The maximum length of stay for women in the hospital was 57 days. T-test results indicate that there is no significant difference in the length of stay between men and women with MI (t = -1.187, p = .236). (See Table 9). A *t*-test was re-run after eliminating five outstanding outliers (1 male, 4 females). There was no significant difference between men and women in regard to their length of stay.

To examine the difference of men and women who died in the hospital, frequency distribution and chi-square were employed. Frequencies revealed that 1 male died and 5 females died. (See Table 11). Due to the small number of subjects, chi-square criteria were not met, but results indicated that there is no significant gender difference (X^2 = 2.720, p = .09).

Hypothesis 6

"There is a gender difference in the coronary diagnostic and therapeutic procedures on patients with MI during hospitalization."

Frequency distribution and chi-square test were also utilized for the sixth hypothesis. The results indicated that men received coronary angiogram and coronary artery bypass graft (CABG) more often than women (91.3%, 21.0% vs 88.7%, 15.3%). Percutaneous transluminal coronary angioplasty (PTCA) was performed equally in both genders (53.3% vs 53.3%). There was no significant difference between men and women in regard to coronary angiogram (p =.441) and CABG (p = .179). (See Table 12).

Other Findings

A chi-square analysis was performed to examine the relationship of chest pain, morphine sulfate, and gender. Chest pain was a common symptom reported by both genders. However, men reported chest pain more often than women did. Morphine sulfate was given more often to men than to women (47.3% vs 33.3%, p = .013). (See Table 8). Overall, patients who reported chest pain received morphine sulfate more often than those patients who did not report chest pain (p = .000). Men who reported chest pain received morphine sulfate more than those men who did not report the symptom of chest pain in the emergency department (p = .005). Women who reported chest pain received morphine sulfate three times more often than those women who did not report chest pain (p = .013). (See Table 13).

Summary of Findings

This chapter addressed the data analysis of gender differences in the presenting symptoms, treatment, and outcome of MI. Results of the statistical tests that were utilized in the present study for each of the six hypotheses were discussed as well as the reliability of the data collection tool.

The description of the sample was presented. The age of the sample population ranged from 27 to 65 years old. The mean age of the total sample was 53.7 years old.

Hypothesis one indicated that chest pain, shortness of breath, nausea, and left arm pain were the most commom symptoms of MI for both men and women in the emergency department. Men presented with chest pain more often than women (92% vs 83.3%, $p = .022$). Hypothesis two conveyed that there was not a significant difference in cardiac enzyme levels between women and men with MI, but there was a significant difference in the presence of Q waves between men and women.

The third hypothesis indicated that a gender difference in the mean age of patients who experience their first MI exists. The mean age for women was 54.99 years and the mean age for men was 52.47 years ($p = .004$). Hypothesis four reflected that men received morphine sulfate more often than women (47.3% vs 33.3%, $p = .013$). Betablockers were also given more often to male patients than to female patients (24.0% vs 12.7%, $p = .011$).

Hypothesis five reported that the mean length of stay in the hospital for men was 6.48 days, and for women it was 7.17 days. The maximum length of stay for men was 25 days versus 57 days for women. Furthermore, men had less than one percent chance of dying than women with MI (.7% vs 3.3%). The sixth hypothesis revealed that men received coronary angiogram and CABG more often than women (91.3%, 21.0% vs 88.0%, 15.3%); however, the result was not significantly different.

The chapter concluded with a discussion of additional research findings. This study indicated that patients who reported chest pain received morphine sulfate more often than those patients who did not report chest pain ($p = .000$). Men who reported chest pain received morphine sulfate more than those men who did not report chest pain ($p = .00479$). Women who reported chest pain received morphine sulfate three times more than those women who did not have chest pain ($p = .013$).

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter summarizes the study and discusses the significance of the study findings related to the six hypotheses and the conceptual framework. The limitations of the study, conclusions, implications for nursing, and recommendations for further study are discussed in the latter portion of the chapter.

Summary of the Study

The purposes of this study were to compare the differences in the presenting symptoms, treatment, and outcome of MI between men and women. The study sample consisted of 300 patients (N = 300) who were admitted to the emergency department at a county hospital in the Southwest area of the United States. Data were collected through chart review from January 1, 1998 to July 1, 2000. Frequency distributions, chi-square, and t-tests were used to analyze the study data.

The present study found that chest pain, shortness of breath, sweating, and left arm pain were the most common symptoms on presentation for both men and women. However, men presented with chest pain more often than women did (92% vs 83.3%, p =.022). This study also found a difference in the electrographic changes between men and women. Men had more Q wave changes than their women counterparts (p = .019). There was no difference in the cardiac enzyme levels between both genders. The present study

also found that the average age for women who experience their first MI was two and a half years older than men. The most common treatments given to men and women in the emergency department were oxygen, nitrates, morphine sulfate, and heparin. A difference in the treatment between men and women as found in this study was that men received morphine sulfate and betablockers more often than women. Within this study, there was no significant difference in the length of stay in the hospital between men and women, no significant difference in coronary diagnostic and therapeutic procedures, or outcome between both genders.

Discussion of the Findings

Difference in the Presentation of MI

The four most common symptoms on presentation for both men and women were chest pain, shortness of breath, sweating, and left arm pain. These findings are in concordance with those previously reported by Micevki (1996) where chest pain, shortness of breath, sweating, and left arm pain were the common symptoms presented by both genders. Penque et al. (1998) also found chest pain and shortness of breath as commom symptoms of MI in men and women. This indicates that chest pain continues to be a leading symptom of MI in both genders.

Research studies on the different symptoms of MI experienced by men and women have been reported (Meischke et al., 1998; Micevski, 1996; Penque et al., 1998). This study found a significant difference regarding chest pain between men and women with MI. Ninety two percent of men presented more frequently with chest pain than 83.3% of women. A possible explanation for this could be that a woman's chest pain tends to be vaguer than the type of chest pain men experience (Margo & Penque, 1999). A woman may perceive pressure on the chest as pain; whereas, some health professionals may dismiss it as a sign of stress. Meischke et al. (1998) support the findings of this

study. Their study indicates that chest pain is reported more often in men than in women. However, their study found that women presented with more shortness of breath and nausea than men, which is not consistent with the findings of the present study. Penque et al. (1998) found that women reported with back pain, dyspnea, and loss of appetite more often than men, which is not in agreement with this study. A possible explanation for the inconsistencies in this study's findings and with those reported by Meischke et al. (1998), Micevski (1996), and Penque et al. (1998) could be the quality of documentation by the individuals assessing the patient upon presentation in the emergency department. Another explanation could be the presence of gender bias on the part of health care practitioners who are more likely to interpret women's complaints of chest pain or other symptoms as hypochondriacal behaviour (Rankin, 1997). In addition, the information in the chart may have been transcribed inaccurately (Mallory, 1997).

Difference in the Cardiac Enzyme Levels and Electrographic Changes in MI

A difference in the cardiac enzyme levels between men and women may have an impact on the treatment and management of MI. This study did not find a significant difference in the cardiac enzyme levels between men and women. A possible explanation for this could be that the cardiac enzyme levels after a myocardial infarction change overtime (Pagana & Pagana, 1990). The time frame for each patient's hospital admission and laboratory work-up may have been different. Another explanation could be that the sample of the present study was relatively small. Perhaps a larger population sample is needed to reflect enzymatic differences, if they exist.

In this study, a difference in the electrographic changes between men and women who are experiencing MI in the emergency department was noted. Twenty one percent of men had more Q wave changes than 11.3% of their women counterparts ($p = .019$). A possible explanation for the difference in the electrocardiogram between men and women found in the present study could be that more men may have had a previous MI, or men

may have had a transmural infarction more often than women. Transmural infarcts (MI involving the three layers of the myocardium) are large enough to create an inscription of a Q wave on the electrocardiograph (McCance & Huether, 1998). One of the inclusion criteria for the present study was to include those patients who had their first MI; however, information on whether or not the patient had suffered a previous MI or had a transmural infarction was not always documented in the history and physical sheet or physician's progress notes. The result of the present study on gender difference in the electrographic changes is not consistent with the study of Elhendy et al. (1999). In their research study, men had more ST-T abnormalities in the electrocardiogram than women with abnormal myocardial perfusion. The role of testosterone may be responsible for the difference on the electrographic pattern between men and women. Testosterone has a direct effect on the configuration and duration of ventricular repolarization (Bidoggia et al., 2000). Another possible explanation for the gender difference in the electrographic changes could be the difference in the cardiac anatomy of men and women. Women have smaller cardiac size and have diminutive coronary arteries (Beery, 1995; Khan et al., 1990).

Difference in the Mean Age of Patients with MI

A difference in the mean age of patients who experience their first MI was found in this study. Women were older than men by two and a half years. This finding is consistent with the study of Marrugat et al. (1998). In their study, women were eight years older than men who experience their first MI. Thomas and Braus (1998) report that women develop coronary artery disease later in their life than men. A possible explanation could be the protective effect of estrogen in women. Until menopause, women have significantly less coronary heart disease than age-matched males due to the influence of estrogen on plasma lipoproteins by raising the high density lipoprotein and lowering the low density lipoprotein cholesterol (Flavell, 1994).

Difference in the Treatment of MI

This study found that oxygen, nitrates, aspirin, morphine sulfate, and heparin were the most common treatments given to men and women in the emergency department. An explanation for this could be the facility's protocol on the treatment of MI in which these medications, except heparin, are the treatments given to all patients who are experiencing MI, unless contraindicated. Gender difference in the management of patients with MI has also been the issue of current cardiovascular research. A difference in the treatment given to men and women in the emergency department was found in this study. Morphine sulfate and betablockers were given more often to men than women. This result is congruent with previous research studies on the difference in the treatment given to men and women with MI. Dellborg & Swedberg (1993); Marrugat et al., (1998) found that men received betablockers, nitroglycerin, and thrombolytics more frequently than women. In this study, morphine sulfate was administered more often to men than women. This is perhaps due to the higher frequency of chest pain in men than in women, as indicated in this study. The American College of Cardiology/American Heart Association Task Force (ACC/AHA) guidelines for the management of patients with MI suggest that betablocker therapy should be given to patients with evolving MI to reduce morbidity and mortality (Ryan et al., 1996). Although there are no studies that show men benefit more than women from betablocker therapy, in this study more men received betablockers than women in the emergency department. There are two possible explanations for this. One reason could be due to the individual's physician's subjective preference for the treatment of MI. Another reason could be the presence of gender bias as indicated in previous studies (Marrugat et al., 1998; Yarzebski et al., 1996; Dellborg & Swedberg, 1993; Hsia, 1993).

Difference in the Outcome of MI

The present study found that there were no significant differences in the length of

stay in the hospital between men and women. The average length of stay for men was six days and seven days for women. Previous research shows that mortality in women is greater than in men during hospitalization following MI and that women who died were older than men (Marrugat et al., 1998; Vacarrino et al., 1998; Vacarrino et al., 1999; & Hochman et al., 1999). These findings are congruent with the frequencies found in the present study. There were more females who died in the hospital than males following MI (5 vs 1). Further research with a larger population sample and inclusion of older patients is warranted to determine whether the difference is statistically significant.

Difference in the Coronary Diagnostic and Therapeutic Procedures

In this study, there was no significant difference between men and women in regard to coronary angiogram, PTCA, and CABG. This finding is in contrast with previous research studies on gender bias in the management of MI. Men receive coronary angiogram, PTCA, and CABG more than their women counterparts (Steingart et al., 1991; Dellborg & Swedberg, 1993; & Maynard et al., 1992). Women are referred for coronary angiogram, PTCA, and CABG later in the course of their disease (Eysman & Douglas, 1993; Khan et al., 1990). Again, further research is warranted.

Relationship of Findings to the Neuman Systems Model

The findings of this study support the Neuman's Systems Model (1995). Stress and patient response to stress are two major components of this framework. Men and women's flexible and normal lines of defenses have been disrupted by MI as manifested by their presenting symptoms. The study partially supports the fact that there is a difference between the male and female client system in regard to the stress response from MI. Chest pain, shortness of breath, sweating, and left arm pain were the most common stress responses reported by both genders in the present study. However, more men reported chest pain than women did. Neuman (1995) states that the recognition of the symptoms and initiation of treatment in the secondary prevention will strengthen the

patient's lines of resistance and will prevent system instability or death. In this study, the common treatments given to men and women who are experiencing MI in the emergency department were oxygen, morphine sulfate, aspirin, nitrates, and heparin. More men received morphine sulfate and betablockers than women did. The recognition of the differing symptoms of men and women who are experiencing MI in secondary prevention is crucial. If symptoms are accurately recognized and appropriate treatments are provided, the patient's lines of resistance will be strengthened, resulting in protection from further illness or death.

Limitations of the Study

The study results cannot be generalized to the overall population because the sample was drawn from only one hospital in one geographic area with a relatively small sample (N = 300). Risk factors for coronary artery disease were not addressed.

A possible limitation of the study regards the information from the patient's chart. Data obtained from the patient's record may have been documented incorrectly or may have been influenced by the health care professional's bias prior to or at the time of hospitalization.

The Gender MI Data Collection Tool (GMIDCT) utilized in this study was developed by the researcher. Although the tool had an inter-rater reliability score of .97, it has not been tested in other studies, which possibly limits its reliability and validity for this study. Further research is needed with the use of the GMIDCT.

Conclusions

In light of the study's findings and limitations, the following conclusions are presented for this population:

1. Women experience less chest pain than men during MI.

2. Men present with Q wave changes more frequently than women with MI.
3. A difference in the treatment of MI exists between men and women. Women who are experiencing MI receive less morphine sulfate and betablockers than men.
4. Women are older than men when they experience their first MI.
5. Men and women who are hospitalized for MI undergo the same coronary diagnostic and therapeutic procedures.

Implications for Nursing

Nurses are in the front line of interaction with patients presenting to the emergency department. Nurses' knowledge regarding symptomatology of MI and its treatment and outcome can affect the plan of care for patients.

The findings of this study can help nurses, nurse practitioners, and other health care providers in the care of MI patients. Health care professionals should be aware that gender bias in the treatment of MI is a possibility. They should also be cognizant that men and women may present with multiple or different symptoms of MI. Assessment and diagnosis of MI is more complex in women than in men, since their presentation patterns are usually more variable (Rankin, 1997).

Based on the findings of this study, women may not report chest pain when experiencing MI. If women do not recognize their own presentation of MI as different from their partners or spouses, they may be less likely to report important clinical symptoms. Therefore, astute assessment by the nurses and the health care providers is crucial so that fair and more appropriate treatment will be provided to all patients experiencing a heart attack without gender bias. To reduce morbidity and mortality in women with MI, women should be treated exactly the same as men.

Nurses are in excellent position to educate patients and the public. Based on the findings of this study and those from previous research studies, nurses should educate

their patients on the symptoms of MI and the gender difference in the symptom presentation of MI. They should also advocate for more research to benefit the health of women and men. Although the risk factors for MI were not examined in this study, nurses should continue to provide routine teaching on their patients for the prevention of coronary artery disease. This would decrease mortality rates of men and women alike.

Recommendations for Further Study

Recommendations for further research studies are suggested based on the findings of this study:

1. Replicate the present study using a larger population sample in more than one hospital and from various geographical regions.
2. Investigate gender difference of MI symptoms using patient questionnaires.
3. Investigate possible differences in the perception of health care providers (such as emergency room staff nurses, nurse practitioners, physicians, and physician's assistants) regarding the presenting symptoms, treatments, and outcome in MI between male and female patients.
4. Examine women and men regarding their outcome after MI using a five-year longitudinal study.
5. Compare the pharmacological treatments given to men and women during their hospitalization following MI in more than one hospital unit (such as in a coronary care unit and while in an intermediate care unit).
6. Compare the cultural differences between men and women who have experienced their first MI.
7. Examine women and men for the presence of risk factors for MI.

Summary

Coronary heart disease continues to be the leading cause of death in men and women in the United States (American Heart Association, 1999). However, recent studies show that mortality in women is higher than in men following MI. Although this study did not show a significant difference in mortality between men and women, we should be aware that coronary heart disease is still the largest killer of women in the nation (American Heart Association, 1999). This study has shown that gender differences in the presentation and treatment of MI exist. Nurses and other health care professionals should be aware of the difference in the presenting symptoms of MI in men and women and they should also be alert to the presence of gender bias in the treatment of the disease. A fair treatment should be provided to both genders to minimize the morbidity and mortality from MI, especially in women.

Research studies that focus on women's cardiovascular health continue to be a challenge in the health care arena. As knowledge about women and heart disease increases, nurses and other health care professionals will gain new tools to combat and help prevent heart disease in women (Thomas & Braus, 1998).

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APPENDIX A

FIGURES

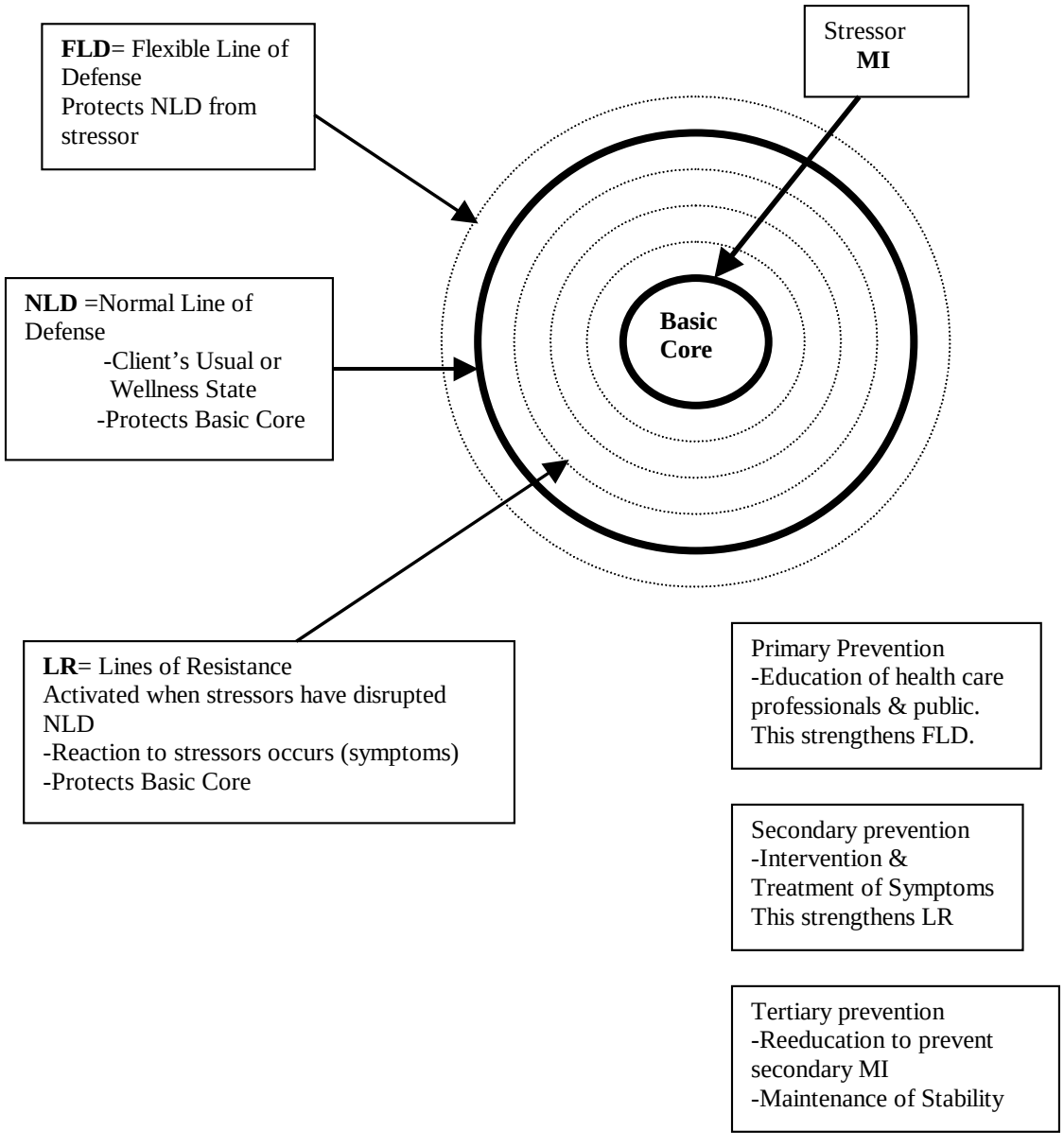

Figure 1. Illustration of a patient with MI using the Neuman Systems Model.

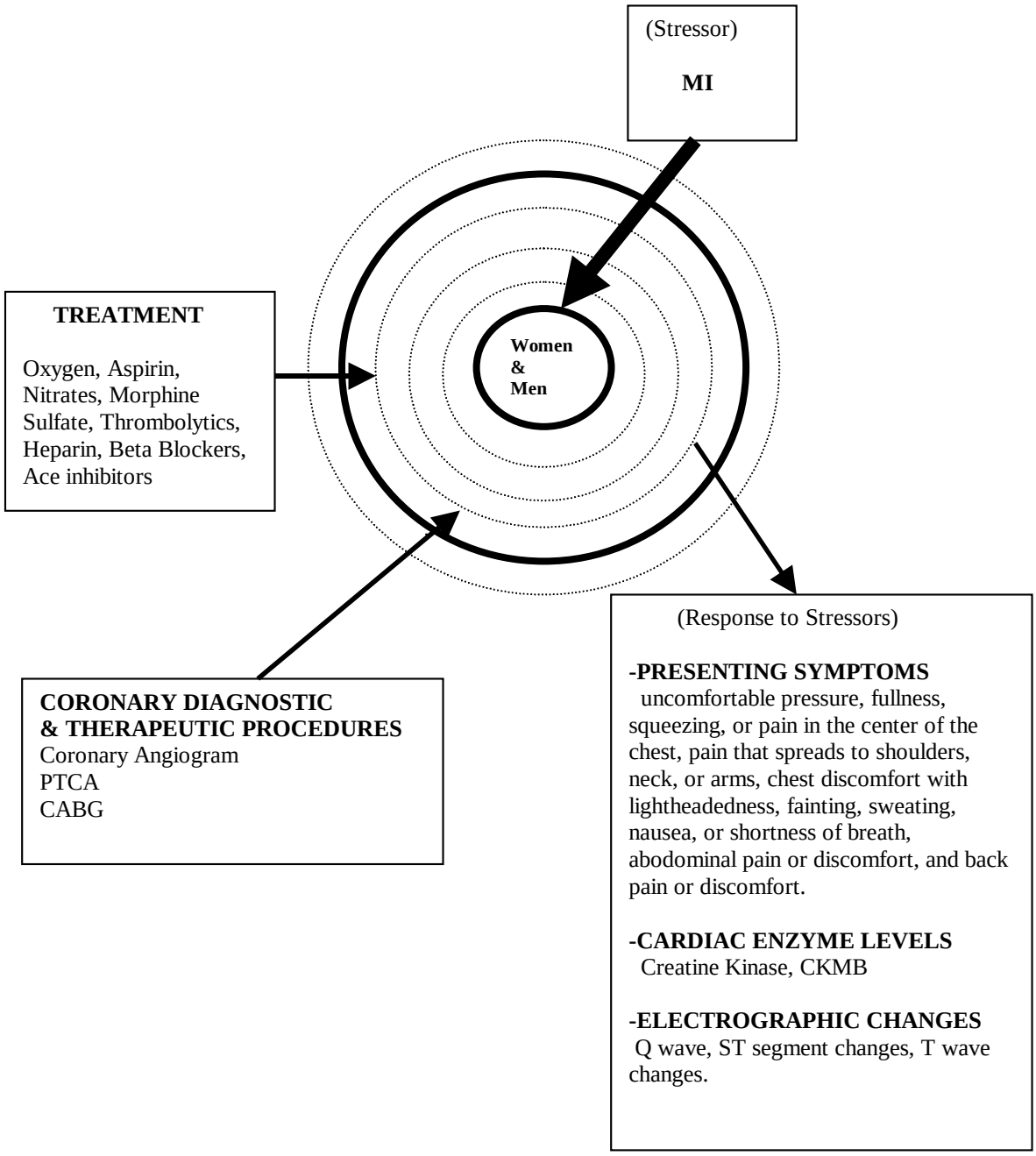

Figure 2. Application of the selected variables under study in the Neuman Systems

APPENDIX B

TABLES

Table 1 Frequencies of Age of Patients with MI by Gender (N=300)

Age in Years	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
25-30	0	0.0%	1	0.7%
31-36	2	1.3%	2	1.3%
37-42	14	9.3%	8	5.3%
43-48	32	21.3%	17	11.3%
49-54	42	28.0%	31	20.7%
55-60	32	21.3%	48	32.0%
61-65	28	18.7%	43	28.7%

Table 2 Frequencies of Presenting Symptoms of Patients with MI by Gender (N=300)

Variable	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
pain in the center of the chest	138	92.0%	125	83.3%
shortness of breath	72	48.0%	74	49.3%
sweating	62	41.3%	56	37.3%
pain in L arm	60	40.0%	62	41.3%
nausea	46	30.7%	60	40.0%
pain spreading to shoulders	22	14.7%	14	9.3%
pain in the neck	18	12.0%	25	16.7%
pain in R arm	15	10.0%	20	13.3%
uncomfortable pressure	15	10.0%	16	10.7%
mid upper back pain/discomfort	8	5.3%	16	10.7%
lower back pain/discomfort	5	3.3%	9	6.0%
L jaw pain	5	3.3%	8	5.3%

Table 2 (cont) Frequencies of Presenting Symptoms of Patients with MI by Gender (N=300)

Variable	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
chest discomfort with lightheadedness	5	3.3%	6	4.0%
R jaw pain	4	2.7%	5	3.3%
squeezing	1	0.7%	2	1.3%
abdominal pain/discomfort	0	0.0%	2	1.3%
intrascapular pain	0	0.0%	1	0.7%
fainting	0	0.0%	1	0.7%
fullness	0	0.0%	0	0.0%
other (vomiting, dizziness, weakness, cough)	41	27.3%	53	35.3%

Table 3 Chi-Square Results of Presenting Symptoms of Patients with MI by Gender (N=300)

Variable	X^2 Value (df=1)	Level of Significance
uncomfortable pressure	0.036	0.850
fullness	a	
squeezing	b	1.000
pain in the center of the chest	5.210	0.022
pain spreading to shoulders	2.020	0.155
pain in the neck	1.330	0.249
pain in R arm	0.809	0.369
pain in L arm	0.055	0.814
nausea	2.859	0.091
sweating	0.503	0.478
shortness of breath	0.053	0.817
fainting	b	1.000

a. No statistics are computed because fullness is a constant.

b. Fisher's Exact Test computed because of low expected counts.

Table 3 (cont) Chi-square Results of Presenting Symptoms of Patients with MI by Gender (N=300)

Variable	X^2 Value (df=1)	Level of Significance
chest discomfort with lightheadedness	0.094	0.759
intrascapular pain	b	1.000
R jaw pain	b	1.000
L jaw pain	0.724	0.395
mid upper back pain/discomfort	2.899	0.089
lower back pain/discomfort	1.199	0.274
abdominal pain/discomfort	b	0.498
other (vomiting, dizziness, weakness, cough)	2.231	0.135

b. Fisher's Exact Test computed because of low expected counts.

Table 4 T-test Results of Cardiac Enzyme Levels of Patients with MI by Gender (N=300)

Variable	N	M	SD
CK-MB levels			
Men	150	42.324	107.760
Women	150	32.569	72.455

Variance	t	df	Sig. (2-tailed)
Assumed Equal	0.920	298	0.358

Table 5 Frequencies of Electrographic Changes in Patients with MI by Gender (N=300)

Variable	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
Q wave changes	32	21.3%	17	11.3%
ST segment changes	110	73.3%	117	78.0%
T wave changes	52	34.7%	50	33.3%

Table 6 Chi-Square Results of Electrographic Changes in Patients with MI by Gender (N=300)

Variable	X^2 Value (df=1)	Level of Significance
Q wave changes	5.488	0.019
ST segment changes	0.887	0.346
T wave changes	0.059	0.807

Table 7 T-test Results of Mean Age of Patients with MI by Gender (N=300)

Variable	N	M	SD
Age			
Men	150	52.473	7.547
Women	150	54.987	7.568

Variance	t	df	Sig. (2-tailed)
Assumed Equal	-2.880	298	0.004

Table 8 Frequencies of Treatment Received by Patients with MI by Gender (N=300)

Variable	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
Nitrates	136	90.7%	126	84.0%
Oxygen	132	88.0%	122	81.3%
Heparin	117	78.0%	108	72.0%
Aspirin	76	50.7%	61	40.7%
Morphine Sulfate	71	47.3%	50	33.3%
Thrombolytics	40	26.7%	35	23.3%
Beta blockers	36	24.0%	19	12.7%
Ace inhibitors	3	2.0%	0	0.0%

Table 9 Chi-Square Results of Treatment in Patients with MI by Gender (N=300)

Variable	X^2 Value (df=1)	Level of Significance
Oxygen	2.568	0.109
Aspirin	3.023	0.082
Nitrates	3.013	0.083
Morphine Sulfate	6.108	0.013
Thrombolytics	0.444	0.505
Heparin	1.440	0.230
Beta blockers	6.434	0.011
Ace inhibitors	a	0.247

a. Fisher's Exact Test computed because of low expected counts.

Table 10 T-test Results of Outcome of Patients with MI by Gender (N=300)

Variable	N	M	SD
Length of Stay			
Men	150	6.487	3.612
Women	150	7.173	6.094

Variance	t	df	Sig. (2-tailed)
Assumed Equal	-1.187	298	0.236

Table 11 Frequencies of Outcome in Patients with MI by Gender (N=300)

Variable	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
Death	1	0.7%	5	3.3%

Table 12 Frequencies of Coronary Diagnostic and Therapeutic Procedures in Patients with MI by Gender (N=300)

Variable	Frequencies			
	Men (n=150)		Women (n=150)	
	Count	Percent	Count	Percent
Coronary Angiogram	137	91.3%	133	88.7%
PTCA	80	53.3%	80	53.3%
CABG	32	21.3%	23	15.3%

Table 13 Frequencies and Chi-Square Results of Morphine Sulfate Treatment by Chest Pain Symptom in Patients with MI by Gender (N=300)

Variable	Frequencies			
Received Morphine Sulfate	Chest Pain		No Chest Pain	
	Count	Percent	Count	Percent
All subjects (n=121)	117	96.7%	4	3.3%
Men (n=71)	70	98.6%	1	1.4%
Women (n=50)	47	94.0%	3	6.0%

Variable	X^2 Value (df=1)	Level of Significance
Received Morphine Sulfate		
All subjects	15.285	0.000
Men	7.958	0.005
Women	6.144	0.013

APPENDIX C

GENDER MI DATA COLLECTION TOOL

The Gender MI Data CollectionTool

I. Demographics:

1. Identification Code: _____
2. Gender: Male ___ Female ____
3. Date of Admission: _____
4. Date of Discharge: _____
5. Deceased: ____Yes _____No
6. Age: ____

II. Cardiac Markers:

1. Electrographic changes: (1=present, 0= not present)

   Q wave ____

   ST segment changes ____

   T wave changes ____

2. Cardiac Enzymes:

   ____ CKMB fraction

III. Presenting Symptoms: (1=present, 0=not present)

___ uncomfortable pressure

___ fullness

___ squeezing

___ pain in the center of the chest

___ pain spreading to shoulders

___ pain in the neck

___ pain in R arm

___ pain in L arm

___ nausea

___ sweating

___ shortness of breath

___ fainting

___ chest discomfort with lightheadedness

___ intrascapular pain

___ R jaw pain

___ L jaw pain

___ mid upper back pain/discomfort

___ lower back pain/discomfort

___ abdominal pain/discomfort

___ other

IV. Treatment Received: (1=received, 0=not received)

___ Oxygen

___ Aspirin

___ Nitrates

___ Morphine Sulfate

___ Thrombolytics

___ Heparin

___ Beta blockers

___ Ace inhibitors

V. Coronary Diagnostic and Therapeutic Procedures: (1 = received, 0= not received)

___ Coronary Angiogram

___ PTCA

___ CABG

APPENDIX D

APPROVAL LETTERS

Approval Letters

VITA

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