This is to certify that the

thesis entitled

DELAYS IN THE BEHAVIOUR OF HEALTH SEEKING ACTIVITY FOR INDIVIDUALS WITH SYMPTOMS OF ACUTE MYOCARDIAL INFARCTION: IS THERE A GENDER DIFFERENCE?

presented by

Kathleen Sue Krol

has been accepted towards fulfillment of the requirements for

Masters of Science degree in Nursing

Major professor

Date 5/10/98

DELAYS IN THE BEHAVIOR OF HEALTH SEEKING ACTIVITY FOR INDIVIDUALS WITH SYMPTOMS OF ACUTE MYOCARDIAL INFARCTION: IS THERE A GENDER DIFFERENCE?

By

Kathleen Sue Krol

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE IN NURSING

College of Nursing

1998

ABSTRACT

DELAYS IN THE BEHAVIOR OF HEALTH SEEKING ACTIVITY FOR INDIVIDUALS WITH SYMPTOMS OF ACUTE MYOCARDIAL INFARCTION: IS THERE A GENDER DIFFERENCE?

By

Kathleen Sue Krol

Coronary artery disease remains the number one killer in both men and women in the United States. The previous two decades have shown drastic changes in the treatment of acute myocardial infarction with the advent of thrombolysis and coronary reperfusion strategies. Rapid identification and treatment of acute myocardial infarction greatly reduces the mortality and morbidity associated with this acute event, with the optimal benefit time for treatment within the first hour from symptom onset. Unfortunately, many patients delay in seeking medical care and miss the maximal benefits of reperfusion.

Pre-hospital delay tends to be increased for certain sub-populations. Hypertension, minorities and having a co-morbid disorder of congestive heart failure were associated with prolonged pre-hospital delay, while a history of hypercholesterolemia was associated with a decreased pre-hospital delay interval.

Primary care practitioners need to identify those patients at risk for prolonged pre-hospital delay and educate the public about action to take if a family member experiences cardiac symptoms.

DEDICATION

To my husband Kevin,

and my daughters Jessica and Adriana,

Do not ever stop laughing!

For in joyful laughter, all wounds are healed and the soul rejoices;

Do not ever stop dreaming,

For in our dreams the world will become a better place.

Thank-you for helping me find one of mine.

ACKNOWLEDGMENTS

This thesis represents the culmination of a long and difficult learning process to obtain my Masters of Science in Nursing. There have been several individuals who have supported me throughout this process for which I am eternally grateful. Their guidance, assistance and encouragement have assisted me in completing this course of study.

A sincere appreciation to Dr. Manfred Stommel who was the chairperson for my thesis committee. His patience, guidance and advice brought me through countless revisions to bring this thesis to its end.

Gratitude is also due Dr. Georgia Padonu and to Brigid Warren, MSN for their constructive assistance in reviewing the thesis content and encouraging deeper analysis of nursing theory with advanced nursing implications.

A very special thank-you is given to the "Holland Seven". Without your constant support of sharing your own frustrations and successes; I would never have succeeded.

Thank-you is also due to the family of Holland Family Medicine. Their interest, words of support and understanding in allowing flexible scheduling with my work schedule is sincerely appreciated.

To my parents, Harold and Hazel Dirkse, who first believed in my success and encouraged me more than 25 years ago; your nurturing is continuous and I find myself truly blessed. Thank-you for always listening and making time to just "be there".

A long overdue expression of humble gratitude is for Bonnie J. Osborn, RN, whose wisdom and understanding during a certain crisis in my life gave me a chance to have a fulfilling career, and now allows me to claim this personal achievement. I hope you never have regrets.

And finally, to my husband Kevin, and my daughters Jessica and Adriana, who kept after me to get my thesis done, and who missed me when I spent hours in the library or in front of the computer, I cannot say thank-you enough. Your love and support are much more than what I deserve.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AHA	American Heart Association
AMI	Acute Myocardial Infarction
APN	Advanced Practice Nurse
CABG	Coronary Artery Bypass Graft
CAD	Coronary Artery Disease
CHD	Coronary Heart Disease
CHF	Congestive Heart Failure
CK	Creatine Phosphokinase
CK-MB	Creatine Phosphokinase - Myocardial Band
CVA	Cerebral Vascular Accident {Stroke}
CVD	Cardiovascular Disease
DM	Diabetes Mellitus
DRG's	Diagnostic Related Groups
ECC	Emergency Cardiac Care
EKG	Electrocardiogram
EMS	Emergency Medical System
HBM	Health Belief Model
HCH	Holland Community Hospital
HMO	Health Maintenance Organization
HPI	History of Present Illness
HTN	Hypertension
IMNP	Illustrated Manual of Nursing Practice

LIST OF ABBREVIATIONS (cont.)

JCAHO . . . . Joint Commission of Accreditation of Hospitals

MI . . . . Myocardial Infarction

MIDAS . . . . . Medical Information Data Assessment Systems

NHAAP . . . . National Heart Attack Alert Program

NHLBI . . . . National Heart, Lung and Blood Institute

NRMI 2 . . . . National Registry of Myocardial Infarction 2

PE . . . . Physical Exam

PPO . . . . Preferred Provider Organization

PTCA . . . . Percutaneous Transluminal Coronary Angioplasty

REACT . . . . . . Rapid Early Action for Coronary Treatment

SES . . . . Social Economic Status

SPSS . . . . . Statistical Package for the Social Sciences

WHO . . . . World Health Organization

INTRODUCTION

Coronary heart disease (CHD) continues to be the leading cause of death for both men and women in the United States according to the National Heart Attack Alert Program (NHAAP), an interdisciplinary team charged with the goal of reducing morbidity and mortality associated with acute myocardial infarction (AMI). As many as 1.25 million people will experience an AMI each year and nearly 500,000 will die suddenly and before hospital treatment (National Institutes of Health, 1993).

The previous two decades have shown drastic changes in the medical therapy for people suffering from an acute myocardial infarction (AMI). With the widespread advent of systemic thrombolytic therapy in the early 1980's and mechanical reperfusion through primary angioplasty (percutaneous transluminal coronary angioplasty [PTCA]), treatment of patients suffering an AMI has become dependent on early access to care. This time factor is most critical in the successful management of achieving maximal myocardial salvage with associated reduction in morbidity and mortality.

Prior to the medical therapy of thrombolysis and mechanical reperfusion strategies, the management of AMI was mostly passive and reactive, with medical health personnel monitoring the natural evolution of an AMI, and responding to complications as they occur (Dracup, Moser, Eisenberg, Meischke, Alonzo, & Braslow, 1995). Most deaths from AMI occur within the first few hours after symptom onset. Since the 1960's and the development of coronary care units, it was realized that prompt recognition and treatment of arrhythmias could prevent cardiac death by terminating lethal heart rhythms, but there was no treatment to prevent myocardial cell death. Currently, with early diagnosis and treatment, the natural course of an AMI can not only be treated, but be altered. This can often limit the extent of damage, and subsequently morbidity and mortality. With the advent of thrombolytic therapy treatment and PTCA, the issue of delay before treatment is intensified.

The "golden window of opportunity" for thrombolysis or PTCA is best defined as the first hour after onset of symptoms with the time-to-benefit curve very steep. Desired benefits diminish rapidly after the first two hours, and diminish incrementally out to twelve hours after onset of symptoms (Lambrew, 1994). Unfortunately, the majority of patients delay seeking medical care and miss the benefits afforded by rapid diagnosis and treatment.

Extensive international investigative trials of thrombolytic therapy and PTCA have concluded that reperfusion therapy with thrombolytic agents is now the standard of care for patients with AMI who meet certain criteria and have no contraindications to this therapy. Individuals with contraindications to thrombolysis may benefit from reperfusion through PTCA (Lambrew, 1994).

The advantages of early reperfusion therapy are clear. Despite these advantages, data from published trials indicate that only 3%-10% of patients are treated within 60 minutes after symptom onset. In published studies, the median delays in seeking care range from 2-6.4 hours. Regrettably, only a minority of patients with AMI receive thrombolytic therapy, in part because of delays in seeking treatment (Meischke, Eisenberg, & Larsen, 1993).

Delay in treatment of patients with AMI is associated with increased morbidity and mortality. This delay of treatment can be divided into several phases: 1) patient delay; 2) emergency medical service delay; and 3) hospital delay, with patient delay in seeking care as the largest component (Ho, 1991). Patient delay, or pre-hospital delay, is an important cause of coronary mortality.

Initial efforts of the NHAAP were aimed at educating personnel of the emergency medical system (EMS), (phase II), and health professionals, (phase III), to rapidly identify and treat patients with AMI, thereby reducing time to treatment by the EMS and hospital teams. The result was a published guideline for these health professionals in 1993.

In spite of these strong efforts, a fundamental barrier to treatment of individuals with signs and symptoms of an AMI is the delay in treatment seeking behavior by many patients, (phase I). This pre-hospital delay is a substantial problem. Studies have suggested that delay time appears to be longer for women, older adults, African-Americans and those with a medical history of angina, hypertension (HTN) or diabetes mellitus (DM) (Alonzo, 1986; Dracup & Moser, 1991). Conflicting reports have been published by Schmidt and Borsch, (1990) and Meischke et al. (1993) regarding characteristics that may describe the population of individuals who delay seeking medical help.

Community outreach programs have been suggested as the appropriate intervention strategy in educating high risk individuals to develop an action plan should they experience symptoms associated with AMI. However, no community awareness program developed to date has resulted in earlier, more consistent recognition of symptoms by patients and an earlier decision to call emergency medical services (Lambrew, 1997).

Successful awareness programs may well require the targeting of specific high-risk groups; but our knowledge of who they are and how to identify them is still very limited.

Purpose of Study

The purpose of this study is to determine the relationship of selected variables and sociodemographic factors to the pre-hospital delay interval. Identifying predictor variables that may contribute to patient delay is an important first step towards the development of interventions that reduce time to treatment in high risk populations. Identifying these patient variables can be valuable in the development of educational programs targeted at specific subpopulations. The research question is: What sociodemographic and descriptive characteristics of patients predict variations in the time from symptom awareness of AMI to the seeking of medical intervention? Because of recent increased concern about women and coronary heart disease, a major focus of this investigation will be on gender differences within the context of these selected sociodemographic and descriptive variables.

Literature Review

Diagnostic Criteria

A myocardial infarction is the irreversible cell damage and death of myocardial tissue as a result of coronary artery occlusion by a thrombus or emboli, coronary artery spasm, severe hematological and coagulation disorders, myocardial contusion or congenital coronary artery anomalies (Illustrated Manual of Nursing Practice [IMNP], 1994).

After infarction, damaged muscle cells release significant amounts of creatine phosphokinase (CK). An isoenzyme of CK is strictly found in heart tissue and is labeled CK-MB(creatine phosphokinase - myocardial band). Elevated levels of CK-MB reliably indicate acute MI; usually rise within four hours of symptom onset, peak after twenty hours, and remain elevated up to seventy-two hours (IMNP, 1994). Newer bio-markers, such as myoglobin and troponin, that rise earlier in the AMI process have been introduced as possible alternative diagnostic indicators, but the gold standard remains total CK and CK-MB which will be used for this study.

As a result of cell death, the remaining myocardial tissue is under increased demand to maintain adequate cardiac output. The result of this insult may lead to sudden death related to a disturbance in electrical conduction and/or hemodynamic instability. Immediate treatment is imperative to stabilize these systems, limit infarct size and reduce morbidity and mortality.

Since CK-MB may not show a significant rise during the "golden hour" of treatment, other diagnostic criteria, specifically the patient history, history of present illness (HPI), physical exam (PE), and the electrocardiographic (EKG) evaluation are used in the diagnosis of AMI. The World Health Organization (WHO, 1959) has declared three diagnostic criteria for AMI; specifically clinical history, elevated cardiac enzyme levels and EKG changes.

The patient health history with knowledge of the HPI is an extremely important part of the critical reasoning skills in establishing a diagnosis. The health history with HPI needs to be obtained rapidly and concurrently with a thorough physical examination and EKG evaluation while knowing that a delay in time to treatment increases risk for more severe morbidity and possible mortality. It is the primary vehicle by which the practitioner establishes rapport with the client and identifies health needs and problems within the context of one's physical, emotional, social and spiritual environments.

The EKG is a graphic recording of the electrical currents that traverse the heart and initiate its contraction (Stedman's 1995, p. 550). When the myocardium is insulted through a disruption in blood flow resulting in ischemic or infarcted tissue, the electrical current may also be disrupted and may be reflected on the EKG, thus, it is an important diagnostic tool. However, of the 700,000 patients with AMI who are discharged from hospitals across the United States every year, more than half presented with non-diagnostic EKG's (Warner, 1996). Thus, it is important to integrate the patient history, HPI, and physical exam with the cardiac bio-markers and EKG's.

Pre-hospital delay

The outcome variable to be focused on in this study is the pre-hospital delay in patients diagnosed with AMI. It is defined as the time of awareness of symptom onset to the time of emergency department arrival (Reilly et al., 1994).

Most major research studies on CHD, including those dealing with pre-hospital delay in seeking medical evaluation have been conducted on white, male, middle class subjects. For example, the Veterans Administration Cooperative Study (n=686), the Multiple Risk Factor Intervention Trial, also know as "Mr. Fit" (n=13,000), the Physician's Health Study (n=22,000), and the Harvard School of Public Health survey (n=45,000) are all important landmark studies but not one woman is included (Diethrich & Cohen, 1992, p. 11-16). This fact limits the ability to generalize findings to other races, females and those of lower incomes (without health insurance). The few studies that have been conducted indicate that delays in seeking medical care may be increased for members of other races, low social economic status (SES), the elderly, females and those with co-morbid diseases, in particular HTN, angina, previous AMI, DM and CHF (Alonzo, 1986; Cooper, Simmons, Castaner, Prasad, Franklin, & Ferlinz, 1986; Clark Bellam, Shah, & Feldman, 1992; Ghali, Cooper, Kowalty, & Liao, 1993; Lee, 1997).

Multiple variables are related to the decision of an individual to seek medical intervention including: 1) sociodemographic variables: ethnicity, gender, age, primary payer for health care, and marital status; 2) health status: co-morbid conditions including a family history of coronary artery disease (CAD), past myocardial infarction (MI), hemodynamic stability, severity of chest pain, hypertension (HTN), angina, congestive heart failure (CHF), history of PTCA or coronary artery bypass graft (CABG) surgery, stroke (CVA), diabetes mellitus (DM), current smoker, and/or hypercholesterolemia (Dracup et al., 1995); 3) symptom context: time of day, day of week, activity, bystanders present, ease of access; 4) perceived benefits of ED evaluation; and 5) perceived barriers to ED evaluation.

Sociodemographic Variables

Ethnicity. Cooper and associates studied a population of patients admitted to Cook County Hospital in Chicago serving the poor and working class minority where 85% were African-Americans, and Hispanics represented the second largest ethnic group. Median time from symptom onset, based on patient recall, to arrival at the hospital was 6 hours, with a mean time of 21 hours for females, and 24 hours for males. Compared to studies among white populations, the median time was twice as long and the mean time was three times as long (Dracup et al., 1995). Ghali and associates reported similar findings when studying a population of mainly African-Americans and the underprivileged with significant pre-hospital delays; mean 11.3 hours with range from 0-18 hours, and Clark and associates reported longer delay times for African-Americans (mean 13.1 hours with range from 0-27.5 hours, median 3 hours) and Hispanics (mean 12.4 hours, range 0-19.3 hours and median 4 hours) than for whites (mean 3.3 hours, range .4-6.2 hours and median 2 hours). Alonzo, (1986) found delay times for African-Americans longer than whites, while Turi and associates found emergency room arrival to be identical when comparing mean time of non-whites and whites (Turi, Stone, Muller, Parker, Rude, Raabe, Jaffee, Hartwell, Robertson & Braunweld, 1986). In these studies, the mean time can be considerably longer because individual patients may wait many hours or even days before coming to the hospital for treatment, thus skewing the data to the right.

The results of these studies clearly represent inconsistent conclusions regarding pre-hospital delays based on ethnicity.

Gender. Many investigations have failed to include gender as a variable that influences pre-hospital delay. In studies that have, conflicting results are reported on the role gender plays in influencing pre-hospital delay. Published reports either emphasize no relationship between gender and time of delay (Moss & Goldstein, 1970; Gilchrist, 1973; Schroeder, Lamb, & Hu, 1978; Maynard, Althouse, Olsufka, Ritchie, Davis, & Kennedy, 1989; Wielgosz, Nolan, Earp, Biro, & Wielgosz, 1988; Moss & Goldstein, 1970; Simon, Feinleib, & Thompson, 1972; Matthews, Siegel, Kuller, Thompson, & Varat, 1983; Kenyon, Ketterer, Gheorghiade, & Goldstein, 1991), or conclude that women delay longer than men (Alonzo, 1986; Moss, Wynar, & Goldstein, 1969; Turi et al., 1986; Schmidt & Borsch, 1990; Meischke, Eisenberg, & Larsen, 1993; Cunningham, Lee, & Cook, 1989; Ell, Haywood, Sobel, deGuzman, Blumfield, & Jia-Ping, 1994). In those studies that have revealed a gender difference in pre-hospital delay time, females consistently delay longer than males.

Some investigators revealed no statistical significance in pre-hospital delay, but differences reported were clinically significant. For example, Hackett and Cassem

(1969) studied 64 men and 24 women admitted for evaluation of AMI, and found no statistical difference in delay time, however women delayed a median of 1 hour longer than men. Karlson and associates (1990), n=613 males, and n=295 females, found similar results with no statistical significance but median delay was 1 hour longer in women.

In 1969, Moss and associates reported women waited 3.3 hours longer than men in seeking medical care for cardiac symptoms. Alonzo (1986) reported a median of 47 minute longer delay from symptom onset to medical evaluation for women, and Schmidt and Borsch (1990) reported that half the women in their study delayed more than 6 hours in reporting for medical care. In a large study of 7,734 individuals reporting to an emergency room with chest pain, researchers found that females who were diagnosed as having an AMI, delayed longer by one hour than males who were diagnosed as having an AMI (Cunningham et al., 1989). Turi and associates (1986), Meischke and associates (1993), and Ell and associates (1994) all reported increased delay intervals in women when compared to men.

Age. The evidence regarding the effect of age on delay time is conflicting, but the general pattern seems to be that the older one is, the greater the delay time seen. Some studies have reported that there is no relationship between age and pre-hospital delay while others have found a direct relationship. Hackett and Cassem, (1969) conducted studies on 100 randomly selected patients diagnosed with an

AMI and found that the age of the patient was not significantly related to the pre-hospital delay interval. A Canadian study on 201 consecutive patients admitted for AMI found age not related to pre-hospital delay time (Weilgosz et al., 1988). Moss and Goldstein (1970) of the United States interviewed 160 patients diagnosed with AMI and found no association between pre-hospital delay and age. These studies have relatively small samples, and therefore lack the statistical power to detect significant differences.

Alonzo (1986), Simon and associates (1972), Matthews and associates (1983), Kenyon and colleagues (1991), Goldberg and colleagues (1992) and Schwarz and associates (1994) all report no relationship between age and pre-hospital delay time from symptom onset to medical evaluation.

In larger multicenter studies such as the Multicenter Investigation of Limitation of Infarct Size (MILIS), where n=778 patients with AMI, Turi and associates (1986) reported that older age contributed to increased delay time, a relationship that was statistically significant. A large Seattle registry for patients with AMI (n=3258) found that older patients delay longer from symptom onset until medical evaluation (Weaver, Litwin, Martin, Kudenchuk, Maynard, Eisenberg, Ho, Cobb, Kennedy & Wirkus, 1991). Karlson, Herlitz, and Sjolin (1990), found that the median pre-hospital delay time for those under age 50 was 0.9-1.7 hours compared to 3.5-4.0 hours for those over the age of 70.

Moss, Wynar and Goldstein (1969), Maynard and associates (1989), Schmidt and Borst (1990), and Meischke and associates (1993) have found a direct relationship between age and prehospital delay with a longer delay interval in older patients.

Marital Status. Their are few reports in the literature regarding marital status and pre-hospital delay. More investigation has been focused on the witnesses or bystanders of the person suffering symptoms of AMI and their impact on pre-hospital delay. Alonzo (1986) found that the most frequently reported person to become aware that a person was having AMI symptoms was the spouse, when a spouse was available. Men were more likely to tell their spouse of their symptoms than women and, as age increases women were less likely to have a spouse to tell. Women were more likely to tell other family members of their symptoms (Alonzo, 1986).

Even when informing their spouse, the decision to seek medical care is not necessarily expedited. Alonzo (1986) found that informing their spouse actually lengthened pre-hospital delay time as opposed to informing a non-family member. Hackett and Cassem (1969) discovered that when non-family members were involved in the decision to seek medical care, the median delay time was two hours, but when family members were involved, the median pre-hospital delay interval extended to twelve hours.

Alonzo (1986) concluded that spouses may have more persuasion than non-family members, but they can be easily influenced to relinquish control or delay in calling for emergency medical services. Bystanders and co-workers are not as emotionally involved and may be more objective in evaluating symptomatology.

Socioeconomic status (Primary Payer). Socioeconomic status (SES) is usually measured by determination of education, income, occupation or a composite of these dimensions with education as the most commonly used measure in the United States (Winkleby, Jatulis, Frank & Fortman, 1992). SES is one of the strongest and most consistent predictors of a person's morbidity and mortality that persists across most diseases and continues throughout the lifespan. Education indicates skills needed for acquiring positive social, psychological, and economic resources (Winkleby et al., 1992), and accordingly a higher income.

Schmidt and Borsch (1990) studied 126 patients to evaluate factors affecting prehospital delay. Low income was one of the variables identified as an independent predictor for increase in the prehospital delay interval, and those with low income are less likely to carry health insurance. Little research has been conducted on the ability or inability to pay for health care in relation to pre-hospital delay time. Some studies have investigated socioeconomic status on pre-hospital delay and concluded that it has no effect (Wielgosz et al., 1988; Hackett &

Cassem, 1969; Simon, Feinlab, & Thompson, 1972; Matthews et al., 1983; Kenyon, 1991), but, some of these studies are dated and rising costs have been identified as barriers to health care services (McCullock & Melynk, 1988).

Cooper and associates (1986) and Gahli and associates (1993) studied African-Americans in hospitals serving the poor and underprivileged. Their findings suggest that delay may be more a result of socioeconomic disadvantage than an ethnic effect. Ell and colleagues (1994) support this view in their study of African-Americans: Patients who presented to a public hospital serving the economically disadvantaged delayed 2.5 times longer than African-American patients who presented to a private hospital. African-Americans who were poor *and* uninsured had significantly longer prehospital delay times than African-Americans with health insurance.

Medical care in the United States is financed through a complex network of private, government and personal resources. The effects of these payer types is not well understood in the decision to seek medical care. Variable health care policies exist within each primary payer source (insurance company), with some policies offering complete coverage for medical expenses while other policies from the same source have established partial payment plans. These partial payment plans usually expect a percentage of total costs to be borne by the recipient of the health care. It is not known if type of primary payer has a predictor value on prehospital delay for the person experiencing symptoms of

AMI. It is postulated that members of an HMO who need to consult with their primary practitioner before seeking evaluation at an emergency department may delay timely medical evaluation by attempting to make this initial contact, whereas individuals with other insurance coverage would bypass this preliminary step and present directly to the ED. Even though HMO's instruct to bypass this permissive step for true emergencies, the lay public may not always recognize their symptomatology as a true emergency. Further research is warranted for this variable.

Symptom Context

Circadian rhythms are body rhythms with a cycle length of approximately 24 hours duration (Arendt, 1989). Most physiological and biochemical variables are not constant over this 24 hour period, but rather show a rhythmic change. In cardiovascular functions, there are variations in heart rate, blood pressure, blood volume, blood viscosity and catecholamines during the day (Arendt, 1989). AMI's occur more frequently during normal working hours with several studies showing a significant peak in the morning waking hours, and a secondary peak at midnight (Figure 1) (Muller, 1989; Thompson, 1992).

The relationship between time of day when symptoms occur and pre-hospital delay is unclear. Some researchers report that daytime onset of symptoms increases delay (Alone, 1986), however others have demonstrated the opposite (Weilgosz et al., 1988). Night-time hours may be long,

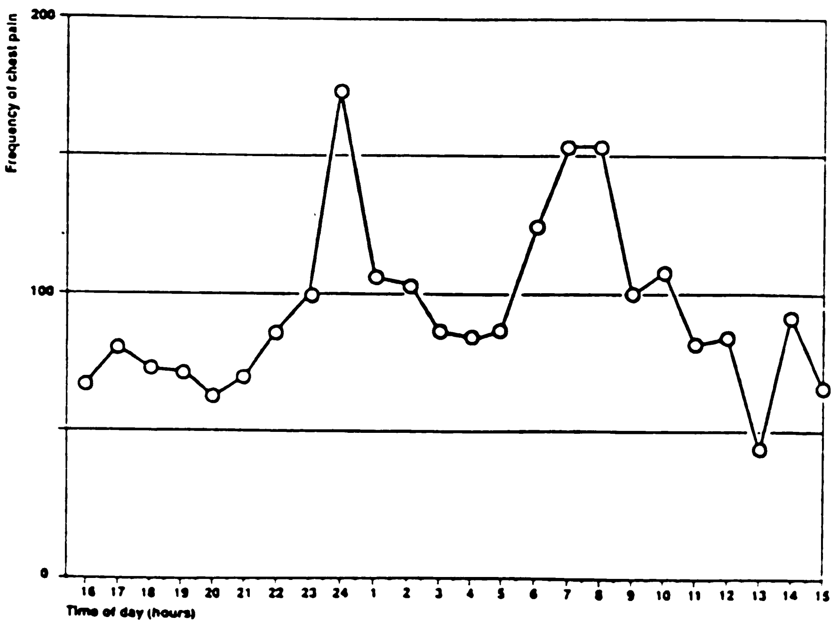

Figure 1: Frequency of chest pain to time of day from two pooled studies (n=2253). From Thompson, 1992.

empty and fearful when experiencing symptoms of AMI, which may motivate a certain population to earlier access to medical care. Others may try to wait until normal daytime hours for medical evaluation, wishing not to bother family, friends or physician in the middle of the night.

Conversely, when symptoms occur during normal waking hours, delay may be prolonged by an individual who wishes to "finish the task at hand", consult with physician office, or want to go home and "rest" to alleviate symptoms before presenting for emergency evaluation. Pre-hospital delay may be shortened by easier access to medical evaluation with open urgent care centers, workplace or occupational health centers, or by the influence of bystanders or co-workers.

Similarly, researchers have investigated the day of the week in regards to onset of symptoms of AMI. One study showed prolonged delay when symptoms occurred on a weekend day (Moss et al., 1969) where as another study revealed decreased delay associated with the weekend (Weilgosz et al., 1988). The patient's location; home, workplace, or at a leisure or sports event can also affect delay. Not wanting to interrupt social activities and fear of embarrassment can affect delay. The presence of friends and co-workers appears to shorten delay but the presence of a spouse or family member can increase delay (Meishke et al., 1995; NHAAP, 1993).

Significant Medical History

Risk factors for cardiovascular disease have been well documented early on in the Framingham Study; repeatedly and reliably confirmed in subsequent studies including the previously mentioned Multiple Risk Factor Interventional Trial, Physician's Health Study and the Harvard School of Public Health Survey (Diethrich & Cohen, 1992). How these risk factors affect pre-hospital delay is unclear.

Once an individual is diagnosed with coronary heart disease and/or has had an AMI in the past, he/she is likely to be familiar with the symptoms and the medical care system and may therefore be less likely to delay for recurrent symptomatology. However, past research has been quite consistent in revealing that past medical history had no effect on shortening delay time (Moss et al., 1969; Hackett & Cassem, 1969; Maynard et al., 1989; Leitch et al., 1989; Clark et al., 1990; Schmidt et al., 1990; Kenyon et al., 1991; Goldberg et al., 1992). Meischke, Eisenburg and Larsen have actually documented increased pre-hospital delay times for persons with diagnosis of angina or diabetes mellitus.

Schroeder and colleagues (1978) and Simon and associates (1972) in their independent studies of pre-hospital delay show an increase in the delay interval for patients with known angina, and similarly, Gillum and associates (1976) and Wielgosz et al. (1988) reveal an increase in prehospital delay for patients with diabetes mellitus. In large studies, Weaver et al. (19) and Turi et al. (1986) concur that having a medical history of angina, DM, HTN or previous cardiac disease increases the prehospital delay interval.

Little or no research was identified in studying known and well documented risk factors for AMI, (i.e. smoking, elevated cholesterol and a positive family history) in pre-hospital delay intervals. Further research is needed in determining any relationship between smoking and pre-hospital delay as well as with hypercholesterolemia and a known positive family history of heart disease.

Since most studies of treatment delays are based on fairly small, locally specific non-random samples, results are often inconsistent reflecting specific populations. At this stage, there is a need for more replication with different populations.

Differences in methodologies, study limitations, and variable definitions of prehospital delay may account for the conflicting results found in some studies. Geographical differences in accessing the medical system make comparisons across the studies difficult. Retrospective interviews or questionnaires requires the researcher to depend on patients memory, which may be inaccurate related to the emotional and physical stresses of that time.

Theoretical Framework

The theoretical orientation for this study is derived from The Health Belief Model (HBM). The HBM was first introduced in the 1950's by Hochman, Kegels, Levanthol and Rosenstock. These original developers of the HBM were concerned with issues of: a) non-compliance with health and medical care recommendations; b) why some people seek health care and others do not; c) what factors were seen as barriers to health care; and d) can health related behaviors be changed? (Mikhail, 1981). The HBM model is depicted in Figure 2.

The basic assumption of the HBM is that "the subjective world of the perceiver determines behavior rather than the objective environment..." (Mikhail, 1981). Perceived susceptibility to a health alteration, perceived seriousness of a health alteration, perceived benefits of taking action and perceived barriers to taking action were the four original variables of the HBM (Rosenstock, 1974). The

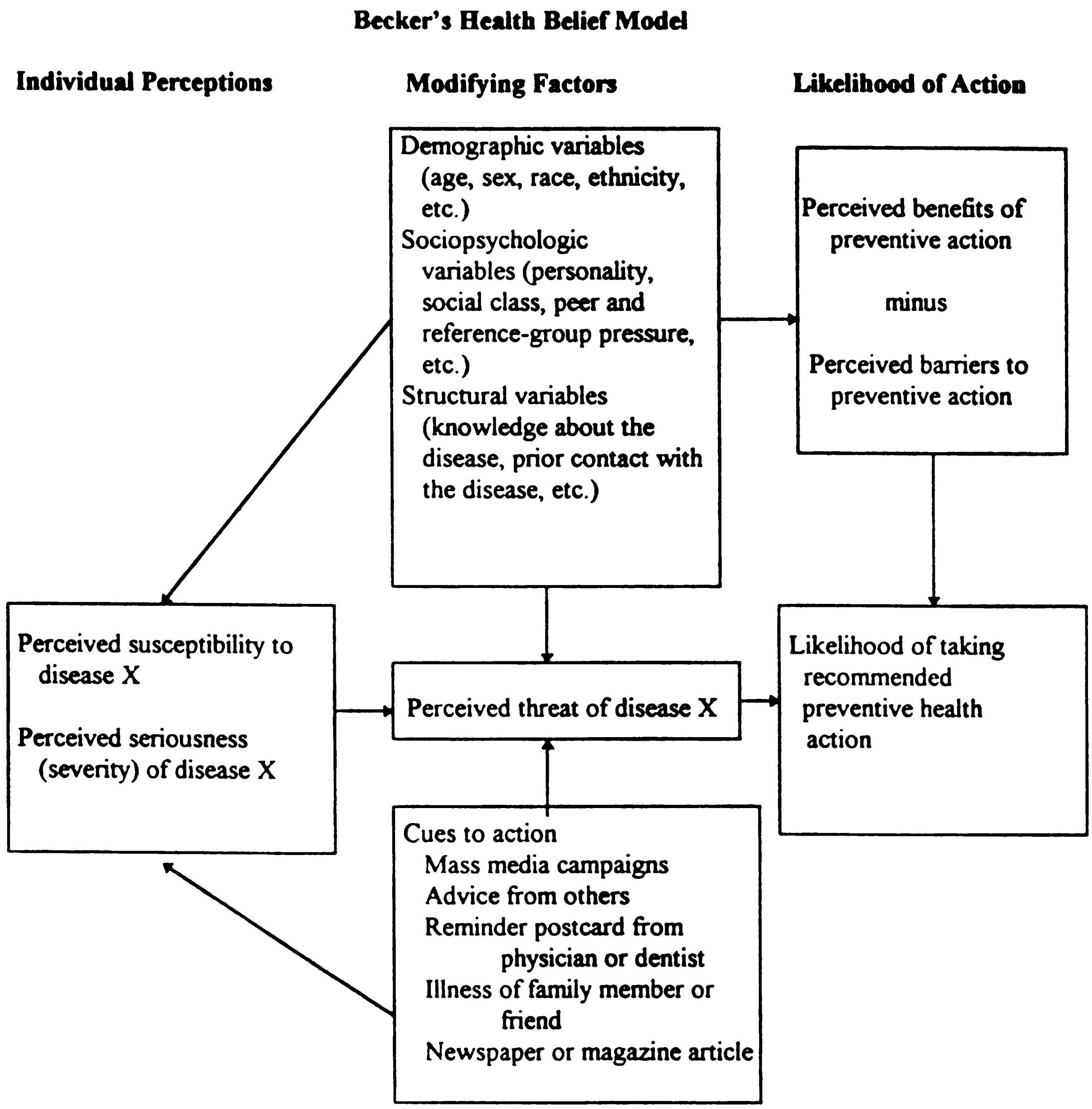

Figure 2: Becker's Health Belief Model (from Pender, N. 1996).

individual is brought to this point by internal and external motivating factors.

Internal motivating factors are derived from perceived symptoms or changes in usual functioning (Reilly, Dracup, & Dattole, 1994). Examples include severity of symptom perception, hemodynamic instability and anxiety. External motivating factors derive from basic condition factors (culture, ethnicity, gender, age, marital status), knowledge about symptoms through past experiences (cardiac disease history), information through the media, witnesses and bystanders who are present at symptom onset and sequelae, and fear of embarrassment. An individual who is roused through internal motivating factors and modified by external motivating factors is likely to initiate health seeking behavior depending on the perceived threat and the perceived benefit or value (Reilly et al., 1994).

Researchers have identified and studied a wide variety of factors influencing pre-hospital delay, identifying both internal and external motivating factors. This study is focused on external motivating factors, namely sociodemographics, symptom context and health status, and how they relate to the outcome variable: pre-hospital delay. External motivating factors are objective variables that are easily identifiable and measurable. Identifying factors that are associated with pre-hospital delay can formulate a hi-risk patient population profile that can be used by practitioners in primary care settings and through community awareness or education programs. In the HBM, external motivating factors are the modifying factors that bear influence on a patients perception of susceptibility, seriousness, or threat of disease and the perception of benefits versus barriers to taking action. Figure 3 is a model of these external motivating factors that may have a relationship to the delay interval of those individuals with symptoms of AMI. This model is descriptive and does not determine causality for delay.

These modifying factors are factors which affect an individual's predisposition to take preventive, curative or restorative action to a perceived threat (Pender, 1987). Patient perceptions and internal motivating factors are beyond the scope of this study.

In sum, despite educational efforts by the American Heart Association and lay press coverage of thrombolysis, individuals are not changing their actions in response to AMI symptomatology; some studies show an increase in pre-hospital delay time in seeking medical care (Reilly et al., 1994). The purpose of this study is to investigate the relationship of sociodemographic variables, significant medical history and symptom context in seeking medical evaluation for symptoms of an AMI. Identification of high risk population profiles can result in more meaningful community awareness to targeted groups.

Selected objective variables with potential influence

of pre-hospital delay

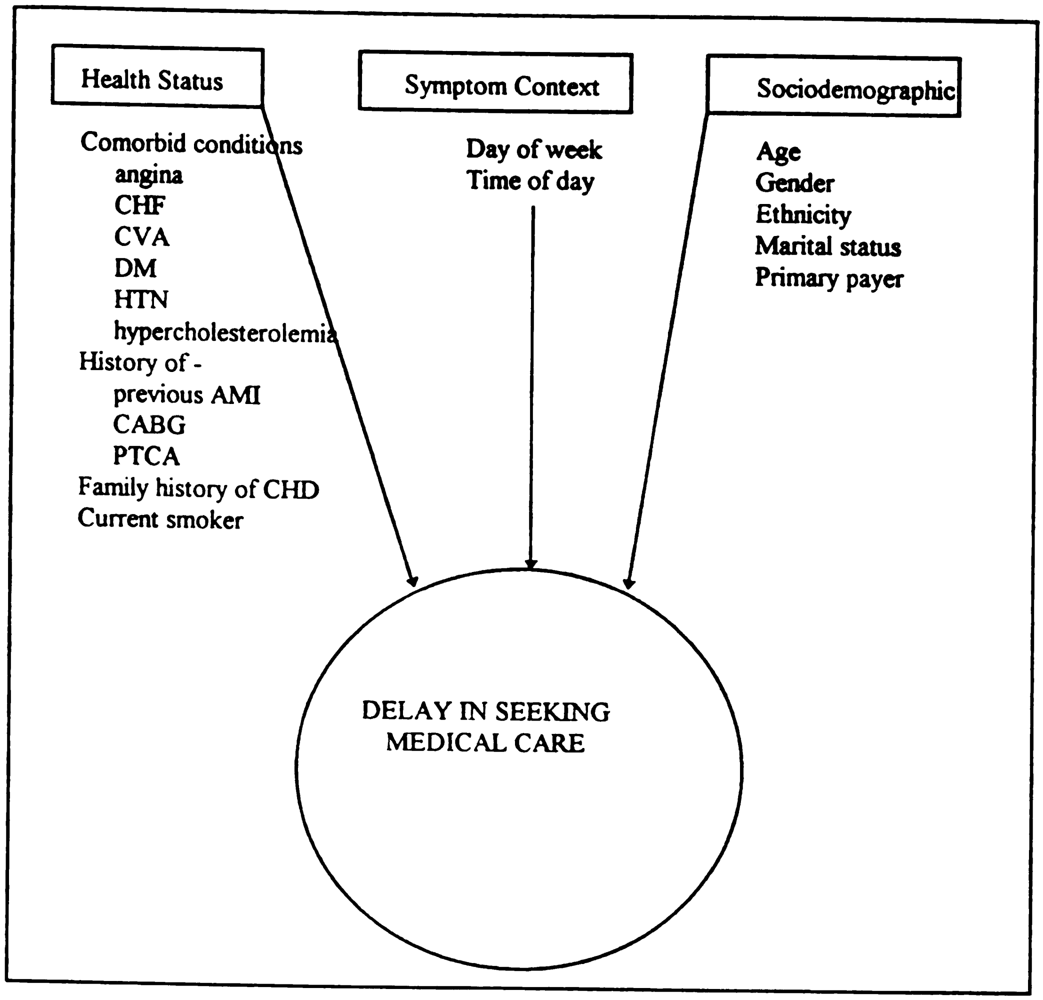

Figure 3. Model for present study.

Methods

Research Design

An ex post facto, correlational design will be used for this study. According to Polit and Hungler (1995), ex post facto research is conducted after the variations in the independent variable have occurred in the natural course of events, and correlational research explores the interrelationships among variables of interest without any active intervention on the part of the researcher.

Advantages of this design type, historical in nature, is the relative ease in gathering data, inexpensive to perform, and a wealth of data to obtain.

Disadvantages of this retrospective method are that the conditions under which data were first collected are not always known, and causality is difficult to determine because one cannot control all influences of extraneous factors.

A design of this nature is appropriate for this study as this researcher is attempting to explore relationships between the independent variables (age, gender, ethnicity, marital status, primary payer coverage, significant health history, time of day and day of week) and the dependent variable (pre-hospital delay). No manipulation of the independent variables are possible. This topic of investigation is not amenable to experimentation.

Sample

The research setting is Holland Community Hospital (HCH) in Holland, Michigan, a 213 bed institution providing inpatient acute care and out-patient care to a service area of two counties. The total HCH service area has a population of 107,430 (Holland Area Chamber of Commerce, 1994). The hospital has a 24 hour per day emergency department staffed by physicians, advanced practice nurse practitioners, and registered nurses. An eight-bed combined coronary care unit and intensive care unit is staffed by an all registered nurse staff. Cardiac catheterization and open heart surgery facilities are not available on site.

The target population comprises all adult, non-pregnant patients admitted to HCH with a medical diagnosis of AMI at discharge. Discharge diagnosis is used because some patients may be admitted with signs and symptoms compatible with AMI, but diagnostic work-up does not confirm this diagnosis. Other medical diagnoses exist with presenting complaints similar to that of an AMI. These may include esophagitis, gastric or peptic ulcer disease, gallbladder disease, pericarditis, and costrochondritis to mention a few of the more common diagnoses.

Eligibility criteria included all adult, non-pregnant patients admitted to HCH with diagnosis of AMI within 24 hours as evidenced by a rise in CK, or CK-MB. If the CK and CK-MB occur after this 24 hour interval, the actual infarct probably occurred after hospital admission; therefore, exclusion criteria is for any individual that displays a CK or CK-MB evidence of AMI occurring more than 24 hours after admission, less than age 21 and/or pregnant.

Data Collection

Data gathered in retrospective research is done from primary sources and secondary sources. It is always desirable to collect data from primary sources whenever feasible. According to Treece and Treece (1986), patient records are classified as primary sources of data. Since the data collected were obtained from a record review, they should be considered a primary source.

Hospital records were reviewed through the Quality Resource Management Office of HCH for all discharges coded by Diagnostic Related Groups (DRG's) with primary diagnosis of AMI. Further evaluation of inclusion and exclusion criteria was determined at the time of data collection (age twenty-one or greater and non-pregnant status).

Appropriate and proper documentation in a patient's record is guided by the Joint Commission of Accreditation of Hospitals (JACHO) and is in part the responsibility of a registered nurse to gather and record. The patient record includes certain sociodemographic data; specifically gender, age, and marital status which may be recorded by office personnel, and pertinent medical history recorded by the patient's physician. Selected data on each patient is recorded electronically in a hospital wide computer network program.

Integrated into this system is a quality management software program entitled "Medical Information Data Assessment Systems (MIDAS)" which allows access to collected data for research studies without revealing identities of patients and thus assuring anonymity. Access to this program is restricted and only personnel with appropriate security clearance are privy to this information. Data regarding selected research variables was accessed through the quality resource management committee and released to this investigator for analysis.

An independent research organization, ClinTrials Research Incorporated, additionally collects data from patient records for the National Registry of Myocardial Infarctions 2, (NRMI 2), which is sponsored by Genentech Incorporated. This program collects, analyzes, and disseminates data on the treatment and outcome for patients with an evolving AMI at more than 1,555 hospitals across the United States (Gore, 1996). Confidential reports of this data are released to the participating hospitals for their own institution as well as national data (Gore, 1996). This data is owned by each participating institution and further analysis is encouraged to evaluate local health-care delivery systems.

Hospital admission record numbers are used for identification in each data collection system, and by matching these numbers from each program, more comprehensive data was available for analysis. The NRMI 2 data was used for the outcome variable: pre-hospital delay, as well as independent variables: age, gender, ethnicity, primary payer, smoking, hypercholesterolemia, day of week and time of day intervals. The MIDAS data was used to identify marital status, medical history and family history.

Demographic data included patient age, gender, marital status, ethnicity and medical insurance status. One hundred fifty-seven patients were admitted to HCH with a subsequent discharge diagnosis of acute myocardial infarction. This data was collected over the course of fourteen months from May 1996 to June 1997. Two cases were excluded; one for incomplete data and one for showing evidence of myocardial infarct greater than twenty-four hours after admission. The remainder one hundred fifty-five cases were used for study analysis.

Instrument and Coding

The data collecting tool was adapted from a Case Report Form used by ClinTrials Research Inc. in recording data for the NRMI 2 (Appendix A). A sample of this adapted tool which was used for this study is in appendix B.

Each subject was given an identification number different from their hospital record number which is unknown to this investigator so that anonymity is maintained. The identification number has three digits because the anticipated sample size was 150.

Operational Definitions of Variables

Pre-hospital delay. The dependent variable is the pre-hospital delay interval. It is the time from symptom onset awareness to the time of medical evaluation. The day of the week was recorded according to the day of the week the AMI symptoms were first perceived by each subject. The time of day was recorded and rounded to the closest full hour utilizing the military 24-hour clock.

The patient's personal perception of symptom onset is influenced by sociodemographic differences, context in which symptom onset occurred and current clinical status. This definition is unique to each individual and this researcher accepts the personal perception of each individual. Operationally this interval was determined from the reported time of symptom onset until the time recorded of initial medical evaluation. For ease of measuring and recording, this interval was measured in tenths of an hour based on the patient's recall, and recorded as quantitative numerical data.

Age. Age is the period of time that a person has lived since birth (Stedman, 1995, p. 35). In this study, age is measured as the number of years since birth as indicated in the medical record and was recorded numerically in whole numbers.

Gender. Gender is a category to which a biological entity is assigned on the basis of their physical sex; male or female (Webster, 1988; Stedman, 1995). In this study, the gender definition is based on the recorded entry into the medical record of the patient.

Marital Status. For the purposes of this study, the legally recognized marital status was used.

Single. Never married.

Married. Currently having a legal spouse.

Divorced. Having been married at one time, but legally severed relationship.

Widowed. Being the survivor of a marriage.

Ethnicity. Ethnicity is defined as a social group characterized by a distinctive social and cultural tradition maintained from generation to generation with a common history and origin and a sense of identification with the group; members of the group have distinctive features in their way of life, shared experiences and often a common genetic heritage (Stedman's, 1995). Individuals of biracial or multiple racial ethnicity were recorded as the ethnic group with which the patients identified. This study recognized the following ethnic groups: 1) Caucasian, 2) African-American, 3) Hispanic, 4) Asian, 5) Native American, 6) other or unknown. Only one response will be allowed for this variable.

Primary Payer (Insurance Status). The primary payer of health care benefits is often a third party reimbursement program. These may be under private commercial health insurance coverage or through government funded programs. This study will identify one of the following for each subject: 1) commercial or private insurance, 2) health maintenance organizations, 3) Medicare, 4) Medicaid, 5) VA/CHAMPUS, 6) self-pay, 7) other or unknown. One response was recorded for each subject although some individuals may have had more than one payer source. The "primary" payer source is recorded.

Significant Medical History. Significant medical history includes documentation in the medical record of 1) previous MI, 2) previous angina, 3) CHF, 4) PTCA with angioplasty, 5) previous CABG, 6) CVA, 7) DM, 8) HTN, 9) current smoker, 10) hypercholesterolemia, and 11) family history of CHD.

Multiple responses may be required to answer this variable. A yes or no response was required for each entry on the data work sheet.

This author accepts these definitions for this study.

Protection of Human Subjects

This proposal was reviewed by HCH Ethics Committee and the Quality Resource Management Committee, an interdisciplinary committee at HCH coordinating all quality improvement and research studies, and the University Committee on Research Involving Human Subjects at Michigan State University.

No identifying characteristics of the patients are included in the data collection or coding process, and there was one investigator only, thereby protecting patient anonymity. No subject or data was be identifiable by person or name. Hospital record admission numbers were used by quality resource staff to match data from the two data collection programs; then eliminated them. New numbers were assigned by this investigator when the data was released for analysis. No paper or electronic trace is available to identify or associate data with individual subjects. Since the subjects are unidentifiable, no breech of confidentiality is possible and no consent form is required. The data is anonymous (personal communication, Linda Baird, HCH risk manager, 1997).

Since this is an ex post facto design, the events have already occurred, no manipulation of the independent variables were possible and no physical harm to patients is possible.

Data Analysis

The computer program, Statistical Package for the Social Sciences (SPSS), (Norusis, 1994), was used for the analysis of this study.

First, all variables were described using frequency distributions: pre-hospital delay, age, gender, marital status, ethnicity, primary payer, symptom context and significant medical history. For interval level variables, these statistical procedures will offer the mean, median, standard deviation and variance for the time to treatment interval and age.

Secondly, correlations were computed between the dependent variable: pre-hospital delay and each independent variable to determine the strength of each relationship individually.

Finally, in order to relate the joint effect of all independent variables (age, gender, ethnicity, marital status, primary payer, time of day, day of week and health history) on the outcome of interest (pre-hospital delay), multiple regression analysis was performed. This allows the ranking of the independent variables and identifies the best predictors of pre-hospital delay.

Frequency data were generated for the demographic variables, significant medical history variables and pre-hospital delay. Student's t-test was used for determining the association between gender and age, as well as between gender and length of pre-hospital delay. Since the remainder of the variables were nominal measurements, chi-square tests were performed to test the association for gender. Students t-test was also used to determine associations between age and the other variables.

The pre-hospital delay variable is non-normal and highly skewed to the right, (Figure 4) Data transformation was used to change this to the natural log of the delay interval, and the data approached a more symmetrical distribution (Figure 5) and was utilized for those statistical tests demanding such assumptions.

Pearson's correlation coefficient was used to determine the relationship between age and the pre-hospital delay interval utilizing the natural log of the interval. To

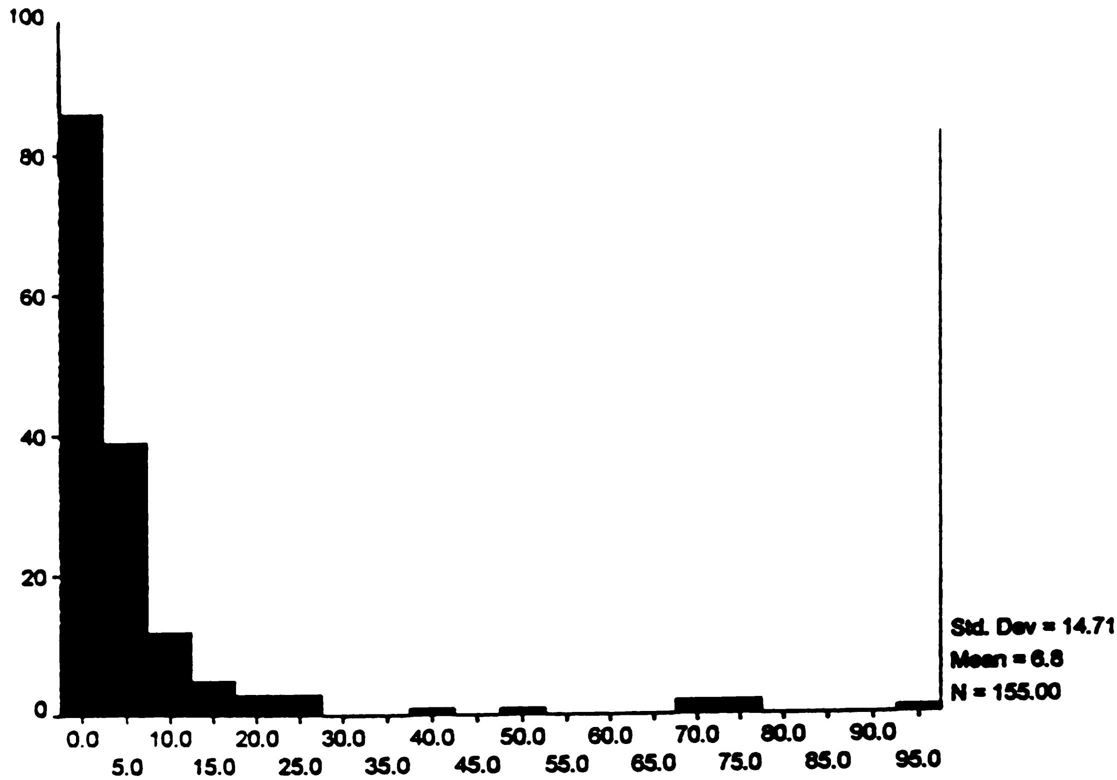

Figure 4: Histogram of Pre-hospital delay.

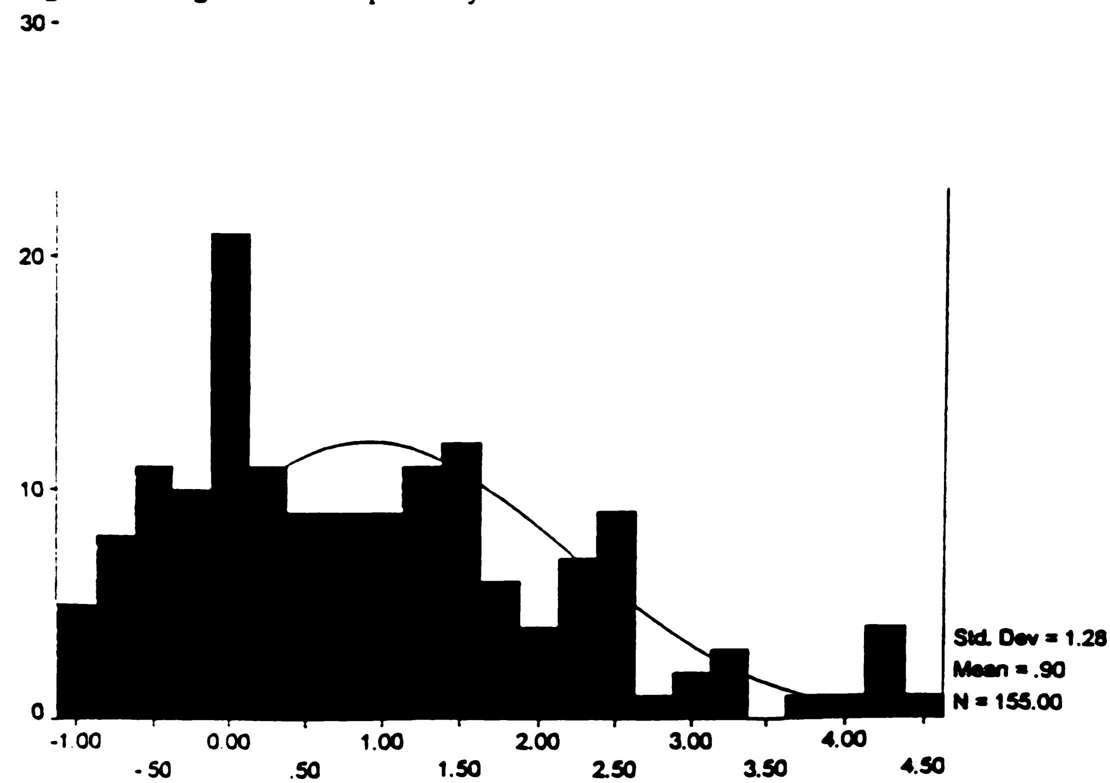

Figure 5: Histogram of Natural Log of Pre-hospital delay.

determine any correlation between the dependent interval pre-hospital delay and other variables, t-tests for independent samples were used.

Finally, multiple linear stepwise regression was chosen to analyze the best predictor variable for pre-hospital delay. Accepted levels of significance were .05 for all methods and calculations.

Descriptive Statistics

Demographics. In keeping with a major focus of this study, the demographic data, symptom context and significant medical history were examined for gender differences. Due to limited expected frequencies, the variables of marital status and ethnicity were re-coded into dichotomous variables: married/not married; and Caucasian/not Caucasian. Health insurance status was re-coded into four variables: 1) private insurance for commercial insurance and PPO's; 2) HMO's; 3) Medicare; and 4) Medicaid/no insurance (those listing no insurance would have social services intervene and assist with Medicaid application if appropriate, and therefore these are grouped together).

Of the remaining one hundred fifty-five patients in the study, 96 (62%) were male and 59 (38%) female. The youngest patient was thirty-one and the eldest ninety-six years of age, showing a sixty-five year age span with a mean of 65.75 years and normally distributed. Age was not shown to be statistically significant when correlated with gender ($p=0.077$), but females tended to be older with a mean age of

70.1 years while the mean age for males was 62.6 years (Table 1).

Males were more likely to be married (77%) compared to females (49%). Unmarried patients were more likely to be older with a mean age of 68.9 years as compared to those who were married with a mean age of 64.1 years (not in tables).

Overall, 26.5% of all the patients had commercial or PPO insurance, 11.6% were members of HMO's, 54.8% had Medicare and 7.1% had Medicaid or no insurance. 72.8% of females listed Medicare as their primary insurance coverage, while 43.7% of males had Medicare. The chi-square test for testing if primary payer coverage differs for men and women is statistically significant. In particular, women have a greater percentage of Medicare coverage in comparison to males, which is not surprising given their higher average age.

The total sample was largely ethnically homogenous with 91% of patients Caucasian. Eight patients were Hispanic, two African-American, one Asian, and three did not report their ethnic identification. When re-coded into a dichotomous variable; Caucasian/not Caucasian, no statistical significance was shown in association to gender (Table 1).

Time of Symptom Onset

The majority of AMI's occurred on a Saturday: 31 (20%); 25 (16.1%) AMI's occurred on Wednesday; 23 (14.8%) occurred on Thursday and Friday each; 18 (11.6%) on Sunday

Table 1.

Demographic Data

	Total Sample (n=155)	Males (n=96)	Females (n=59)	Test Stat	P - Value
Age	x=65.75 yrs. (SD=13.9)	x=62.6 yrs. (SD=13.9)	x=70.1 yrs. (SD=12.3)	t=3.77	.077
Marital Status				Chi-Square	
Married	n=103 (66.5%)	n=74 (77%)	n=29 (49%)		
				x=12.7049	0.0004*
Not Married	n = 52 (33.5%)	n=22 (23%)	n=30 (51%)		
Ethnicity					
Caucasian	n=141 (91%)	n=86 (90%)	n=55 (93%)		
				X = 0.5845	0.4446
Not Caucasian	n=14 (9%)	n=10 (10%)	n=4 (7%)		
Primary Payer					
Private Ins.	n=41 (26.5%)	n=35 (36.5%)	n=6 (10.2%)		
HMO	n=18 (11.6%)	n=12 (12.5%)	n=6 (10.2%)		
				X=11.0185	.0009*
Medicare	n=85 (54.8%)	n=42 (43.7%)	n=43 (72.8%)		
Medicaid/ No Insurance	n=11 (7.1%)	n=7 (7.3%)	n=4 (6.8%)		

*indicates statistical significance

and Tuesday each; and 17 (11%) on Monday. Saturdays had almost nine more AMI's occur than one would expect under the assumption that the number of AMI's is the same each day of the week, however, the deviation of observed from expected is not statistically significant. In order to concentrate on the main pattern, the day of the week variable was re-coded into a dichotomous variable of either a week-day (Monday, Tuesday, Wednesday, Thursday, or Friday) or a week-end day (Saturday or Sunday). A total of 49 (32%) of the AMI's occurred on a week-end (averaging 24.5 each day) and 106 (68%) AMI's occurred on a week-day (averaging 21.2 AMI's per day). Statistical significance was not established for any difference between week-day or week-end day.

The least number of reported symptoms of AMI occurred during the early morning hours of 0001 - 0400 (military time) for women with 4 cases (6.8%) and from 0401-0800 for men with 12 cases (11.6%). The greatest number of reported symptoms of AMI occurred during the afternoon hours for women (n=15; 25.4%), while the late morning hours of 0801-1200 had men reporting more frequently (n=22; 22.9%). These findings are compatible with previous studies in that more MI's occur during normal daytime waking hours, but failed to show an early morning and secondary midnight peak that Muller (1989) or Thompson (1992) showed. There was no statistical significance level demonstrated with Chi-square analysis for gender.

When the hours of symptom onset are recoded into a dichotomous variable of 0001-1600, and 1601-2400, then a much larger percentage of women have symptom onset in the late afternoon and evening hours which reaches statistical significance with a p-value of .012 (Table 2).

Table 2.

Gender Differences in Hour of Symptom Onset

Hours of Onset	Total Sample n=155	Males n=96	Females n=59	Test Stat	P-Value
0001-1600	n=100 (64.5%)	n=69 (71.9%)	n=31 (52.5%)	X=5.966	0.012*
1601-2400	n=55 (35.5%)	n=27 (28.1%)	n=28 (47.5%)		

*denotes statistical significance

Significant Medical History

Statistics for significant medical history are shown in table 3, with chi-square tests for association with gender. Seventy (45.2%) of the total number of subjects reported a positive family history for coronary artery disease, and 68 (43%) had hypertension. 37 (23%) reported a previous MI,and 24 and 17 had previous re-vascularization procedures by CABG or PTCA respectively. Eleven (7.1%) patients reported no significant medical history.

Overall, women tended to have more co-morbid medical problems with statistical significance established for CHF (p=0.014) and DM (p=0.003). This data also supports that more females also had a greater percentage of angina, CVA, HTN and hypercholesterolemia but statistical significance was not established.

Men reported more re-vascularization procedures through CABG and PTCA, more previous MI's and more positive family

Table 3.

Significant Medical History

	Total Sample n=155 n	%	Males n=96 n	%	Females n=59 n	%	Stat Test X	P-Value
Pos. Fam. Hx.	70	45	46	48	24	41	0.768	0.381
HTN	68	44	37	38	31	51	2.890	0.089
Smoker	46	30	35	36	11	19	5.521	0.018 *
Prev. AMI	37	24	26	27	11	19	1.423	0.233
Hyperchol ester- olemia	34	22	21	22	13	22	0.005	0.982
DM	31	20	12	12	19	32	8.809	0.003 *
CABG	24	15	18	19	6	10	2.042	0.153
Angina	21	13	12	12	9	15	0.235	0.627
PTCA	17	11	12	12	5	8	0.602	0.438
CHF	11	7	3	3	8	14	5.995	0.014 *
No Sig. Hx.	11	7	3	3	8	14	0.581	0.446
CVA	10	6	5	5	5	8	0.642	0.423

*indicates statistical significance

history although not statistically significant. Statistical significance is established for male smokers (p=0.018).

Pre-hospital Delay

The pre-hospital delay interval at minimum was .4 of an hour (24 minutes), and maximum was 96 hours (4 days.) The average length of delay was 6.8 hours (standard deviation 14.71), median 2.0 hours and mode 1.0 hours. The distribution is highly skewed to the right. Since this non-normal distribution violates assumptions required for parametric testing, the variable was transformed to its natural log. The transformed variable approached a nearly symmetric distribution and is used as the basis for subsequent statistical significance tests.

Because of the skew of the original distribution, Table 4 also contains the median as a more accurate test for central tendency, as the mean is highly affected by the upper range of the data. A median of 2.0 reveals that half of the cases fell within the first two hours of symptom onset, and half of the cases fall between 2.0 and 96.0 hours.

Table 4.

Pre-Hospital Delay

	Total n=155 Original data (in hours)	Nat Log	Males n=96 Original data (in hours)	Nat Log	Females n=59 Original data (in hours)	Nat Log
Range	.4-96.0	-.92-4.56	.4-74.7	-.92-4.31	.4-96.0	-.92-4.56
Mean	6.79	.902	6.3	1.84	7.5	2.01
Standard Deviation	14.71	1.28	13.07	2.57	17.15	2.84
Median	2.0	.693	1.8	.588	2.2	.788
Mode	1.0	0	1.0	0	1.0	0

Tests of Correlation/Comparison of Populations

Since a major focus of this study is on determining gender differences, bivariate relationships between delay time and all relevant potential predictors were examined first. Pearson's correlation coefficient was calculated to measure the degree to which the dependent variable, pre-hospital delay (and expressed as the natural log) was associated with age. No significant linear relationship was found (interval with age, p=0.702). Scatterplots did not give evidence for nonlinear relationships.

To compare the pre-hospital delay for the other independent variables, t-tests or one-way ANOVA tests were performed (Table 5). Two variables approached statistical significance: Ethnicity (p=0.058), indicating that there was a higher pre-hospital delay for the non-caucasian cases, and Primary Payer (p=0.055), where there was a higher correlation for delay with patients reporting Medicaid or no insurance coverage. Three variables are statistically significant: Marital Status (p=0.040), those patients who were not married experienced a larger pre-hospital delay, HTN (p=0.006), a history of HTN was associated with a prolonged pre-hospital delay, and Hypercholesterolemia (p=0.003), known hypercholesterolemia was correlated with a shortened pre-hospital delay.

Multiple Regression

To determine the "best predictor" of pre-hospital delay, stepwise multiple regression procedure was used with

Table 5.

Analysis of Pre-hospital Delay

Independent Variable	N	Test Statistic	P-Value	Group Means
Age	155	Pearson's R	0.702	
Gender		t-test, t=0.10	0.923	
Male	96			0.8953
Female	59			0.9149
Marital Status		t-test, t=2.076	0.040*	
Married	103			0.75285
Unmarried	52			1.19974
Ethnicity		t-test, t=1.910	0.058	
Caucasian	141			0.84148
Non-Caucasian	14			1.52009
Primary Payer		ANOVA, F=2.592	0.055	
Commercial/PPO	41			0.57739
HMO	18			1.14986
Medicare	85			0.90496
Medicaid/No Ins	11			1.69434
Day of Week		ANOVA, F=6.7226	0.3473	
Sunday	18			0.33078
Monday	17			1.22582
Tuesday	18			1.12683
Wednesday	25			1.07139
Thursday	23			0.61243
Friday	23			0.70934
Saturday	31			1.15061
Hours of Onset		ANOVA F=7.277	0.201	
0001 - 0400	20			0.8136
0401 - 0800	18			0.9635
0801 - 1200	33			1.0232
1201 - 1600	29			0.8049
1601 - 2000	29			0.7923
2001 - 2400	26			1.0088
Angina		t-test, t=-0.532	0.5985	
Yes	21			0.76430
No	134			0.92448
CABG		t-test, t=1.037	0.301	
Yes	24			0.65394
No	131			0.94836
CHF		t-test, t=1.645	0.102	
Yes	11			1.51078
No	144			0.85633

Independent Variable	N	Test Statistic	P-Value	Group Means
CVA		t-test, t=0.114	0.909	
Yes	10			0.94764
No	145			0.89968
DM		t-test, t=-0.497	0.620	
Yes	31			0.80035
No	124			0.92838
HTN		t-test, t=2.801	0.006*	
Yes	68			1.22120
No	87			0.65389
Hypercholesterol		t-test, t=-3.010	0.003*	
Yes	34			0.46177
No	121			1.02669
Positive Family History		t-test, t=-1.165	0.246	
Yes	70			0.77111
No	85			1.01120
Previous MI		t-test, t=-0.980	0.329	
Yes	37			0.72295
No	118			0.95916
PTCA		t-test, t=-0.874	0.383	
Yes	17			0.64670
No	118			0.93432
Smoker		t-test, t=-0.789	0.431	
Yes	46			0.77790
No	109			0.95547

*denotes statistical significance

the natural log of the delay time interval as the outcome variable. Variables that did not reach a significance level of at least 0.10 were removed from the equation, and variables already in the equation must have reached at least a significance level of 0.15 to stay in the equation. Following this procedure, the variables remaining in the model are HTN, hypercholesterolemia, ethnicity and CHF (Table 6).

Table 6.

Regression Model Summary

Variables	N	R	B	t-test	P-Value
HTN Yes (1) No (0)	68 87	0.221	0.552	2.792	0.006
Hypercho Yes (1) No (0)	34 121	0.287	-0.528	-2.230	0.027
Ethnicity Cauc. (1) N/Cauc(0	141 14	0.317	-0.649	-1.891	0.061
CHF Yes (1) No (0)	11 144	0.346	0.689	1.797	0.074

HTN, with a B coefficient of +0.552, was the most influential predictor of pre-hospital delay, given the other three variables in the model. Patients with a history of hypercholesterolemia had a negative B coefficient (-0.528), and were more likely to have a shorter pre-hospital delay. If patients were Caucasian as opposed to non-Caucasian, this also had a negative effect (B coefficient -0.649) and more likely to have a shorter pre-hospital delay. Finally, a B coefficient +0.689 suggests that patients with CHF had a prolonged pre-hospital delay given the other three variables in the model.

Overall, the low R-squared (0.119) indicates that this model can predict only 12% of the variance in pre-hospital delay, and therefore has limited clinical usefulness.

Interpretation of Findings

In this study, age was not found to be a significant variable in the pre-hospital delay of individuals reporting symptoms of AMI. Although the majority of researchers have found that advanced age contributed to a longer pre-hospital delay, statistical significance was not reached in this study ($p=0.702$). Considering that the elderly may have more co-morbid diseases and exposed to health care more frequently than the young may be a factor. Regular or more frequent health visits may provide a basis for more frequent interaction and more opportunities for teaching and reinforcement regarding symtomatology.

Gender was not found to be a statistically significant variable in pre-hospital delay, however there is some evidence that there are gender differences in the presentation of patients diagnosed with AMI. In this study, females were older, were less likely to be married, more likely to be dependent on Medicare health insurance and had more co-morbidities. The average age of the female patient was 70, compared to 62.6 years for males, which would entitle them to Medicare insurance coverage, and not the male patients. Since they are older, they are more likely to be widowed than their younger counterpart, and suffer from more diseases of the aged. DM and CHF were significantly more common in females than males ($p= 0.003$ and 0.014 respectively), but males were more apt to be smokers ($p=0.018$).

On average, females reported a 7.5 hour pre-hospital delay compared to 6.3 hour delay for males, however this does not reach statistical significance. This is compatible with multiple previous studies discussed in the literature review. Gender was not identified as a significant predictor in the final model.

In this particular study, males were more likely to have a history of previous re-vascularization procedures through CABG or PTCA than females, although statistical significance was not achieved.

Marital status was significant (p=0.040) for a shortened pre-hospital delay. It is reasonable to assume that the person caring most about an individual experiencing AMI symptoms would want to get immediate medical evaluation for their spouse. This statement also makes an assumption that the spouse is with the individual at the time of symptom onset. A spouse would also be able to arrange for transportation to the emergency department. Many past researchers have found that marital status actually prolonged pre-hospital delay by sharing in denial with the patient or may be less willing to go against their spouse's wishes to delay presentation.

Ethnicity was re-coded into a dichotomous variable to reflect Caucasian and non-Caucasian to obtain more valuable data. When correlating ethnicity with pre-hospital delay, statistical significance was not reached, but the data supported a longer delay interval for non-Caucasian. In the final regression model, ethnicity was identified but remained an insignificant predictor for pre-hospital delay given that they also had HTN and CHF. Multiple variables may relate with ethnicity including SES (education, occupation, income). These variables were not in the current study, thereby limiting the ability to make a powerful statement. Ethnic minorities may also have undiagnosed or poorly managed co-morbid diseases due to financial limitations or poor access to health care. This continues to follow what many of the previous studies identified in the literature review have demonstrated.

The data reveals a highly homogeneous population (91%) in regards to ethnicity. This was different from what was initially anticipated as Holland claims a diverse culture, with 84% Caucasian, 8% Hispanic, 2% Asian, 1% African-American, 1% American Indian and 4% other (Holland Area Chamber of Commerce, based on 1990 census, 1993). The Holland area has attracted many new workers of diverse ethnic cultures to the community, but the basis of the older community remains highly Caucasian of Dutch descent and may account for the higher percentage of Caucasians in this study.

Primary payer insurance coverage revealed that those with private health insurance had the shortest pre-hospital delay. Medicaid/no insurance group waited the longest to seek medical evaluation. Statistical significance was not established, but the trends point to an area of possible concern. Those with HMO insurance delayed longer than those with private insurance or Medicare. Questions of delay related to seeking permission before emergency evaluation may be a consideration, but the population with HMO insurance is generally younger (not eligible for Medicare), and by mere fact of age tend to deny symptoms longer that the elderly.

There was no statistical significance found in comparing week-day to week-end occurrence of AMI, nor did the time of day of symptom onset affect the pre-hospital delay. The soft data trends would support a greater occurrence of MI's occurring on Saturdays, but statistical significance was not established. The week-end leisure activities which often result in more physical activity, (the "week-end warrior" so to speak) as compared to more sedentary activity may account for the increase number of MI's occurring on a week-end, in particular Saturdays.

When the time of day of symptom onset variable was re-coded into two variables, a statistically significant number of females had symptom onset in the late afternoon and evening hours as compared to night-time, early morning, morning and early afternoon hours combined. The rationale for this difference is unclear, but possible variables may include increased social activities that occur during these hours or increased family interactions and responsibilities (i.e. spouse and/or children home from work, preparing supper meal, dealing with everyone's individual stressors etc.).

A positive family history of CAD was reported in 45% of the total sample and was the most common medical history variable identified, followed closely by HTN (44% of the total identified risk factors for myocardial infarctions).

A known history of HTN was not only one of the commonest variables, but was also most significant in predicting prolonged pre-hospital delay. HTN continues to be the "silent killer" disease, and if not monitored carefully could be out of control without the victim feeling any untoward effects. HTN is well known as a significant risk factor for the development of strokes, but not as closely identified to the development of an AMI (Dietrich & Cohen, 1992). Prolonged pre-hospital delay was statistically significant for individuals reporting HTN as opposed to those without known HTN.

Hypercholesterolemia is a well-known risk factor and one more commonly associated with development of CAD. A known history of hypercholesterolemia actually resulted in a statistically significant *shortened* pre-hospital delay as compared to individuals without known hypercholesterolemia. The public has been made well aware of the risk factor associated with a high fat and cholesterol diet through the media including TV, radio, newsprint, labels on food items, magazine advertising etc. In a great effort to raise the "heart health" consciousness of the American public, producers of food items are making great profits by advertising low cholesterol or low fat food substances. There has been a definite monetary benefit in promoting low cholesterol and fat intake and associating the dangers of high cholesterol with heart disease. Having this sensory saturation may be one explanation of the shorter pre-hospital delay interval seen in patients with known hypercholesterolemia.

CHF, although rather small in number of individuals reporting this medical history, was also identified through multiple regression as one of the better predictors of prolonged pre-hospital delay. CHF is a chronic condition that may exacerbate itself as an acute crisis, or be more insidious in its onset. It is often the result of progressive weakness of the myocardium that may take years to develop. Since this is such a chronic illness, patients may try to delay possible hospital admissions, or try to self-treat at home as long as possible before succumbing to another hospital admission.

Other factors found by other investigators to contribute to pre-hospital but not confirmed in this study include angina, CVA, DM, and history of previous MI. Smoking status was not found to be a predictor of pre-hospital delay.

Discussion

Implications for Advanced Nursing Practice and Primary Care

Nurses who work in advanced practice in a variety of settings including family practice, internal medicine, urgent care centers, emergency rooms and community health will frequently encounter patients with risk factors for CAD. As advanced practice nurses (APN's) increase the access to primary care, they may be the first health care provider to identify, evaluate, monitor, and treat clients with these risk factors. APN's must have the educational background and clinical skills to become astute diagnosticians and identify individuals at risk for CAD and ensure optimal care to reduce morbidity and mortality from acute myocardial infarction.

Advanced practice nurses can work in multiple roles to bring optimal health care management to the public. Health promotion and primary prevention can be accomplished by being a role model in reducing risk factors for oneself. As a clinician, early diagnosis and management of potential risk factors while concurrently educating the client at every health care visit needs to be the standard of care.

As the health care machine continues to go through a paradigm change focusing on wellness promotion, disease prevention, and early identification and treatment of disease states, APN's are at the forefront of patient advocacy and education. This is the "information age", and any one person can rapidly become an expert on any single disease entity overnight using their home personal computer. Primary care practitioners must take into context this narrow view of a singular disease entity and expand the patients understanding of their own individual and unique response to the diagnosis, treatment and management of their own health.

Health care professionals are in need of specific research based knowledge that can guide their clinical practice within the cultural norms of the community they serve. APN's should contribute to ongoing research for establishing patient care protocols, evaluating and managing patient response to treatment, and develop culturally sensitive health care delivery systems.

Educational strategies must be sensitive to age, gender, and cultural norms; be accessible and economically feasible. Healthcare systems that are strictly for the Anglo-American culture is no longer acceptable. In order to encourage consumer responsibility, cultural and ethnic awareness must be incorporated into models of health care. This research identifies unique high risk characteristics of the population in this community of those who have suffered from AMI. An example of culturally sensitive interventions may be educational sessions on dietary management that would include food products enjoyed by the Hispanic population (tortillas, refried beans, etc.).

Anticipatory guidance is an appropriate strategy to incorporate when managing individuals who display these risk factors. Early access to emergency care via the emergency medical system when experiencing symptoms of AMI will promote better outcomes: reducing myocardial tissue damage. Teach patients that the appropriate use of "911" is far safer in transporting to the emergency department than driving themselves. Encourage patients with risk factors to wear "emergency alert" bracelets or necklaces that identifies them and their health concerns in the light that they may not be able to respond appropriately at the time of a crisis.

Third party payers should be interested in the timely accessibility of appropriate emergency evaluation for their clients. The "golden window" of opportunity remains the first hour after symptom onset with the potential possibility of reversing the infarct process and salvaging myocardial tissue. Delayed access of care results in increased tissue damage, with increase morbidity and possible mortality. Although not reaching statistical significance, individuals with commercial or PPO insurance (n=41) had a mean delay time of 4.64 hours, compared to HMO's (n=18) with a mean delay time of 8.32 hours (p=0.55). The variables affecting this delay have not been investigated, but obtaining permission from a primary care practitioner (which is often required from an HMO except for emergencies, however one may not know if this is an emergency or not) for emergency room evaluation may be contributing to prolonged pre-hospital delay.

Limitations

This research study is based on available sociodemographic data collected by the institution on all patients at registration. The data collection focused on objective information that is normally collected in each patients record, including a health history and the present time and date. It does not explore role theory or decision making processes of the patient or significant others who may have a role in the decision to seek medical care.

The conceptual model used for this study removed the patient perception factors that were used in other frameworks. Although extremely valuable variables in the decision to seek medical care process, this information was not available on this retrospective study design. The conceptual framework used for this study served well for the information that was available. The addition of patient perceptions and actions would provide valuable data but should be collected in a concurrent study instead of retrospectively.

Patients or family members who are under physical and emotional distress may inaccurately report data to the recorder. A form of cognitive dissonance, anxiety that results from simultaneously holding contradictory or otherwise incompatible attitudes, beliefs, or the like (Random House Dictionary, 1987), may occur with many patients. For example, the comment is often heard "I can't believe this is happening to me" while the patient is experiencing symptoms of an AMI.

The study design does not reveal the conditions of original data collection and may vary for different subjects. There is no control for extraneous factors, and this study may be subject to systematic bias since only one investigator coded and analyzed the data.

This research was subject to limitations that affect applicability of the results to a generalized population. First, a non-random convenience sample of patients with a discharge diagnosis of AMI was reviewed and presumed to represent the population receiving care at HCH. Even though this sample included all patients with this discharge diagnosis over a fourteen month time frame, their is no guarantee that the entire population of individuals with myocardial infarctions was truly represented. Since no cardiac catheterization lab and no open heart procedures are available at this institution, some patients may have been evaluated in the emergency department and transferred to tertiary care centers where these procedures are emergently available. The conditions in which the original data collection was made is not known and variations in documentation may be encountered. There was no control for extraneous factors.

Also of importance, this sample was too homogenous. The study subjects were primarily Caucasian males, which limits the generalizability of the results to larger populations. The attempt was to reflect the current population of this community. Recent census numbers indicate a greater number of minorities living in this community than what the study sample reflects, but as previously mentioned, the newcomers to this community are younger and not yet fitting into the population at risk for AMI. This study is unique to the community in which it was conducted.

Reliability of data was ensured by having one researcher collect and code data, but multiple personnel may have been involved in documenting the initial data in the patient record. With one researcher encoding data, systemic measurement bias may result in limited validity.

Recommendations

In the past, community education programs have increased knowledge about the nature of a heart attack and its symptoms, but they have not resulted in a concomitant reduction in pre-hospital delays (Lambrew, 1997). The results of this study reveal an average pre-hospital delay interval of 6.8 hours, but the data was highly skewed to the right and not normal in its distribution. The median time of 2.0 hours and a mode of 1.0 hours is highly encouraging in that it appears that the message for early access to emergent evaluation for those with symptoms of AMI is penetrating the public in this community. More primary care practitioners are successfully impacting patient behaviors and/or the public is becoming more knowledgeable in this "information age".

Patients with known risk factors are five to seven times more likely to suffer an ischemic cardiac event than those in the general public (Lambrew, 1997). Healthcare providers should educate high-risk patients and provide them with an action plan to deal with the symptoms of an AMI. Education of family members about courses of action to take is also imperative. Use of the emergency medical service is highly encouraged as opposed to self transportation or being dependent on a family member or friend.

The public needs to be educated about the potential negative consequences of pre-hospital delay. Insurance companies should investigate the time of accessibility for their clients and promote early access to optimize myocardial salvage.

Continued research based studies investigating patient delay is needed to form interventions that are age, gender, and culturally sensitive. Further research is needed to investigate gender differences in the development and experience of living with CAD. Women now placed on hormone replacement therapy may have a different future than the generation before them. Multiple "subjective" variables including patient decision making behaviors, emotional factors, personalities (type A or type B) and identification of barriers with evaluating the uniqueness of cultural norms and beliefs are additional avenues to investigate. SES is a major predictor of morbidity and mortality and needs to be investigated as it relates to pre-hospital delay. Repeated studies may be important as populations change and our society is growing older.

The Rapid Early Action for Coronary Treatment (REACT) trial, funded by the National Heart, Lung and Blood Institute (NHLBI) is in progress and is examining community intervention strategies that might facilitate early recognition of symptoms of an AMI and early action. In addition to this national effort, communities need to identify there cultural norms and facilitate appropriate action.

Summary

Advances in health promotion, wellness and early detection of disease have the potential to reduce mortality and morbidity through patient education and involvement.

Advanced practice nurses are at the forefront of this movement and experts in patient education and advocacy. This study showed a median pre-hospital delay of 2.0 hours, but only thirty-seven patients (23.9%) presented to the emergency department within the first hour, meaning that most patients in this study would have missed the "golden window of opportunity" for active intervention in the process of myocardial infarction and optimizing myocardial salvage. Those found to be at increased risk for prolonged pre-hospital delay included patients with history of HTN, not married, and non-Caucasian. Continued education, with sensitivity to cultural and gender influences is required to prepare individuals for appropriate decision making in the face of the signs and symptoms of acute MI.

LIST OF REFERENCES

LIST OF REFERENCES

Alonzo, A. A. (1980). Acute illness behavior: a conceptual exploration and specification. Social Science Medicine, 14A, 515.

Alonzo, A. A. (1986). The impact of the family and lay others on care-seeking during life-threatening episodes of suspected coronary artery disease. Social Science Medicine, 22, 1297-1311.

Arendt, J. et al. (1989) (eds). Biological rhythms in clinical practice. Wright, London.

Avis, N., Smith, K., & McKinlay, J. (1989). Accuracy of perceptions of heart attack risk: What influences perceptions and can they be changed? American Journal of Public Health, 79, 1608.

Brink, P., & Wood, J. (1994). Basic steps in planning nursing research; from question to proposal (4th ed.). London: Jones and Bartlett.

Burnett, R., Blumenthal, J., Mark, D., Leimberger, J., & Califf, R. (1995). Distinguishing between early and late responders to symptoms of acute myocardial infarction. American Journal of Cardiology, 75, 1019.

Castelli, W. (1984). Epidemiology of coronary heart disease: the Framingham study. American Journal of Medicine, 76, supplement 2A: 4.

Cayne, B. S. (Ed.), et al. (1988). The new lexicon Webster's dictionary of the English language (1988 ed.). New York: Lexicon.

Chandra, N. (1997). Patient outcomes in women, the elderly, and minorities in NRMI 2. (abstract) Proceedings of the National Registry of Myocardial Infarction 2, 17.

Clark, L. T., Bellam, S. V., Shah, A. H., & Feldman, J. G. (1992). Analysis of prehospital delay among inner-city patients with symptoms of myocardial infarction: implications for therapeutic intervention. Journal National Medical Association, 84, 931.

Cooper, R. S., Simmons, B., Castaner, A., Prasad, R., Franklin, C., & Ferlinz, J. (1986). Survival rates and prehospital delay during myocardial infarction among black persons. American Journal of Cardiology, 57, 208.

Cunningham, M. A., Lee, T. H., Cook, E. F. et al. (1989). The effect of gender on the probability of myocardial infarction among emergency department patients with acute chest pain: a report from the Multicenter Chest Pain Study Group. Journal General Internal Medicine, 4, 392.

Dempsey, S., Dracup, K., & Moser, D. (1995). Women's decision to seek care for symptoms of acute myocardial infarction. Heart & Lung, 24, 444.

Diethrich, E., & Cohan, C. (1992). Women and heart disease: what you can do to stop the number-one killer of American women. New York: Random House.

Dracup, K., & Moser, D. (1991). Treatment-seeking behavior among those with signs and symptoms of acute myocardial infarction. Heart & Lung, 20, 570.

Dracup, K., Moser, D., Eisenberg, M., Meischke, H., Alonzo, A., & Braslow, A. (1995). Causes of delay in seeking treatment for heart attack symptoms. Social Science & Medicine, 40, 379.

Eaker, E., Pinsky, J., & Castelli, W. (1992). Myocardial infarction and coronary death among women: psychosocial predictors from a 20-year follow-up of women in the Framingham study. American Journal of Epidemiology, 135, 854.

Ell, K., Haywood, J., Sobel, E., deGuzman, M., Blumfield, D., & Ning, J. (1994). Acute chest pain in African Americans: Factors in the delay in seeking emergency care. American Journal of Public Health, 84, 965.

Emergency Cardiac Care Committee and Subcommittees, American Heart Association. Guidelines for cardiopulmonary resuscitation and emergency cardiac care, I: introduction. Journal of American Medical Association, 268, 2171.

Fawcett, H. (1993). Heartfelt advice. Nursing Times, 89, 36.

Flexner, S. B. (Ed.). et al. (1987). The Random house dictionary of the English language (2nd ed.). New York: Random House.

French, W. (1996). Effect of payer status in NRMI 2 and patient outcomes. (abstract) Proceedings of National Registry of Myocardial Infarction 2, 34.

Ghali, J. K., Cooper, R. S., Kowalty, I., & Liao, Y. (1993). Delay between onset of chest pain and arrival to the coronary care unit among minority and disadvantaged patients. Journal National Medical Association, 85, 180.

Gilchrist, C. (1973). Patient delay before treatment of myocardial infarction. British Medical Journal, 3 535.

Gillum, R. F., Feinleib, M., Margolis, J. R., Fabsitz, R. R., & Brash, R. C. (1976). Delay in the pre-hospital phase of acute myocardial infarction. Archives Internal Medicine, 136, 649-654.

Goldberg, R. J., Gurwitz, J., Yarzebski, J., Landon, J., Gore, J. M., Alpert, J. S., Dalen, P. M. & Dalen, J. E. (1992). Patient delay and receipt of thrombolytic therapy among patients with acute myocardial infarction from a community wide perspective. American Journal Cardiology, 70, 421.

Gore, J. (1996). NRMI 2 overview: the first quarter million patients. (abstract). Proceedings of the National Registry of Myocardial Infarctions 2, 8.

Grebus, C. (1996). The importance of patient education in acute myocardial infarction. Heartbeat: A cardiac nursing newsletter, 6, 3.

Hackett, T. P. & Cassem, N. H. (1969). Factors contributing to delay in responding to the signs and symptoms of acute myocardial infarction. American Journal Cardiology, 24, 651.

Hartford, M., Herlitz, J., Karlson, B., & Risenfors, M. (1990). Components of delay time in suspected acute myocardial infarction with particular emphasis on patient delay. Journal of Internal Medicine, 228, 519.

Hartford, M., Karlson, B., Sjolin, M., Holmberg, S., & Herlitz, J. (1993). Symptoms, thoughts, and environmental factors in suspected acute myocardial infarction. Heart & Lung, 22, 64.

Hartweg, DL. (1995). Dorothea Orem: Self-care deficit theory. In C. M. McQuiston & A. A. Webb (Eds.), Foundations of nursing theory (pp. 141-202). Thousand Oaks, CA: Sage.

Heriot, A., Brecker, S., & Coltart, D. (1993). Delay in presentation after myocardial infarction. Journal of the Royal Society of Medicine, 86, 642.

Herlitz, J., Blohm, M., Hartford, M., Hjalmarsson, A., Holmberg, S. & Karlson, B. W. (1989). Delay time in suspected acute myocardial infarction and the importance of its modification. Clinical Cardiology, 12, 370.

Hill, M., & Fletcher, B. (1991). Cardiology nursing spotlight. RN, August.

Ho, M. (1991). Delays in the treatment of acute myocardial infarction: An overview. Heart & Lung, 20, 566.

Hofgren, K., Bondestam, E., Johansson, F. G., Jern, S., Herlitz, J. & Holmberg, S. (1988). Initial pain course and delay to hospital admission in relation to myocardial infarct size. Heart Lung, 17, 274.

Holland Chamber of Commerce. (1994). Community profile.

Holland Community Hospital. (1995). Internal records.

Jackson, R., Anderson, W., Peacock, IV W., Vaught, L., Carley, R., & Wilson, A. (1996). Effect of a patient's sex on the timing of thrombolytic therapy. Annals of Emergency Medicine, 27, 8.

Judelson, D., Miller, D., & Carroll, E. (1995). The difference in a woman's heart. Live VHA satellite network videoconference. Sept. 16.

Karlson, B. W., Herlitz, J., Sjolin, M. et al. (1990). Clinical factors associated with delay time in suspected acute myocardial infarction. American Heart Journal, 120, 1213.

Kenyon, L. W., Ketterer, M. W., Gheorghiade, M. & Goldstein, S. (1991). Psychological factors related to prehospital delay during acute myocardial infarction. Circulation, 84, 1969.

Lambrew, C. T. (1994). Reducing time to treatment: the NHAAP and ACLS guidelines. Proceedings of national registry of myocardial infarction (NRMI) investigator-coordinator meeting. April 28 - May 1. Naples, Florida.

Lambrew, C. T. (1997). Decreasing patient delay time: Educating the community at risk of acute MI. Proceedings of national registry of myocardial infarction 2 (NRMI 2) investigator-coordinator meeting. February 7 - February 8. San Francisco, California.

Latour-Pere, J., Gutierrez-Vicen, T., Lopez-Camps, V., Bonastre-Mora, J., Giner-Boix, J., Rodriguez-Serra, M., & Rosado-Breton, L. Socioeconomic status and severity of illness on admission in acute myocardial infarction patients. Social Science & Medicine, 43, 1025.

Lee, H. (1997). Typical and atypical clinical signs and symptoms of myocardial infarction and delayed seeking of professional care among blacks. American Journal of Critical Care, 6, 7.

Leitch, J., Birbara, T., Freedman, B., Wilcox, I., & Harris, P. (1989). Factors influencing the time from onset of chest pain to arrival at hospital. The Medical Journal of Australia, 150, 6.

Loeb, S. (Ed.), et al. (1994). Illustrated manual of nursing practice. (2^{nd} ed.). Springhouse, Penn.: Springhouse.

Matthews, K. A., Siegel, J. M., Kuller, L. H., Thompson, M. & Varat, M. (1983). Determinants of decisions to seek medical treatment by patients with acute myocardial infarction symptoms. Journal Personal Social Psychology, 44, 1144.

Maynard, C., Althouse, R., Olsufka, M., Ritchie, J. L., Davis, K. B. & Kennedy, J. W. (1989). Early versus late hospital arrival for acute myocardial infarction in the Western Washington thrombolytic therapy trials. American Journal of Cardiology, 63, 1296.

McCullock Melnyk, K. (1988). Barriers: a critical review of recent literature. Nursing Research, 37, 4.

Meischke, H., Eisenberg, M. S., & Larsen, M. P. (1993). Prehospital delay interval for patients who use emergency medical services; the effect of heart-related medical conditions and demographic variables. Annals Emergency Medicine, 22, 1597.

Meleis, A. (1991). Theoretical nursing: Development and progress (2^{nd} ed.). Philadelphia: Lippincott.

Mikhail, B. (1981). The health belief model: a review and critical evaluation of the model, research, and practice. Advances in Nursing Science, October.

Moss, A. J. & Goldstein, S. (1970). The pre-hospital phase of acute myocardial infarction. Circulation, 41 737.

Moss, A. J., Wynar, B. & Goldstein, S. (1970). Delay in hospitalization during the acute coronary period. American Journal of Cardiology, 24, 659.

Muller, J.E. (1989). Circadian variation and triggers of onset of acute myocardial infarction. Circulation, 79, 733-743.

National Heart, Lung, and Blood Institute. (1994). Heart Memo. Special Edition. 1994.

National Institute of Health. (1993). Emergency department: rapid identification and treatment of patients with acute myocardial infarction (NIH Publication No. 93-3278).

Polit, D. F. & Hungler, B. P. (1995). Nursing research: Principles and methods. Philadelphia: Lippincott.

Reilly, A., Dracup, K., & Dattolo, J. (1994). Factors influencing prehospital delay in patients experiencing chest pain. American Journal of Critical Care, 3, 4.

Ryan, T. J., Anderson, J. L., Antman, E. M., Braniff, B. A., Brooks, N. H., Califf, R. M., Hillis, L. D., Hiratzka, L. F., Rapaport, E., Riegel, B. J., Rissell, R. O., Smith, E. E. III, & Weaver, W. D. (1996). ACC/AHA guidelines for the management of patients with acute myocardial infarction: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction). Journal of American College of Cardiology, 28, 1328.

Sarnecky, M. (1990). Historiography: A legitimate research methodology for nursing. Advance Nursing Science, 12, 1.

Schmidt, S. B. & Borsch, M. A. (1990). The pre-hospital phase of acute myocardial infarction in the era of thrombolysis. American Journal of Cardiology, 65, 1411.

Schroeder J., Lamb I., & Hu M. (1978). The prehospital course of patients with chest pain: analysis of the prodromal, symptomatic, decision-making, transportation and emergency room periods. The American Journal of Medicine, 64, 742.

Schawarz, B., Schoberberger, R., Rieder, A., & Kunze, M. (1994). Factors delaying treatment of acute myocardial infarction. European Heart Journal, 15, 1595.

Simon, A. B., Feinleib, M. & Thompson, H. K. Jr. (1972). Components of delay in the pre-hospital phase of acute myocardial infarction. American Journal of Cardiology, 30, 476.

Thompson, D. (1992). The time of onset of heart attacks. Nursing Standard, 6, 33.

Treece, E. W. & Treece, J. W. (1986). Elements of research in nursing. St. Louis: Mosby.

Turi, Z. G., Stone, P. H., Muller, J. E., Parker, C., Rude, R. E., Raabe, D. E., Jaffe, A. S., Hartwell, T. D., Robertson, T. L., & Braunwald, E. (and the AMILIS Study Group). (1986). Implications for acute intervention related to time of hospital arrival in acute myocardial infarction. American Journal of Cardiology, 58, 203.

Villaire, M. (1996). Early heart-attack care: the critical paradigm shift toward prevention. Critical Care Nurse, 16, 79.

Warner, E. G. (1996). Salvaging myocardium through prompt interpretation of the 15- and 18- lead ECG. Proceedings of National Registry of Myocardial Infarction 2 (NRMI 2) Investigator-Coordinator Meeting. San Diego, CA.

Weaver, W. D., Litwin, P. E., Martin, J. S., Kudenchuk, P. J., Maynard, C., Eisenberg, M. S., Ho, M. T., Cobb, I. A., Kennedy, J. W. & Wirkus, S. (the MITI Group). (1991). Effect of age on use of thrombolytic therapy and mortality in acute myocardial infarction. Journal of American College of Cardiology, 18, 657.

Wielgosz, A. T. J., Nolan, R. P., Earp, J. A., Biro, E. & Weilgosz, M. B. (1988). Reasons for patients' delay in response to symptoms of acute myocardial infarction. Canadian Medical Association Journal, 139, 853.

Winkelby, M., Jatulis, D., Frank, E., & Fortmann, S. (1992). Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. American Journal of Public Health, 6, 816.

World Health Organization. (1959). Hypertension and coronary heart disease. Classification and criteria for epidemiological studies. World Health Organization Technical Series, 168, 3.

Appendix A

Appendix A

NRMI 2 Case Report Form

1234567-1-0001

Patient Initials ☐☐☐ (F M L) Birthdate ☐☐ ☐☐ ☐☐ (M D Y)

Optional Field ☐☐☐☐☐☐☐☐☐☐☐

Demographics/Medical History

Race/Ethnicity (√ 1)	Primary Payor (√ 1)	Medical Hx. (√ all)
☐ Caucasian	☐ Commercial/PPO	☐ Previous MI
☐ Black	☐ HMO	☐ Angina
☐ Hispanic	☐ Medicare	☐ CHF
☐ Asian	☐ Medicaid	☐ PTCA
☐ Pacific Islander	☐ VA/CHAMPUS	☐ CABG
☐ Native American	☐ Self-Pay	☐ Stroke
☐ Other ______	☐ Other ______	☐ Diabetes
☐ Unknown	☐ Unknown	☐ Hypertension
		☐ Current smoker
		☐ + Family hx. of CAD
		☐ Hypercholesterolemia

Weight ☐☐☐ ☐ lbs ☐ kgs Age ☐☐☐

Sex (√ 1) ☐ Male ☐ Female

Patient Transferred-In to this Hospital? ☐ Yes ☐ No

If Yes, Transfer-In Hospital ID# TI-☐☐ or

Name ______________________

This Hospital Arrival Date ☐☐ ☐☐ ☐☐ (M D Y) Time ☐☐ ☐☐ (24-hr clock)

Time Line

Event	Date M	D	Y	Time 24-hr. clock
MI Sx Onset	☐☐	☐☐	☐☐	☐☐ : ☐☐
First Hospital Arrival	☐☐	☐☐	☐☐	☐☐ : ☐☐
First 12-Lead ECG	☐☐	☐☐	☐☐	☐☐ : ☐☐
First Diagnostic ECG	☐☐	☐☐	☐☐	☐☐ : ☐☐
IV Lytic Ordered	☐☐	☐☐	☐☐	☐☐ : ☐☐
IV Lytic Initiated	☐☐	☐☐	☐☐	☐☐ : ☐☐
First Coronary Angio	☐☐	☐☐	☐☐	☐☐ : ☐☐
Primary PTCA	☐☐	☐☐	☐☐	☐☐ : ☐☐
CABG Initiated	☐☐	☐☐	☐☐	☐☐ : ☐☐
Discharged/Death/ Transferred-Out	☐☐	☐☐	☐☐	☐☐ : ☐☐

Presentation (First Hospital) Mode of Transport (√ 1) ☐ Self transport ☐ Ambulance ☐ Air transport

Prehospital 12-lead ECG obtained? ☐ Yes ☐ No First Recorded BP ☐☐☐ / ☐☐☐ (sys / dia) Pulse ☐☐☐ (bpm)

Chest pain at presentation? ☐ Yes ☐ No

Admission Dx (√ 1)	First Assessment of Heart Failure (√ 1)	First 12-Lead ECG Results (√ all)		If First 12-Lead ECG Nondiagnostic Method(s) of MI Dx (√ all)
☐ MI	☐ No CHF	☐ ST ↑ ___ ☐☐ # of leads	☐ LBBB	☐ Subsequent diagnostic ECG
☐ R/O MI	☐ Rales, JVD	☐ ST ↓	☐ RBBB	☐ Echocardiography
☐ Unstable angina	☐ Pulmonary edema	☐ Nonspecific ST or T wave Δ's	☐ Normal	☐ Coronary angiography
☐ Other	☐ Cardiogenic shock	☐ Q wave (acute infarct zone)	☐ Other______	☐ Cardiac enzymes
				☐ Other ______

Admission Bed (√ 1) ☐ ICU/CCU ☐ Other monitored bed ☐ Unmonitored bed ☐ Not admitted

Initial Reperfusion Strategy Was IV Thrombolysis the Initial Reperfusion Strategy? ☐ Yes ☐ No

IF YES

Thrombolytic (√ all)	Ordered By (√ 1)	Location Initiated (√ 1)	Site Initiated (√ 1)
☐ Activase (rt-PA)	☐ Emergency MD	☐ Prehospital	☐ ED
☐ Other ______	☐ Cardiologist	☐ First hospital	☐ ICU/CCU
	☐ Primary MD	☐ This hospital (Only for pts Transferred-in)	☐ Cath lab
	☐ Other		☐ Other

	Yes	No
Consult obtained prior to initiation of thrombolytic?	☐	☐
First 3 PTTs ≥ 60 seconds?	☐	☐

If Activase Administered, Complete the Following:

Bolus dose ☐☐☐.☐ mgs. Weight-adjusted dose? Yes ☐ No ☐

Total dose ☐☐☐.☐ mgs. Total duration .... ☐☐☐ mins.

IF NO

Reason(s) IV Thrombolysis Not Utilized (√ all)

☐ Advanced age

☐ Too late .... ☐☐ hours from symptom onset

☐ Nondiagnostic ECG

☐ Reason not documented

☐ Contraindication (specify) ______________________

☐ Other (specify) ______________________

Alternative Initial Reperfusion Strategy (√ all)

☐ Primary PTCA

☐ IC thrombolysis

Lytic ____________ Dose ____________

☐ Immediate CABG

☐ No alternative initial reperfusion strategy

1234567-2-0001

Meds within 24 hours of MI Diagnosis (√ all)

- ☐ IV heparin
- ☐ SQ heparin
- ☐ ASA
- ☐ IV NTG
- ☐ IV beta blocker
- ☐ Oral beta blocker
- ☐ Lidocaine
- ☐ IV magnesium
- ☐ ACE inhibitor
- ☐ Calcium blocker
- ☐ Other antithrombin
- ☐ Other antiplatelet

Other Procedures Performed at This Hospital Prior to Discharge (√ all)

- ☐ Coronary angiography
- ☐ PTCA (excl. 1° PTCA)
- ☐ Rescue PTCA
- ☐ Atherectomy/stent/laser
- ☐ CABG (excl. immediate)
- ☐ Echocardiography
- ☐ IABP
- ☐ Pacemaker
- ☐ Ventilator
- ☐ Stress test
- ☐ Repeat dose IV thrombolytic (specify) ____________

Patient Outcomes

Clinical Events

Event	Cause of Death	Event	Cause of Death
☐ Hypotension requiring intervention	☐	☐ 2° or 3° AV block	☐
☐ Recurrent ischemia/angina	☐	☐ Sustained V-tach/V-fib	☐
☐ Recurrent MI (ECG + or CK-MB+)	☐	☐ Cardiac rupture/PEA (EMD)	☐
☐ CHF/pulmonary edema requiring drug tx.	☐	☐ Unexpected cardiac arrest	☐
☐ Cardiogenic shock	☐	☐ Other major event (specify) ____________	☐
☐ Pericarditis	☐		

Stroke/Intracranial Bleed (ICB)

Onset of neurological symptoms .... Date M ☐☐ D ☐☐ Y ☐☐ Time (24-hr. clock) ☐☐ : ☐☐

CT Scan or MRI obtained? ☐ Yes ☐ No If Yes, ... Date ☐☐ ☐☐ ☐☐ Time ☐☐ : ☐☐

Type of Stroke/ICB (√ 1) ☐ Hemorrhagic ☐ Thromboembolic ☐ Thromboembolic with hemorrhagic conversion

Location (specify) ____________ ☐ Other (specify) ____________

Outcomes (√ all) ☐ Required procedure/surgery ☐ Life-threatening ☐ Prolonged hospitalization ☐ Residual deficit at discharge ☐ Death

Major Bleeding (Episodes other than Stroke/ICB where bleeding resulted in substantial hemodynamic compromise)

Specify Site(s)	Date (M D Y)	Procedure / Surgery? Yes	No	Prolonged Hospitalization? Yes	No	Resulted in Death? Yes	No
____________	☐☐ ☐☐ ☐☐	☐	☐	☐	☐	☐	☐
____________	☐☐ ☐☐ ☐☐	☐	☐	☐	☐	☐	☐

Information at Discharge

MI Location (√ all)

- ☐ Anterior/Septal
- ☐ Lateral
- ☐ Inferior
- ☐ Posterior
- ☐ RV involvement
- ☐ Unspecified/other

MI Type (√ 1)

- ☐ Q wave
- ☐ Non-Q wave (Subendocardial)

Was a total CK or CK-MB result ≥ 2 times upper limit of normal? ☐ Yes ☐ No

Ejection fraction (EF)........................ ☐☐ %

Method EF obtained (√ 1) ☐ LV-gram ☐ Nuclear ☐ Echo ☐ Other

Primary MI-related ICD-9 CM discharge diagnosis code 4 1 0 . ☐ 1

Total days in ICU/CCU bed (your hospital only) .... ☐☐☐

Discharge Disposition (√ 1 below and complete corresponding section)

☐ **Discharged**

☐ Home or ☐ LTC or ☐ AMA

Discharge Medications (√ all)

- ☐ ACE inhibitor
- ☐ Ca blocker
- ☐ Antiarrhythmic
- ☐ Digoxin
- ☐ ASA
- ☐ Diuretic
- ☐ Beta blocker
- ☐ Nitrate

☐ **Transferred-Out (to acute care facility)**

Transfer-Out Hospital ID# TO - ☐☐ or

Name ____________

Reason Transferred-Out (√ all)

- ☐ Additional treatment/intervention
- ☐ Patient request
- ☐ Insurance requirement
- ☐ Other

☐ **Deceased**

Autopsy? ☐ Yes ☐ No

Inhospital Location of Death (√ 1)

- ☐ Emergency Department
- ☐ ICU/CCU
- ☐ Cardiac cath lab
- ☐ Operating room
- ☐ Other monitored bed
- ☐ Unmonitored bed

Completed by ____________ (print)

Signature ____________ Date ☐☐ ☐☐ ☐☐ (M D Y)

Appendix B

Delays in the treatment of AMI: Is there a gender difference?

Data Collection

_____ ID number assigned

_____ Sex 1. Male 2. Female

_____ Health Insurance (Primary payer)

1. Commercial (PPO)	2. Health Maintenance Org (HMO)
3. Medicare	4. Medicaid
5. VA/CHAMPUS	6. Self Pay

_____ Ethnicity

1. Caucasian	2. African-American
3. Hispanic	4. Asian
5. Native American	6. Other or Unknown

_____ Marital Status

1. Single	2. Married
3. Divorced	4. Widowed

Previous Medical History

_____Previous MI	1. Yes	2. No
_____Angina	1. Yes	2. No
_____CHF	1. Yes	2. No
_____PTCA w/angioplasty	1. Yes	2. No
_____CABG	1. Yes	2. No
_____CVA	1. Yes	2. No
DM	1. Yes	2. No
_____HTN	1. Yes	2. No
_____Hypercholesterolemia	1. Yes	2. No
_____Positive family history	1. Yes	2. No
_____Current smoker	1. Yes	2. No

Emergency Department Arrival

M D Y TIME (24 hr clock)

__ __ __ __ __ __ __ __:__ __

_____Symptom Onset (converted into tenths of hour)

__ __ __ __ __ __ __ __:__ __

_____Time Interval (converted to hours - in tenths)

_____Day of Week

1. Sunday	2. Monday
3. Tuesday	4. Wednesday
5. Thursday	6. Friday
7. Saturday	

Appendix C

Appendix C

MICHIGAN STATE
UNIVERSITY

November 26, 1997

TO: Manfred Stommel
A-230 Life Sciences Building

RE: IRB#: 97-785
TITLE: DELAYS IN THE BEHAVIOR OF HEALTH SEEKING ACTIVITY FOR INDIVIDUALS WITH SYMTOMS OF ACUTE MYOCARDIAL INFARCTION: IS THERE A GENDER DIFFERENCE?
REVISION REQUESTED: N/A
CATEGORY: 1-E
APPROVAL DATE: 11/26/97

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Kathleen Krol

OFFICE OF
RESEARCH AND GRADUATE STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)

Michigan State University
246 Administration Building
East Lansing, Michigan
48824-1046

517/355-2180
FAX: 517/432-1171

Appendix D

Appendix D

Holland Community Hospital

602 Michigan Avenue
Holland, Michigan 49423-4999
(616) 392-5141

September 30, 1997

Holland Family Medicine
ATTN: Kathy Krol, B.S.N.
601 Michigan Ave
Suite 104
Holland, MI 49423

RE: Secondary Analysis of National Registry of Myocardial Infarction II data

Dear Kathy:

Holland Community Hospital is pleased to grant you permission to perform a secondary analysis of our hospital data as reported in the National Registry of Myocardial Infarctions II (NRMI II). We would like you to share your analysis and thesis with us.

We offer you our best wishes as you complete your educational goals.

Sincerely,

Reezie DeVet

Reezie DeVet, Corporate Vice President & CNO

Our Mission—To Continually Improve the Health of the Communities We Serve