To my children, Katie and Tripp, who
provide me constant joy and light up my life.
I have treasured every minute of being your mom.
I love you with all my heart
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# TABLE OF CONTENTS

DEDICATION .......................................................................................................................... ii

ACKNOWLEDGEMENTS ..................................................................................................... iii

LIST OF TABLES ................................................................................................................... vii

LIST OF FIGURES ............................................................................................................... viii

Chapter

I. THE COST OF INDECISION IN PREHOSPITAL DELAY ........................................... 1

   Significance of the Issue ............................................................................................... 1
   Statement of Problem ................................................................................................. 8
   Purpose of the Study .................................................................................................... 12
   Research Questions/Hypotheses .................................................................................. 15

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK ......................... 20

   Literature Search ....................................................................................................... 20
   Theoretical Framework .............................................................................................. 21
   Review of the Literature ............................................................................................ 28
   Sociodemographic Factors ......................................................................................... 29
      Gender ..................................................................................................................... 29
      Previous Cardiac Event ......................................................................................... 31
   Cognitive Factors ...................................................................................................... 33
      Symptom Attribution to the Heart ......................................................................... 33
      Perceived Seriousness of Symptoms ..................................................................... 35
      Perceived Ability to Control Symptoms ............................................................... 37
   Emotional Factor ....................................................................................................... 38
      Level of Anxiety .................................................................................................... 38
   Behavioral Factors ................................................................................................... 39
      First Action Taken ............................................................................................... 39
   Definition of Terms .................................................................................................. 42
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Participants per Site and Percent of Total Sample</td>
<td>48</td>
</tr>
<tr>
<td>2. Sociodemographic and Clinical Characteristics</td>
<td>49</td>
</tr>
<tr>
<td>3. Coping Responses with the Modified Response to Symptoms Questionnaire</td>
<td>51</td>
</tr>
<tr>
<td>4. Prehospital Delay Time by Site</td>
<td>58</td>
</tr>
<tr>
<td>5. Comparison of Mean Log Prehospital Delay Time by Gender and History of a Previous Cardiac Event</td>
<td>59</td>
</tr>
<tr>
<td>6. Coping Responses to onset of AMI Symptoms by Gender and History of a Previous Cardiac Event</td>
<td>61</td>
</tr>
<tr>
<td>7. Summary of significant Main Effects of Gender and Previous Cardiac Event and their Interactive Effect on the Coping Responses after AMI Symptom Onset</td>
<td>62</td>
</tr>
<tr>
<td>8. Mean log prehospital delay time for Behavioral, Cognitive, and Emotional Coping Responses with a significant impact</td>
<td>66</td>
</tr>
<tr>
<td>9. Cognitive and Emotional Coping Responses with a significant impact on Behavioral Coping Responses of First Action Taken after AMI Symptom Onset</td>
<td>68</td>
</tr>
<tr>
<td>10. Multiple Linear Regression of Prehospital Delay Time on Five significant Coping Responses</td>
<td>71</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure                           Page
1. CVD and other major causes of death for all males and females .......................... 2
   in the United States for 2006 .............................................................................2
2. ACC/AHA reperfusion treatment goals .................................................................6
3. Relationship between early reperfusion, mortality reduction, and .......................... 7
   extent of myocardial salvage ..............................................................................7
4. Diagram of main effects and interactive effect of gender and previous cardiac 15
   event on prehospital delay time ...........................................................................15
5. Diagram of main effects and interactive effect of gender and previous cardiac 16
   event on the cognitive, emotional, and behavioral coping responses to AMI 16
   symptoms .............................................................................................................16
6. Diagram of the impact of behavioral, cognitive, and emotional coping responses 17
   on prehospital delay time after AMI symptom onset .........................................17
7. Diagram of the impact of the cognitive and emotional coping responses 18
   on the first action taken after AMI symptom onset ..........................................18
8. The Self-Regulation model ..................................................................................28
9. 2 x 2 Factorial design of gender and previous cardiac event ..............................45
10. Model of relationship of predictor variables to prehospital delay .......................47
11. Interactive effect of gender and previous cardiac event on symptom attribution 63
12. Diagram of the impact of the behavioral, cognitive, and emotional coping 65
    responses on prehospital delay time after AMI symptom onset .......................65
13. Diagram of *significant* relationships between all variables .............................78
CHAPTER I

THE COST OF INDECISION IN PREHOSPITAL DELAY

Significance of the Issue

Cardiovascular disease (CVD) has been the leading cause of death in the United States since the beginning of the twentieth century. CVD accounts for 34% of “total mortality” or one of every 2.9 deaths in the United States (American Heart Association (AHA), 2010). This death rate surpasses cancer, chronic lower respiratory disease, accidents, diabetes mellitus, and influenza and pneumonia combined (AHA), 2010). In 2006, one of every five deaths in the United States was related to coronary heart disease (CHD). Approximately every 25 seconds someone suffers a coronary event and every 60 seconds someone dies from one (AHA, 2010). CHD is the largest major killer of both American males and females (AHA, 2010).

Each year approximately one million Americans experience an acute myocardial infarction (AMI). The estimated average number of years of life lost due to an AMI is 15 (AHA, 2010). Up to 50% of patients with acute coronary syndrome (ACS) experience sudden death prior to their arrival to an emergency department (DeVon, Hogan, Ochs, & Shapiro, 2010). The Centers for Disease Control (CDC), 2004) estimate that in the United States, 400,000 to 460,000 people die each year of coronary heart disease in an emergency department or before reaching a hospital. This mortality rate accounts for over 60% of all cardiac–related deaths (AHA, 2004).
According to the CDC (2004), the number of Americans older than age 65 will increase dramatically over the next two decades from approximately 35 million in 2000 to more than 53 million in 2020; by 2020, a total of 16.5% of Americans will be 65 years of age or older, compared to 12.6% in 2000. This aging of the population will result in an increased incidence of chronic disease, including an increased incidence of coronary artery disease. These changes mean an increased demand for cardiovascular related services, an increase in health care expenditures, an increase in lost income and productivity, and an increase in disability.

Coronary heart disease accounts for 19% of disability allowances by the Social Security Administration, placing it as the number one cause of premature permanent
disability in the United States labor force (CDC, 2004). From 1979 to 2006, the number of cardiovascular operations and procedures increased from approximately 600,000 in 1979 to over 7 million in 2006 (AHA, 2010). The AHA (2010) estimates the current cost of cardiovascular disease at $503 billion with 35% of those costs related specifically to coronary heart disease. This total reflects direct health care costs (hospital, nursing home, and home health care, physicians, medications, and other durable medical equipment) and indirect costs (lost productivity from disability and/or death).

Cardiovascular disease is currently the leading cause of death in American women; one in 2.8 female deaths is due to CVD (AHA, 2010). Since 1984, more women than men have died from cardiovascular causes (AHA, 2004). Because of higher short-term and higher long-term mortality rates after an acute myocardial infarction, there is a worse prognosis for women than men (Rosenfeld, 2001). Thirty-eight percent of women die within one year of their first heart attack compared to 25% of men (Rosenfeld, 2001; Society for Women’s Health Research (SWHR), 2004) and women over 65 years of age who experience an AMI have a 21% 30-day mortality rate (Rosenfeld, 2001). Six years after a heart attack, 35% of women will have another AMI and 46% will develop disabling heart failure (Rosenfeld, 2001; Zerwic, Ryan, DeVon, & Drell, 2003).

Studies show that mortality can be reduced if patients are treated in a timely manner by one of two types of reperfusion therapies: emergent percutaneous coronary intervention (PCI) or administration of a thrombolytic agent (Bett, Tonkin, Thompson, & Aroney, 2005; Meischke, Diehr, Rowe, Cagle, & Eisenberg, 2004; Luepker et al., 2000). However, the benefit of reperfusion therapy is related to the time interval between
symptom onset and treatment intervention (Buckley et al., 2007; Eppler, Eisenberg, Schaeffer, Meischke, & Larson, 1994; Ho, Eisenberg, Litwin, Schaeffer, & Damon, 1989; Meischke, Eisenberg, Schaeffer, Larsen, & Henwood, 1994; Zapka et al., 2000). As the time between AMI symptom onset and time to treatment increases, the efficacy of reperfusion therapy decreases (Dracup et al., 2006; Meischke et al., 1997; Meischke, Eisenberg, Schaeffer, & Henwood, 2000; Meischke, Diehr, Rowe, Cagle, & Eisenberg, 2004; Zapka et al., 2000).

Prior to the availability of reperfusion therapies in the 1980s, the management of AMI patients was focused on reducing the work of the myocardium and suppressing arrhythmias (Dracup et al., 1995). The damage to the myocardium could not be prevented; consequently, clinical goals focused on the treatment of complications. With the understanding of the pathophysiology of an AMI, namely the role of platelet activation and thrombus formation, came the advent of thrombolytics and PCI. The opportunity arose to reperfuse the myocardium as it was infarcting. Interventions to treat an AMI became time-dependent, and a relationship between time to treatment and patient outcome evolved.

In 1986, the first large randomized clinical trial demonstrating that intravenous thrombolytic therapy with streptokinase could improve survival was published (Maroo & Topol, 2004). GISSI-1 (the first study of the Gruppo Italiano per lo studio della strepochinasi ell’infarto Miocardio) provided evidence that thrombolytics were most effective when given early after the onset of an AMI (Maroo & Topol, 2004).
In 1993, the Global Utilization of Streptokinase and t-PA for Occluded Coronary Arteries randomized myocardial reperfusion trial (GUSTO-1) established the importance of the ‘open artery hypothesis’ by demonstrating a significant interaction between time to treatment and reduction in mortality (Maroo & Topol, 2004). “Since this landmark clinical trial, the concept of short door-to-needle time has become a priority in the treatment of AMI” (Maroo & Topol, 2004, p. 1869) requiring prompt recognition of AMI symptoms, prompt access to emergency medical services, and prompt reperfusion treatment; it is a concept negatively impacted by prehospital delay.

The National Heart Attack Alert program recommends that reperfusion therapy begin within one hour of symptom onset (Moser, McKinley, Dracup, & Chung, 2005; Tullmann, Haugh, Dracup, & Bourguignon, 2007). Clinical trials have demonstrated reductions in morbidity and mortality when patients are treated with thrombolytics within one hour of symptom onset (Pattenden, Watt, Lewis, & Stanford, 2002). There is a 50% reduction in patient mortality if thrombolytics are administered within one hour from symptom onset, as compared to only 23% if administered between one and three hours from symptom onset (Dracup et al., 1995; Moser et al., 2007; Quinn, 2005). A diagram of the American College of Cardiology (ACC) and American Heart Association (AHA) reperfusion treatment goals is shown below.
Figure 2. ACC/AHA Reperfusion Treatment Goals (from Antman et al., 2007)
“The overarching goal is to keep total ischemic time within 120 minutes (ideally within 60 minutes) from symptom onset to initiation of reperfusion treatment. The medical system goal is to facilitate rapid recognition and treatment of patients” (Antman et al., 2008, p. 303).

As door-to-balloon times increase, unadjusted mortality rates rise (Cannon et al., 2000). The National Registry of Myocardial Infarction-2 (NRMI-2) data demonstrated that a considerable number of patients present to the hospital after an extended delay and outside of the time frame for thrombolytic and angioplasty effectiveness (Cannon et al., 2000; Goldberg, Gurwitz, & Gore, 1999). For every 30 minutes of delay time, the one-year mortality risk can increase by 7.5% and life expectancy can decrease by one year (Moser et al., 2007). GUSTO II-b demonstrated that patients who receive the first balloon inflation within 60 minutes of hospital arrival have a 1.0% 30-day mortality rate; however, for every 15 minutes of delay time greater than one hour the odds of death increase 1.6 times (Moser et al., 2007).
In seeking medical care for cardiac symptoms, only 20% of myocardial infarction patients arrive in the emergency department within one hour of symptom onset (King and McGuire, 2007) while at least 50% delay greater than 1.5 hours (Moser et al., 2007). Approximately one quarter to one half delay longer than four hours (Blank & Smithline, 2002; Dracup et al., 2006; Ho et al., 1989; Tullmann et al., 2007). According to Dracup et al. (2006) and Zapka et al. (2000), 20%-40% of patients delay seeking help for greater than 6 hours. These delays in seeking treatment place patients outside of the time frame required for them to receive the optimum benefit from reperfusion therapy.

Data Supporting an Early Reperfusion Decision Provides Striking Benefit in Myocardial Salvage and Mortality Reduction

Figure 3. Relationship between Early Reperfusion, Mortality Reduction, and Extent of Myocardial Salvage (from Gersh, et al., 2005).
Statement of Problem

Even though major advances have been made in the treatment of acute myocardial infarctions and emergency medical systems in the last two decades, little progress has been made in reducing these prehospital delay times (Dracup & Moser, 1997; Rosenfeld, 2001). Prehospital delay times have remained constant since 1986 (Buckley et al, 2007); the median and mean delay times have changed little (Dracup et al., 2006). Rosenfeld (2001) states that the median total delay times for symptoms of acute chest pain or AMI reported in the literature for the last decade have ranged from two to seven hours which is similar to the four hour median delay reported by Hackett and Cassem in 1969.

Treatment-seeking delay within the context of cardiac illness remains a persistent clinical issue and represents a major unresolved public health problem (Moser et al., 2005; Turris, 2009).

According to Sullivan et al. (2009), the greatest opportunity to improve ACS patient outcomes is the delay before presentation to the hospital because this delay is associated with longer door-to-balloon times and lower rates of primary reperfusion therapy. Fox and Huber (2008) reported that much of the delay prior to reperfusion happens before the patient arrives at the hospital with door-to-balloon times accounting for only about one-third of the delay between symptom onset and treatment. In a recent study by Khraim, Scherer, Dorn, and Carey (2009), the first response by the majority of study participants was to take actions that extended delay rather than take actions that decreased delay.

The lack of progress in reducing prehospital delay times is especially true for women who have been shown to delay longer than men (Dempsey, Dracup, & Moser,
1995; Dracup & Moser, 1997; Gaspoz et al., 1996; Goldberg et al., 1999; Johansson, Stromberg, & Swahn, 2004; Lefler & Bondy, 2004; Meischke, Larsen, & Eisenberg, 1998; Noureddine et al., 2006; Rosenfeld, 2001; SWHR, 2004). Their delay diminishes the effectiveness of reperfusion therapies which leads to a negative impact on AMI morbidity and mortality rates (Dempsey et al., 1995; Rosenfeld, 2001). Individuals knowledgeable about heart attack symptoms and who believe the symptoms being experienced are those of a heart attack seek treatment more quickly than those individuals who attribute their symptoms to another cause (Zerwic, 1999; Dracup, 1995). Lefler (2004) found the most significant psychosocial reason for delay by women is the incorrect interpretation and attribution of presenting symptoms.

The cultural impact of symptom attribution and response cannot be understated. Moser et al. (2005) reported in her study that not wanting to trouble others was a factor that contributed to prehospital delay in women. McSweeney (1996) suggests that the reactions of women to health threats are culturally mediated and may be expressed in a different manner than in men. Lefler (2004) reminds us that women have traditionally put their families and household obligations before their own health. These patterns indicate that subtle or nonspecific symptoms of an impending acute myocardial infarction may not be acknowledged by a woman as important enough to put aside family obligations to seek treatment.

One variable that has been found to interface with gender in such a way as to impact prehospital delay time is history of a previous AMI (Alonzo, 1999; Moser et al., 2005). It is estimated that in 2010, 785,000 Americans will have a new coronary attack and 470,000 will have a recurrent attack (AHA, 2010). However, the data regarding the
effect of the previous AMI on treatment seeking delay are conflicting (Burnett, Blumenthal, Mark, Leimberger, & Califf, 1995). Johansson et al. (2004) discovered that when patients with and without a history of an AMI were compared, there were significantly more patients with a history of an AMI who sought care sooner; a relationship between history of an AMI and longer delay times was not found. On the other hand, Thuresson et al. (2007) discovered that patients with a history of coronary artery disease (i.e., AMI, angina pectoris, PCI, and coronary surgery) hesitated as much as patients without a history of coronary artery disease.

According to Alonzo (1999), research has demonstrated that individuals who have experienced a previous cardiac event (such as an AMI) take longer to seek care for ischemic symptoms when compared to individuals who have not had a previous cardiac event. This delay in seeking care can have a negative impact on what is already a vulnerable and high risk population. Approximately 50% of all acute myocardial infarctions and at least 70% of deaths from coronary heart disease occur in individuals who have had a previous experience with cardiovascular disease (Buckley et al., 2007; Zapka et al., 2000). Individuals who survive the acute phase of a heart attack have a chance of illness and death that is 1.5 – 15 times higher than that of the general population (AHA, 2010).

In a study designed to better understand the reason for delays in seeking ACS care, Sullivan et al. (2009) found that gender and prior AMI were not associated with intention to wait, but prior revascularization (coronary angiography, coronary artery bypass graft surgery, percutaneous coronary intervention, or any other revascularization procedure) was associated with less intention to wait. In a study by Khraim et al. 2009,
increased sensitivity to symptoms indicative of a cardiac problem contributed to a reduction in decision delay among men who had a previous history of AMI, angina, or cardiac intervention.

In a series of five logistic regression models to identify predictors of treatment seeking delay, El-Masri and Fox-Wasylyshyn (2006) found contradictory results regarding the role of a previous AMI as a predictor of treatment seeking delay. Two of the models identified history of AMI as a risk factor for prolonged delay while one model identified an inverse relationship between history of AMI and delay (El-Masri & Fox-Wasylyshyn, 2006).

In addition to previous AMI, coping behaviors used during the prehospital phase of emergency cardiac care have been identified as possible predictors of prehospital delay. Coping can be defined as “constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984, p. 141). Meischke et al. (1999) stated there are few studies on coping strategies of patients in response to AMI symptoms. According to Dracup et al. (1995), few researchers have investigated a patient’s subjective appraisal of the significance of AMI symptoms.

Prior to their study, Fox-Wasylyshyn, El-Masri, and Krohn (2007) found no studies comparing coping behaviors used during the time period between symptom onset and the decision to seek medical treatment by individuals having their first AMI versus individuals experiencing a subsequent AMI. Their study revealed some similarities and differences in coping strategies utilized between those with and without a history of an
AMI; however, information regarding the extent to which these differences influence treatment-seeking delay was not provided (Fox-Wasylyshyn et al., 2007).

Reynolds and Alonzo (2000) suggest that individuals who have had an AMI are likely to delay longer than those who have not had an AMI due to maladaptive coping responses, mislabeling of symptoms, and/or a false sense of optimism. However, according to Fox-Wasylyshyn et al. (2007), this hypothesis has not been empirically validated; the evidence from which to draw conclusions regarding the impact of a previous AMI on coping strategies utilized at the time of AMI symptom onset is insufficient. Although Perkins-Porras, Whitehead, Strike, and Steptoe (2009) found that patients who had suffered a previous AMI were more likely to have a shorter prehospital delay time period, an association between gender and cardiac history and contacting EMS following AMI symptom onset was not found. The evidence from these studies indicates that the impact of a previous AMI or revascularization procedure and gender on treatment seeking delay behavior is inconsistent.

Purpose of the Study

A number of programs have been implemented throughout the country to decrease the prehospital delay phase of emergency cardiac care. These efforts have been successful at reducing ambulance and hospital delays, but these delays represent only a small percentage of total delay (Zerwic, 1999). In seeking treatment for their AMI symptoms, women typically delay longer than men; yet, according to Rosenfeld (2001), few studies have analyzed the response to AMI symptoms by gender. Research studies have shown there are gender differences in delay times, but those studies have not been
able to adequately explain the reasons for the difference in delay times between men and women.

According to DeVon et al. (2010), the most important factor impacting time to treatment for ACS is the decision made by the patient to delay seeking care. Using the Self-Regulation model (Leventhal, Safer, & Panagis, 1983) as a framework, it will be demonstrated that the decision to seek treatment is a response to a complex pathway of symptoms, emotions, thoughts, and feelings which must be made in a short period of time. In order to decrease time to treatment, it is essential to understand the decision making processes that lead to accessing emergency health care services. For prehospital delay time to be decreased, this complex pathway of behavioral, cognitive, and emotional factors need to be more clearly understood. It is useful to know that certain variables increase delay, but knowing why they affect delay is more useful. Knowing more about the coping strategies utilized during this time period could provide insight into the “why.”

The cognitive processes and problem-solving strategies that differentiate individuals who take a long time to seek care from those who respond immediately need to be understood. The cognitive processes that occur when an individual weighs the possibility that certain prodromal symptoms may be an impending heart attack need to be described. The underlying cognitive and emotional processes that bring about the actual behavior need to be examined (Dracup et al. 1995).

According to Fox and Huber (2008), delays in initiating treatment are influenced by individual characteristics such as age, sex, and the presence or absence of a prior AMI. Therefore, the purpose of this dissertation is to examine the relationship between gender and a previous cardiac event on prehospital delay time and then, using the Modified
Response to Symptom Questionnaire, examine the relationships between gender, previous cardiac event and the behavioral, cognitive, and emotional coping responses to AMI symptoms on prehospital delay time. Leventhal’s Self-Regulation model (Leventhal et al., 1983) has been shown to be helpful when trying to understand the cognitive and behavioral processes related to delays in seeking care for AMI symptoms (Holliday, Lowe, & Outram, 2000; Meischke et al., 1999). Thus, Leventhal’s theoretical framework will be used to better understand those coping responses that occur after AMI symptom onset. Those responses will include the first action taken, symptom attribution to the heart, perceived seriousness of symptoms, level of anxiety, and perceived ability to control symptoms. It has been suggested that these factors are major determinants of delay, more so than knowledge of the appropriate response to symptoms (Dracup & Moser, 1997).

A cardiac event will be defined as an AMI, PCI, and/or coronary artery bypass graft (CABG) surgery (Buckley et al., 2007). While reperfusion therapy with a fibrinolytic and/or PCI is often the preferable first-line treatment for an AMI, there are a clinical subset of patients for whom surgical revascularization through coronary artery bypass graft surgery is indicated (Eagle et al., 2004); therefore, patients who have had a CABG will be included in this study. According to Rosenfeld (2001), measurement of single variables does not capture the relationship among the behavioral, cognitive, and emotional factors that contribute to prehospital delay. A study that captures the relationship of these factors would be more effective; therefore, the following research questions and hypotheses were analyzed.
Research Questions/Hypotheses

1. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event, impact prehospital delay time?

Figure 4. Diagram of main effects and interactive effect of gender and previous cardiac event on prehospital delay time.

Hypothesis 1: Women will have a longer prehospital delay time than men.
Hypothesis 2: Men and women with a history of a previous cardiac event will have a shorter prehospital delay time than men and women without a previous cardiac event.
Hypothesis 3: Women with a history of a previous cardiac event will have a longer prehospital delay time than men with a previous cardiac event.

Questions 2 through 4 reflect the main effects as well as the interactive effect of gender and previous cardiac event on the cognitive, emotional, and behavioral coping responses to AMI symptoms (Figure 5).
2. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact the behavioral coping responses of first action taken (ignored symptoms, tried to relax, told someone, self-treated, accessed healthcare provider) to AMI symptoms?

3. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact the cognitive coping responses (symptom attribution, perceived severity of symptoms, perceived ability to control symptoms) to AMI symptoms?
4. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact the emotional coping response (level of anxiety) to AMI symptoms?

Questions 5 through 7 reflect the impact of the behavioral, cognitive, and emotional coping responses to AMI symptoms on prehospital delay time (Figure 6).

5. How does the first action taken (ignored symptoms, tried to relax, told someone, self-treated, accessed healthcare provider) after AMI symptom onset impact prehospital delay time?

Hypothesis 4: Of the first action taken after AMI symptom onset, ignoring symptoms, trying to relax, engaging in self-treatment strategies, and/or telling
someone about symptoms increases prehospital delay time and accessing a healthcare provider decreases prehospital delay time.

6. How do the cognitive coping responses (symptom attribution, perceived severity of symptoms, perceived ability to control symptoms) utilized after AMI symptom onset impact prehospital delay time?

7. How does the emotional coping response (level of anxiety) utilized after AMI symptom onset impact prehospital delay time?

Questions 8 and 9 reflect the relationships between the behavioral, cognitive, and emotional coping responses after AMI symptom onset (Figure 7).

Figure 7. Diagram of the impact of the cognitive and emotional coping responses on the first action taken after AMI symptom onset.
8. How do the cognitive coping responses utilized after AMI symptom onset impact the first action taken?

9. How does the emotional coping response utilized after AMI symptom onset impact the first action taken?
CHAPTER II

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Literature Search

In preparation for this dissertation, an extensive literature search was conducted in PubMed, CINAHL, PsychINFO, and Sociological Abstracts databases using multiple subject headings and key word combinations which included: acute myocardial infarction, acute coronary syndrome, heart attack, chest pain, gender, women, gender differences, gender bias, care seeking, treatment seeking, treatment seeking behavior, treatment seeking delay, delay, patient delay, prehospital delay, treatment delay, health behavior, illness behavior, decision making, self-regulatory, and Self-Regulation model. As a result, articles were included if the focus was on any of the following:

1) women (regardless of age, race, or type of illness); 2) prehospital phase of emergency cardiac care; 3) cardiovascular disease; 4) acute myocardial infarction and its symptoms; 5) acute coronary syndrome; 6) description of patient behavior from the onset of heart attack symptoms to arrival at an emergency department (ED) and/or hospital; 7) AMI coping strategies; 8) previous AMI; or 9) a theoretical framework that included Leventhal’s Self-Regulation model.

Men were not excluded from this literature review as gender differences between symptom presentation, prehospital delay, and time to treatment were critical as a point of reference. Articles that included American Heart Association/American College of Cardiology Scientific Statements regarding the standard of care for treatment of acute
myocardial infarction patients which included those with an ST-Elevated MI (STEMI) and/or Non-ST-Elevated MI (NSTEMI) were also included. Electronic searches were enhanced by the ancestry approach in which articles cited in the literature were reviewed for applicability to this particular dissertation focus.

Theoretical Framework

Health behavior can be defined as “any behavior that influences or is believed to influence physical health outcomes either by increasing or decreasing their risk or severity” (Sutton, 2001, p. 6499). For individuals who experience an acute myocardial infarction (AMI), longer delay behavior means reperfusion therapies are not accessed in a timely manner which leads to an increase in morbidity and mortality rates (Lefler, 2002; Lefler & Bondy, 2004; Moser et al., 2007; Rosenfeld, 2001). For AMI patients, a shorter delay time means the possibility of a better outcome (Finnegan et al., 2000; Zerwic, 1999). However, for individuals who have suffered a previous AMI or have a history of coronary heart disease, the risk of death and increased morbidity is greater (Alonzo & Reynolds, 1998). Their delay in seeking care means that their risk of sudden cardiac death is five times to seven times higher than the general population (Alonzo, 1999).

A number of psychosocial theories or models have been used to predict, change, and explain health behaviors. Alonzo and Reynolds (1998) claim that treatment seeking delay behavior and coping during an AMI is multi-dimensional and, thus should be evaluated within a framework that reflects those characteristics. One such theoretical framework is Leventhal’s Self-Regulation model (Leventhal, Safer, & Panagis, 1983) for
it reflects the emotional, cognitive, and behavioral coping skills employed at the time of
AMI symptoms onset which are key elements in the decision to seek medical care.

According to Alonzo and Reynolds (1997, p. 266), Leventhal’s Self-Regulation
model provides “an analytic understanding of care-seeking and can be used to locate
points within the coping process where educational and behavioral interventions could be
effective in reducing the time required” to seek care. The Self-Regulation model focuses
on problem-solving coping behaviors and emotion-focused coping behaviors; the former
is focused on doing something constructive with the stressful situation while the latter
focuses on regulating the emotional consequences of the stressful event (Alonzo &
Reynolds, 1997).

The Self-Regulation model of illness behavior was developed as a response to the
problem of patient compliance with health-promoting and illness-preventing behaviors
(Leventhal et al., 1983); it can be a useful framework for understanding the anxiety, fear,
and threat associated with medical treatment (Alonzo & Reynolds, 1997). With this
model, the impact of sociodemographic factors, clinical characteristics, and cultural roles
and expectations on one’s response to the health threat is considered (Dracup et al.,
2003). A health threat (e.g., chest pain, shortness of breath, nausea) that is distinct from
previous experiences and exceeds normal expectations activates three stages: 1) mental
representation of the health threat (cognitive and emotional); 2) action plan for coping
with the perceived threat; and 3) appraisal of how well the action plan addresses the
threat (Dempsey et al., 1995; Dracup et al., 2003; Meischke et al., 1995).

In the first or representation stage, the health threat is recognized and labeled and
its causes and consequences are assessed. This stage is affected by an individual’s
subjective experience, sense of vulnerability to illness, and general knowledge about the
disease and its treatment (Alonzo & Reynolds, 1997, 1998; Dracup et al., 1995; Meischke et al., 1999). The labeling process requires that signs and symptoms be placed within a framework that makes sense to the individual. Thus, in response to the stimulus that is chest pain, a mental representation of the health threat based on episodic and semantic memories is created in what can be called an illness prototype (Alonzo & Reynolds, 1997, 1998; Dempsey et al., 1995; Meischke et al., 1995). Memories are a significant component of illness prototypes as well as beliefs about the cause of the disease, its duration, treatment, long-term consequences, and impact on quality of life (Alonzo & Reynolds, 1997).

Episodic memories are autobiographical and are based on past experiences with the symptoms associated with the AMI and/or the diagnostic procedures utilized (Alonzo & Reynolds, 1997, 1998; Meischke et al., 1995). Past experience with cardiac-related illnesses can influence the identity of the health threat (Meischke et al., 1995) and can interfere with expedient treatment seeking activities due to mislabeling of symptoms, a sense of invulnerability related to post-AMI cardiac rehabilitation activities, and/or maladaptive coping strategies (Alonzo & Reynolds, 1998; Johansson et al., 2004).

Semantic memories reflect an individual’s knowledge and are based on more common, abstract, conceptual information about heart disease, rather than direct experience. Information provided by health care organizations or associations such as the American Heart Association or the National Heart Lung and Blood Institute are examples of input into semantic memories (Alonzo & Reynolds, 1997, 1998).
It is believed that at the time of AMI symptom onset, defense mechanisms to neutralize the threats are employed (Alonzo & Reynolds, 1997, 1998). Some of the defense mechanisms utilized include denial, selective ignoring, minimization, uncertainty, suppression, and distraction (Alonzo & Reynolds, 1997). For individuals with a history of a previous cardiac event, these coping mechanisms are utilized longer possibly due to wanting to avoid the previous trauma associated with the AMI such as accessing EMS, being in the emergency department, undergoing invasive therapies, and/or the long term consequences of living with CHD (Alonzo & Reynolds, 1998; Johansson et al., 2004).

The invasive therapies associated with CHD and/or an AMI can include a heart catheterization, a percutaneous coronary intervention, and/or coronary bypass graft surgery, all of which can produce a “potentially traumatic, turbulent, emotional experience” for an individual (Alonzo & Reynolds, 1998, p. 1107). Individuals who have experienced a previous cardiac event know what will be encountered once they access the health care system for their AMI symptoms; this knowledge may prove to be a deterrent to seeking care (Alonzo & Reynolds, 1997). This representation stage ends when a label can be assigned to the signs and symptoms and the individual is ready to move to the second stage, which is the coping or action plan stage.

During the coping or action plan stage, the individual develops cognitive and emotion-focused coping strategies (or responses to neutralize the threat) and formulates an action plan designed to restore equilibrium. The goal in this phase is to lessen the intensity of the signs and symptoms in such a way that the level of emotional arousal is decreased (Alonzo & Reynolds, 1998). During this stage, the individual may assess the
environment for causes, explanations, remedies, or strategies to provide stability (Alonzo & Reynolds, 1997). Coping strategies utilized may include calling 911, seeking advice, minimizing symptoms, and avoiding thinking about the personal risk of an AMI (Meischke et al., 1999).

Some of the strategies are primarily automatic (e.g., stopping activity when chest pain begins) and others are consciously considered, such as calling the physician or taking an antacid for indigestion (Dracup et al., 1995). After a mental representation of the health threat has been developed to cope with the signs and symptoms of an impending AMI, assessment, construction, and coordination of resources occurs (Alonzo & Reynolds, 1997, 1998; Meischke et al., 1995). This phase requires the use of knowledge and behavioral resources immediately available as well as those resources more distal to the situation such as consulting others, accessing EMS, and/or going to the emergency department (Alonzo & Reynolds, 1998).

Considerable time may be consumed in the second stage by manipulating the meaning of the AMI symptoms, for the meaning assigned to the symptoms ultimately drives the behavior chosen (Alonzo & Reynolds, 1998). This stage concludes with a decision to either wait and see what happens or a decision to seek immediate help by calling the emergency medical service (EMS) or driving to the hospital (Dempsey et al., 1995).

In the last or evaluation/appraisal stage, a reassessment or evaluation of the coping plan in light of both perceived barriers and perceived success in reducing the health threat occurs (Dracup et al., 1995; Dempsey et al., 1995). The mental representation of the health threat that developed during the first stage is reassessed and
may be altered as a result of the appraisal/reappraisal of symptoms during this stage. During this stage, overt strategies to cope with the symptoms and the subsequent emotions which have been aroused are employed; the overt strategies are then continually evaluated for their effectiveness (Alonzo & Reynolds, 1998).

For individuals who have had a previous cardiac event, this phase and the previous phase may be characterized by starts and stops in treatment seeking behavior. According to Alonzo and Reynolds (1998), their memory may be flooded with intrusive recollections of the previous AMI experience which can lead to denial, avoidance, or mislabeling of symptoms all of which impede timely treatment of their AMI symptoms (Alonzo, 1999; Alonzo & Reynolds, 1998).

When trying to understand the processes involved in making the decision to use EMS for symptoms of an AMI, Meischke et al. (1995) found the Self-Regulation model to be a useful framework. Dracup et al. (1995) and Alonzo and Reynolds (1997) found the contribution of this model to be in its explanatory power when confronted with signs and symptoms of unknown origin, such as those of a heart attack. For example, when chest pain begins, an explanation for the pain follows (e.g., indigestion, muscle, or heart-related), resulting in behavior appropriate to the explanation (e.g., taking an antacid or stopping the activity) and an appraisal of the effectiveness of the behavior (e.g., pain subsides or continues).

The Self-Regulation model takes into account the impact of social and emotional variables of AMI treatment seeking behavior not just symptom driven variables (Alonzo & Reynolds, 1997, 1998; Walsh, Lynch, Murphy, & Daly, 2004), which is particularly important as researchers seek to understand the prehospital delay experience of women.
with heart disease. In a study by Dempsey et al. (1995), women reported an appraisal and reappraisal of symptoms that was impacted by their emotional responses to the event.

To intervene and expedite the AMI treatment-seeking process, the strategies utilized must have a cognitive focus to inform about AMI signs and symptoms, an emotional focus regarding coping with emotions in the midst of AMI signs and symptoms, and a behavioral focus regarding actions that should be taken to treat the AMI signs and symptoms (Alonzo & Reynolds, 1997). The Self-Regulation model enables a focus on the cognitive processes of the individual, which is often the basis for studies of health behavior and compliance (Dracup et al., 1995; Poss, 2001). Individual cognitive and emotional processes are utilized to evaluate the inherent risk associated with symptoms of a heart attack; this evaluation serves as a catalyst for action. The labeling of the deviant health status by the individual coupled with his/her perceived susceptibility to an AMI and its perceived severity determines actions taken to decrease the perceived threat. The outcome is defined in terms of the reaction to the perceived threat; this reaction contributes to the prehospital delay time.

In a study comparing time to treatment for acute myocardial infarction patients located in the United States, England, and countries of the Pacific Rim, Dracup et al. (2003) found no association between sociodemographic and clinical variables and prehospital delay. The authors et al. (2003) suggest that cognitive, emotional, and cultural factors together with clinical and sociodemographic factors need to be evaluated. Leventhal’s Self-Regulation model (see Figure 8) includes the sociodemographic, cognitive, and emotional factors that contribute to the mental representation of the health threat which, in this case includes symptoms of an AMI and the subsequent response to
those symptoms (Dracup et al., 2003). According to Buckley et al. (2007, p. 107), the Self-Regulation model provides “a useful way of conceptualizing the problem of delayed presentation for treatment of AMI symptoms” incorporating cognitive, emotional, and behavioral factors associated with prehospital delay.

![The Self-Regulation model (Dracup et al., 2006).](image)

**Figure 8.** The Self-Regulation model (Dracup et al., 2006).

**Review of the Literature**

Patient-related delay accounts for almost two thirds of the time from symptom onset to treatment. This time interval includes the time it takes to appraise symptoms, make a decision to act upon the appraisal, and subsequently seek emergency assistance (Buckley et al., 2007). As demonstrated in the Self-Regulation model, this process includes the interaction of sociodemographic, emotional, cognitive, and behavioral
factors at the time of AMI symptom onset; this interaction determines how quickly care will be sought for AMI symptoms.

Lefler and Bondy (2004) found in their metasynthesis concerning reasons women delay seeking treatment for symptoms of an AMI that severity of presenting symptoms, presence of other chronic illnesses which confused symptoms, correct attribution or labeling of symptoms to the heart, perceived seriousness of symptoms, and engagement in various coping mechanisms were all factors that contributed to a delay in seeking treatment. These factors (which are assessed in the Modified Response to Symptoms Questionnaire) along with gender and history of a previous cardiac event will be evaluated for their impact on treatment-seeking delay behavior within the context of Leventhal’s Self-Regulation model.

Since the evolution of thrombolytics, numerous studies have been conducted in an effort to better understand prehospital delay behavior and to reduce the prehospital delay time of both men and women. Because an interaction between time to treatment and mortality was demonstrated in the GUSTO-1 trial, research studies published after the publication of GUSTO-1 in 1993 will be reviewed.

Sociodemographic Factors

Gender

Female gender has been identified as a sociodemographic factor that increases prehospital delay time (Johansson et al., 2004; Meischke et al., 1998; Moser et al., 2007; Noureddine et al., 2006; Rosenfeld, 2001). Even though the National Heart Attack Alert
program recommends reperfusion therapy begin within one hour of symptom onset (Moser et al., 2005; Tullmann et al., 2007), fewer women than men access care during that first hour (Blank & Smithline, 2002). Blank and Smithline (2002) reported that prehospital delay was 45 minutes longer in women as compared to men.

Misconceptions about AMI symptoms coupled with physiologic differences in AMI symptoms may hinder a woman’s interpretation and subsequent response to the cardiac emergency (Finnegan et al., 2000; McDonald et al., 2006; Meischke et al., 1999; Schoenberg, Peters, & Drew, 2003). It has been suggested that atypical symptoms, disbelief about heart disease in women, along with competing social demands of families and obligations within the home, interfere with a woman’s ability to seek and/or gain access to care (Dracup et al., 2006; McDonald et al., 2006; Rosenfeld, 2001; Schoenberg et al., 2003; Turris, 2009).

Due to caregiver responsibilities, women often fail to recognize the need to care for themselves first so they can continue to care for their families (Finnegan et al., 2000; McDonald et al., 2006). In her qualitative study, Turris (2009) found that “attending to role responsibilities as wives and mothers was judged to be vital, whereas attending to symptoms that might indicate cardiac disease was a lower priority” (pp. 9-10).

In their study of predictors of decision delay among Jordanians with an acute myocardial infarction, Khraim et al. (2009) found an increase in delay time among married women. Within the Arab Muslim culture, household matters are a married woman’s responsibility; consequently, AMI symptoms may be ignored or minimized due to family caregiving responsibilities which results in an increased prehospital decision delay time (Khraim et al., 2009; Noureddine et al., 2006; Noureddine, Arevian, Adra, &
Puzantian, 2008). McDonald et al. (2006) suggests that interventions which help women realize the importance of caring for themselves at the time of AMI symptom onset so they can continue to care for their families, might assist them with restructuring the social norm of caring for others first.

Previous Cardiac Event

Conflicting reports regarding the relationship between previous AMI and treatment seeking delay have persisted in the healthcare literature for the past two decades (Dracup et al., 2003; Turris, 2009). In a regression analysis to identify the clinical variables that predicted decision delay, Khraim et al. (2009) found that positive history of AMI, angina, and heart interventions were three of the six clinical variables which explained 26% of the decision delay variance. Perkins-Porras et al. (2009) claimed that the interaction of gender and previous history of an AMI would be a predictor of short total prehospital delay time; however neither gender nor cardiac history impacted the notification of EMS following AMI symptom onset.

Dracup et al. (1995 & 2006) reported an increase in prehospital delay times for individuals with a history of coronary heart disease while Johansson et al. (2004) and Rosenfeld (2001) reported no increase in prehospital delay times. Pattenden et al. (2002) found in their qualitative study on decision making processes utilized by individuals with AMI symptoms that patients who have had a percutaneous coronary intervention or coronary artery bypass graft surgery do not believe they are at risk for an AMI.

Caldwell and Miaskowski (2002) suggest that past history of an AMI may make an individual less sensitive to the signs and symptoms of another AMI which increases
delay either because of the disbelief about having another heart attack or because they feel a sense of protection due to regularly scheduled follow-up appointments with their physician. In their study that identified factors that would prompt an individual to seek care quickly for symptoms of an AMI, Zapka et al. (2000) found that seeing a personal physician and/or cardiologist regularly was not related to intentions to act quickly. Buckley et al. (2007) found that even though almost half of their 200 subjects with CHD reported a history of a PCI or CABG, 40% considered themselves less likely to have a heart attack when compared to someone else their own age.

Johansson et al. (2004) and Pattenden et al. (2002) found that patients became confused when they experienced AMI symptoms again because the symptoms mirrored those of angina and the use of nitrates lessened the pain. According to Fox-Wasylyshyn et al. (2007), misinterpretation and confusion of recurrent AMI symptoms is a common finding.

Most intervention studies that have been designed to decrease prehospital delay have targeted the general population through mass media communication (McKinley et al., 2009); few have delivered one-on-one education interventions to those individuals with a history of coronary heart disease. Unfortunately, those intervention studies that have targeted individuals with a history of coronary heart disease have been unsuccessful at significantly decreasing prehospital delay in spite of increasing knowledge about AMI signs and symptoms and increasing EMS utilization (Blank & Smithline, 2002; Buckley et al., 2007; McKinley et al., 2009).

As a sub-study of a larger, multi-center study (Dracup et al., 2006), a nonsignificant trend towards a shorter delay time was demonstrated by McKinley et al.
(2009) whose study participants reported an increase in knowledge of AMI symptoms and the appropriate response to those symptoms (Buckley et al., 2007); however, Alonzo and Reynolds (1998) claim that individuals with CAD do not have more knowledge of heart disease and the knowledge they do have does not translate into shorter delay times (Dracup & Moser, 1997).

Cognitive Factors

Symptom Attribution to the Heart

The Self-Regulation model supports the importance of symptom attribution to the heart as a means of affecting prehospital delay (Dracup et al., 1995, 2006; Zapka et al., 2000); therefore, cognitive and emotional responses described in the Self-Regulation model are important when making decisions about the response to symptoms of a possible AMI (Johansson et al., 2004). In explanatory models of responses to health threats such as the Self-Regulation model, symptom attribution has been shown to be a central construct that is an important factor in decisions to seek care (Buckley et al., 2007; Zapka et al., 2000).

Investigators have found that decision time and subsequent prehospital delay time is shortened when symptoms are attributed to the heart (Buckley et al., 2007) even though attribution of symptoms to another body organ other than the heart is common (McKinley et al., 2009). Fukuoka et al. (2007) found in their study regarding the relationship between severity of chest pain and AMI symptom attribution that approximately 60% of patients did not attribute their AMI symptoms to the heart. For men, severe chest pain
was attributed to the heart, while women were twice as likely as men to attribute their AMI symptoms to the flu (Fukuoka et al., 2007).

Correct attribution of symptoms to the heart requires knowledge of heart attack signs and symptoms and a match between what is experienced and expected (Finnegan et al., 2000; Rosenfeld, 2001; Zerwic, 1999). If there is any uncertainty about symptoms (Noureddine et al., 2006, 2008; Rosenfeld, 2001; Rosenfeld, Lindauer, & Darney, 2005; Schoenberg et al., 2003), mislabeling of symptoms (Dracup et al., 2006; Meischke et al., 1999; Moser et al., 2005; Noureddine et al., 2006, 2008; Rosenfeld, 2001; Rosenfeld et al., 2005), or a validation of symptoms with another (Dracup & Moser, 1997; Dracup et al., 2006; Johansson et al., 2004; Meischke, et al., 1999; Moser et al., 2005; Noureddine et al., 2008; Rosenfeld, 2001; Zerwic, 1999) delay time is increased.

Using the questionnaire from the REACT trial, Zapka et al. (2000) found that both symptom attribution and perceived self-confidence in symptom recognition were important characteristics in care-seeking. Symptom attribution to the heart was a distinguishing characteristic that differentiated those individuals who requested medical assistance less than 60 minutes after symptom onset (early responders) from those individuals who requested medical assistance greater than 60 minutes from symptom onset (late responders) (Burnett et al., 1995). Meischke et al. (1999) reported that when women were having symptoms of a heart attack, they did not attribute their symptoms to their heart; consequently, by mislabeling their symptoms, EMS was not accessed immediately.

Women do not perceive themselves to be at risk for a heart attack (Finnegan et al., 2000; Fukuoka et al., 2007). In addition, there is a growing body of evidence suggesting
that there are gender differences in AMI symptom presentation (Fukuoka et al., 2007). Thus, lower perceived risk coupled with atypical symptom presentation may mean that women are less likely to attribute their AMI symptoms to the heart (Fukuoka et al., 2007). However, if women are knowledgeable of heart attack symptoms (Meischke, et al., 1999; Noureddine et al., 2006; Rosenfeld, 2001; Zapka et al., 2000), perceive they are at risk for a heart attack (Burnett et al., 1995; Khraim et al., 2009; Meischke et al., 1999; Noureddine et al., 2006), attribute the symptoms being experienced to the heart (Burnett et al., 1995; Dracup et al., 2006; Johansson et al., 2004; Meischke et al., 1999; Moser et al., 2005, Perkins-Porras et al., 2009; Rosenfeld, 2001; Rosenfeld et al., 2005; Thuresson et al., 2007) and take action on the health threat (Dracup & Moser, 1997; Dracup et al., 2006; Johansson et al., 2004; Rosenfeld et al., 2005; Thuresson et al., 2007), treatment seeking delay time is decreased.

According to Fukuoka et al. (2007), patients with a history of a previous cardiac event (angina or AMI) are more likely to attribute their AMI symptoms as cardiac in origin when compared to those patients without a history of a previous cardiac event (angina or AMI). The strongest predictor of appropriate symptom attribution for both men and women is history of CHD; however, a history of CHD does not translate to a shorter prehospital delay time (Fukuoka et al., 2007).

*Perceived Seriousness of Symptoms*

According to the Self-Regulation model, the labeling of deviant symptoms and the perceived severity of symptoms serves as a “cue to action” that initiates the health behavior which in this case is seeking care for AMI symptoms (Burnett et al., 1995;
An important predictor of the delay time is a patient’s subjective feelings regarding the severity of symptoms (Johansson et al., 2004). Patients who minimize the severity of their symptoms prolong delay while patients who think their symptoms are serious or who think they might be experiencing a heart attack have a shorter delay time (Johansson et al., 2004).

The interpretation of the severity of symptoms appears to be directly impacted by the onset of symptoms. Finnegan et al. (2000) found that when the onset of AMI symptoms was gradual, patients either ignored the symptoms or tolerated them even though they realized that something was wrong; their hope was that the symptoms would go away. When symptoms were severe or debilitating, the decision to seek medical care was made much quicker and delay time was decreased (Finnegan et al., 2000).

The Gruppo Italiano per lo Studio Della Supravivenza Nell Infarcto-Avoidable Delay Study Group (GISSI) reported that approximately 80% of prehospital delay was accounted for during the time period when the decision to seek health care was made (Noureddine et al., 2006). Meischke et al. (1995) found that history of a previous AMI coupled with the perception of symptom severity increased the likelihood that an individual believed they were experiencing an AMI. Individuals with co-morbidities may have learned to self-manage and self-treat their other chronic condition thus causing them to not evaluate cardiac symptoms seriously when they occur (Zegrean, Fox-Wasylyshyn, & El-Masri, 2009).
Perceived Ability to Control Symptoms

According to Moser and Dracup (1995), the perception of control has been associated with a shorter prehospital delay time. It has been suggested that delay time is directly impacted by a woman’s ability to maintain control over the situation which subsequently impacts the coping strategies utilized (Rosenfeld, 2001; Rosenfeld et al., 2005). Dempsey et al. (1995) found that maintaining control and relinquishing control were two key psychosocial processes driving a woman’s decision to seek care for her AMI symptoms. Control reflected the self-generated belief that “one has the power to influence outcomes” and emerged as the most significant explanatory factor in understanding delay (Dempsey et al., 1995, p.7).

Dempsey et al. (1995) reported that after being confronted by the symptoms of an AMI, women maintained control over their symptoms by acknowledgement of the symptoms as being different from normal, perceived insignificance of the symptoms, and subsequently seeking relief through a variety of self-treatment strategies. Control was relinquished when others were consulted and health care treatment was sought. McKinley et al. (2009) found in their intervention study that perceived control influenced the choices made in response to the health threat which in this case is AMI symptoms.

Burnett et al. (1995) claimed that if patients perceived their ability to control their AMI symptoms as low, medical assistance for AMI symptoms was sought < 60 minutes after AMI symptom onset. In the study by Sullivan et al. (2009), it was suggested that fear of the loss of control was the driving force behind patient delay. According to the authors, patients delay seeking care because they are fearful of trusting and depending on others not because they fear the symptoms of ACS.
Emotional Factor

Level of Anxiety

According to McKinley et al. (2009), individuals need help sorting through the emotions that accompany a potentially life-threatening diagnosis such as an AMI.

Alonzo and Reynolds (1998) state that emotional dimensions in AMI care-seeking behavior have been neglected and yet, upon AMI symptom onset, emotions can serve as cues for action. Emotional responses to signs and symptoms of an AMI have been described as feelings of fear, threat or anxiety (Alonzo & Reynolds, 1998). These feelings can grow when efforts at self-treatment are unsuccessful and when the ability to control the health threat seems out of reach (Dempsey et al., 1995).

According to Alonzo and Reynolds (1999, p. 34), “myocardial infarction is an example of a sudden, potentially shocking and life-endangering event, which may profoundly alter life-style and future expectations.” For individuals with a previous AMI, the emotional arousal associated with AMI symptoms can be particularly distressing as remembrances of the previous traumatic experience may be stimulated (Alonzo & Reynolds, 1998).

Alonzo and Reynolds (1999) suggest that the experience of the initial AMI and all of its sequelae have the potential to produce a continuum of traumatic responses which they define as cumulative adversity. Cumulative adversity associated with AMI symptoms consists of primary trauma which is the initial physical insult to the myocardium, secondary trauma which is the experience of accessing a health care provider, and tertiary trauma which is the stress associated with interfacing with the
modern American health care system; together these traumas can contribute to prehospital delay time (Alonzo & Reynolds, 1999).

Behavioral Factors

First Action Taken

The time from symptom recognition to the time it takes to make the decision to seek treatment accounts for the majority of time that is lost from the onset of symptoms to arrival at a medical facility (Blohm, Hartford, Karlson, Karlsson, & Herlitz, 1994; Gaspoz et al., 1996; Herlitz et al., 1992; Luepker et al., 2000; McKinley et al., 2009; Meischke et al., 1997, Zerwic, 1999); therefore, the first action taken in response to AMI symptoms is a critical step toward reperfusing the myocardium.

The emergency medical system (EMS) is a service specifically designed, staffed, and equipped for the emergency care of patients; it is out-of-hospital patient care and an extension of emergency medicine. EMS practitioners include paramedics, first responders, and emergency medical technicians (EMTs). The relationship between EMS and cardiology dates back to the late 1950’s and early 1960s when the effectiveness of mouth-to-mouth ventilation and cardiac massage demonstrated that rapid response to cardiac emergencies in the ambulance by trained community members could improve outcomes (www.naemt.org accessed 9/27/2009).

Since that time, the American Heart Association (AHA) and the National Heart Attack Alert Program (NHAAP) have adopted guidelines which recommend that EMS should be contacted immediately (Call 9-1-1) for anyone having heart attack warning
signs and/or symptoms (www.americanheart.org and www.nhlbi.nih.gov/actintime accessed 10/8/2009). It has been demonstrated that patients who contact EMS initially upon onset of AMI symptoms have shorter total prehospital delays and receive reperfusion therapy more promptly (Dracup et al., 2003; Perkins-Porras et al., 2009) than those who do not contact EMS. Unfortunately, a previous AMI does not increase the likelihood that EMS will be contacted first (Dracup & Moser, 1997).

Alonzo and Reynolds (1998) state that upon symptom onset, individuals with a prior history of an AMI and coronary heart disease (CHD) do not seek care any faster than individuals without that history. In fact, a positive cardiac history has been identified as a predictor of treatment seeking delay. At the time of AMI symptom onset, there is a tendency for individuals who have experienced a previous cardiac event to deny the sense of urgency and to engage in lengthy periods of symptom evaluation (Alonzo & Reynolds, 1997) which may result in transportation to the hospital by way of a personal vehicle rather than EMS (Dracup & Moser, 1997). Within the context of the Self-Regulation model, the process of self-treatment is found within the action stage and is a strategy designed to alleviate those AMI symptoms perceived as threatening.

Unfortunately, self-treatment activities can contribute to an increase in prehospital delay rather than a decrease. It has been suggested that patients who have had a previous AMI or who have angina may actually delay longer because they are accustomed to alleviating their symptoms through rest and/or medication (Zerwic, 1999). Dracup and Moser (1997) found that the predominant initial responses upon AMI symptom onset were to try and relax or to hope and pray that the symptoms would go away; less than 10% made any attempt to seek medical care and only 2% called 9-1-1.
Fox-Wasylyshyn et al. (2007) and Zegrean et al. (2009) state that participants with a history of an AMI are more likely to use prescribed medications in response to their AMI symptoms whereas patients without a history of a previous AMI are more likely to respond to AMI symptoms by taking nonprescription medications; the use of nonprescription or over-the-counter medications is associated with greater decision delay as compared to taking prescription medications (Dracup et al., 1995; Zegrean et al., 2009). Johansson et al. (2004) found that approximately 70% of the patients with a history of angina took nitrates to relieve the pain before going to the hospital.

Another strategy that has been identified by both men and women as important when trying to decide whether or not to seek care is that of consulting others or telling someone upon onset of AMI symptoms (Finnegan et al., 2000). According to Dracup et al. (1995) and Finnegan et al. (2000), most patients arrive at the decision to seek care with the assistance of a family member, physician, friend, or bystander rather than accessing EMS immediately by themselves. Those individuals who attempted to contact their physician first had significantly increased delay times (Dracup et al., 1995; Meischke et al., 1999; Zerwic, 1999); Johansson et al. (2004) reported that prehospital delay was prolonged by one hour. Dracup et al. (1995) and Finnegan et al. (2000) reported that informing family members of symptoms resulted in an increase in prehospital delay and an engagement in self-treatment strategies while worsening symptoms often led friends or bystanders to take control of the situation and seek care.

In the study by Dracup et al. (1995), the spouse was usually the first person informed of AMI symptoms which resulted in considerable delays. Median delay was twelve hours when family was consulted first for AMI symptoms as compared to two
hours when friends were told first (Dracup et al., 1995). Dracup et al. (1995) and Zerwic (1999) reported that the shortest delays occurred when non-family members were consulted first. It has been suggested that family members might share the wishful thinking of the patient thus increasing delay while non-family members do not want to shoulder the responsibility of what could possibly be a bad decision which results in a decrease in prehospital delay (Dracup et al. 1995; 2003).

Definition of Terms

For this dissertation, a secondary data analysis is being conducted; therefore, the diagnosis of an AMI will be the one utilized by the original authors which is “elevated cardiac enzymes and typical EKG changes” (Moser et al., 2005, p. 46; Moser et al., 2007, p. 11). A cardiac event will be defined as an acute myocardial infarction (AMI), a coronary artery bypass graft (CABG) surgery, and/or a percutaneous coronary intervention (PCI) which includes percutaneous coronary transluminal angioplasty (PTCA) and stent (Buckley et al., 2007). A previous cardiac event will be defined as a previous history of an AMI, a PCI, and/or a CABG which has been documented in the medical record prior to the one for which the patient was admitted to the hospital.

The conceptual definition of delay time that is reflected in my research questions is prehospital delay which is defined as the interval of time from awareness of symptom onset to the time patients arrive at the hospital (Buckley et al., 2007; Dracup et al., 2006; Perkins-Porras et al., 2009). In their article, Dracup et al. (1995) identified three action phases of delay: patient/bystander recognition and action phase, prehospital action phase, and hospital action phase.
The first, "patient/bystander recognition and action phase," includes the time interval from the onset of symptoms to activation of transportation to the hospital. This initial phase includes behavioral responses by patients and those around them when symptoms of an acute myocardial infarction begin and when the patient becomes aware of the fact that ‘something is wrong.’ During this phase, patients and those around them engage in behaviors that can contribute to the increase in delay time. The second, the “prehospital action phase,” involves the interval of time from activation of the transport system to arrival at the hospital. Transportation to the hospital and the time required to get there is the key component of this phase. The third and final phase, called the “hospital action phase,” includes the time interval from the patient’s arrival at the hospital to the time when healthcare providers in the emergency department begin treatment.

Delays can occur at any point in time during this process; however, the prehospital action phase typically lasts approximately 7 to 22 minutes and the hospital action phase lasts approximately 60 to 90 minutes (Dracup et al., 1995). With a mean total delay time greater than 4.5 hours and a median total delay time somewhere between 2 and 6.4 hours, the patient/bystander recognition and action phase consumes the majority of the prehospital treatment time (Bett et al., 2005; Buckley et al., 2007; Dracup et al., 1995, 2006; Meischke et al., 2004). In a study designed to identify factors associated with home-to-hospital delay, Perkins-Porras et al. (2009) found decision time consumed 60% of the total prehospital delay period; therefore, this phase of prehospital delay is the focus of this dissertation and will be referred to as prehospital delay throughout this dissertation.
Although major advances have been made in transport time and therapy time in the past two decades, little progress has been made in reducing patients’ delay in seeking treatment or in reducing decision time. Understanding the decision time is difficult because the behavior takes place before patients enter the healthcare system. Time is an important variable because of its relationship to AMI morbidity and mortality; it has become a measure of the complex interrelationship of decisions, symptoms, and behaviors that occur during the decision time.

Within the context of AMI symptoms, “coping strategies are the cognitive and behavioral responses utilized in response to one’s experience of symptoms in an attempt to resolve those symptoms and/or to maintain a sense of psychological control” (Fox-Wasylyshyn et al., 2007, p. 145). These strategies include mental and physical efforts generated by AMI symptoms in response to internal biophysiological and emotional stressors which exceed the resources of the individual (Zegrean et al., 2009).

Coping strategies utilized may be problem-focused aimed towards managing symptoms (e.g. self-treatment and seeking medical care) or emotion-focused aimed toward regulating the emotional consequences of stress (e.g. using distraction, ignoring symptoms, and attempting to redefine the problem) (Fox-Wasylyshyn et al., 2007). Symptom attribution to the heart, perceived seriousness of symptoms, level of anxiety generated by symptoms, perceived ability to control symptoms, and first action taken which includes ignoring symptoms, trying to relax, telling someone, self-treatment, and accessing a healthcare provider are all coping strategies or responses that will be measured for this dissertation.
CHAPTER III

METHODOLOGY

Research Design and Assumptions

This is a secondary data analysis of data which were collected between 1997 through 2002 and used in descriptive, cross-sectional studies (DeJong et al., 2004; Frazier et al., 2002; Fukuoka et al., 2007; Moser et al., 2003, 2005, 2007; Sheahan et al., 2006) on individuals who have had an acute myocardial infarction. The two exogenous independent variables are gender (male, female) and previous cardiac event (PCE; yes, no) with prehospital delay time as the ultimate dependent variable. A 2 x 2 factorial design (see Figure 9) will be used to examine the main effects of gender and previous cardiac event as well as the interactive effect of gender and previous cardiac event on prehospital delay time. With over 700 subjects in the dataset, there should be ample power to detect a meaningful interaction effect if it is present.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCE Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCE No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 9. 2 x 2 Factorial Design of Gender and Previous Cardiac Event (PCE).
The theoretical framework for this dissertation proposal, Leventhal’s Self-Regulation Model, suggests that the relationship of sociodemographic (e.g., gender) and clinical characteristics (e.g., previous cardiac event) with cognitive, emotional, and behavioral responses to AMI symptoms can have an impact on prehospital delay time. Based upon the review of the literature and the Self-Regulation Model, I propose that the cognitive, emotional, and behavioral responses to AMI symptoms are related to the exogenous independent variables (i.e., gender, a previous cardiac event, and their possible interaction) and the main outcome variable, prehospital delay time as shown in Figure 10. This model will be used to examine the relationship of these variables to one another. The Modified Response to Symptoms Questionnaire (MRSQ) will be used to measure the cognitive, emotional, and behavioral responses to AMI symptoms.

A one-way flow of causation will be utilized from the exogenous explanatory variables to the type of coping response used to prehospital delay time (Figure 10). The coping responses include the type of first action taken, symptom attribution to the heart, perceived severity of symptoms, perceived ability to control symptoms, and level of anxiety.
Sample and Sampling Plan

In the original studies by Moser and her colleagues, convenience sampling was used to recruit over 800 participants from academic medical centers and community hospitals in the United States, South Korea, Japan, and the United Kingdom. Eligible participants with the following inclusion criteria were recruited from coronary care units and cardiac step-down units: 1) diagnosis of AMI confirmed by elevated cardiac enzymes and ECG changes consistent with an AMI; 2) pain-free and stable medical condition at the time of the interview; 3) no serious comorbid conditions such as sepsis or
acute renal failure; 4) no cognitive impairment which would interfere with the ability to provide informed consent and to participate in the interview; and 5) AMI symptom onset outside of the hospital. For this dissertation study, an additional inclusion criterion-no missing data on the study variables-was added, bringing the sample size down to 780.

Table 1. Number of Participants per Site and Percent of Total Sample (N = 780).

<table>
<thead>
<tr>
<th></th>
<th>United States</th>
<th>South Korea</th>
<th>Japan</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>N; %</td>
<td>406; 52.1%</td>
<td>108; 13.8%</td>
<td>132; 16.9%</td>
<td>134; 17.2%</td>
</tr>
</tbody>
</table>

Participants in the sample were predominantly Caucasian (59.6%), male (64.6%), and married (75.1%). The median age of the sample was 60 years of age with women four years older than the men. Approximately 60% of the sample was under 65 years of age while approximately 40% were over 65. A previous AMI and previous PCI accounted for 45% of the cardiac clinical history with approximately 8% of the sample having a known history of CAD without an event. The median level of education was 12 years. The sociodemographic and clinical characteristics of the sample is further summarized below in Table 2.
Table 2. Sociodemographic and Clinical Characteristics (N = 780)

<table>
<thead>
<tr>
<th>Gender (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (N = 504)</td>
<td>64.6%</td>
<td></td>
</tr>
<tr>
<td>Female (N = 276)</td>
<td>35.4%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (Mean)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>60 YOA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&lt; 65 YOA (N, %)</th>
<th>&gt; 65 YOA (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>466, 59.7%</td>
<td>308, 39.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical History (N, %)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous AMI</td>
<td>179, 23%</td>
</tr>
<tr>
<td>Previous PCI</td>
<td></td>
</tr>
<tr>
<td>(PTCA + Stent)</td>
<td>169, 21.7%</td>
</tr>
<tr>
<td>Previous CABG</td>
<td>53, 6.8%</td>
</tr>
<tr>
<td>Known CAD History</td>
<td></td>
</tr>
<tr>
<td>without event</td>
<td>60, 7.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital Status (N, %)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>586, 75.1%</td>
</tr>
<tr>
<td>Single</td>
<td>47, 6%</td>
</tr>
<tr>
<td>Divorced</td>
<td>60, 7.7%</td>
</tr>
<tr>
<td>Separated</td>
<td>11, 1.4%</td>
</tr>
<tr>
<td>Widowed</td>
<td>70, 9%</td>
</tr>
<tr>
<td>Co-habitate</td>
<td>3, 0.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race (N, %)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>465, 59.6%</td>
</tr>
<tr>
<td>Black</td>
<td>38, 4.9%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2, 0.3%</td>
</tr>
<tr>
<td>Asian</td>
<td>237, 30.4%</td>
</tr>
<tr>
<td>Other</td>
<td>35, 4.5%</td>
</tr>
</tbody>
</table>

Data Collection Methods

Institutional Review Board approval and written informed consent from the participants were obtained as part of the original studies. Because this is a secondary data analysis in which de-identified data are being used, the Vanderbilt Institutional Review Board certified the exempt status of my dissertation study. New informed consent from the participants to analyze these data was not deemed necessary. Sociodemographic and
clinical data in the original studies were collected by trained research assistants, native to
each country, who used a combination of interviews and medical record review. Patients
were interviewed within 72 hours of admission to the hospital after they were pain-free
and their clinical condition was stable. In the original studies, inter-rater reliability of the
chart abstractions was examined, and a 94% inter-rater agreement was achieved.
Instructions for chart abstraction can be found in Appendix C.

To ensure uniformity, a structured interview using the Modified Response to
Symptoms Questionnaire (MRSQ) (Burnett et al., 1995; Fukuoka et al., 2007; McKinley,
Moser, & Dracup, 2000; Moser et al., 2005) was used to collect information about the
experience surrounding the onset of AMI symptoms and the decision-making process
related to seeking treatment. A copy of the complete questionnaire along with
instructions for the research assistants is included as Appendix A and B, respectively.
Table 3 provides a list of the coping responses that were assessed with the MRSQ.

In Japan and Korea, all measures were translated from English to Japanese and
Korean and then translated back to English by a second person to ensure equivalency
(Dracup et al., 2003; Fukuoka et al., 2007). In the original study, test-retest reliability of
the questionnaire in a subset of patients was obtained within 24-36 hours of the first
questionnaire and demonstrated 92% agreement between both measures.
Table 3. Coping Responses with the Modified Response to Symptoms Questionnaire

Behavioral response to AMI symptom onset

What was the first thing you did when you first noticed your symptoms?
1. Ignored the symptoms
2. Tried to relax
3. Self-treated the symptoms
4. Told someone about the symptoms
5. Accessed a healthcare provider

Cognitive response to AMI symptom onset

When you first noticed your symptoms what did you think the problem was?
1. Your heart
2. Not your heart

When you first experienced your symptoms how serious did you think they were?
1. Not serious
2. Mildly serious
3. Moderately serious
4. Very serious
5. Extremely serious

How much ability to control your symptoms do you think you have?
1. No ability
2. Mild ability
3. Moderate ability
4. Very much ability
5. Extremely much ability

Emotional response to AMI symptom onset

How anxious were you by your symptoms when you first noticed them?
1. Not anxious
2. Mildly anxious
3. Moderately anxious
4. Very anxious
5. Extremely anxious

In the original studies, the MRSQ was used to collect information about delay time, the experience during AMI symptom onset, and the factors that could have contributed to delay time (Fukuoka et al., 2007; Moser et al., 2005). The instrument was a previously
tested, reliable and valid modification of the Response to Symptoms Questionnaire which consists of 18 items designed to obtain data about patient delay and factors that contribute to delay in six domains: 1) context within which AMI symptoms occur; 2) antecedents of AMI symptom onset; 3) behavioral responses to AMI symptoms; 4) emotional responses to AMI symptoms; 5) cognitive responses to AMI symptoms; and 6) response of others to AMI symptoms (Burnett et al., 1995; McKinley et al., 2000).

The Modified Response to Symptoms Questionnaire evaluates the behavioral, cognitive, and emotional responses to AMI symptoms along with the social context surrounding the patient’s decision to seek care (Dracup & Moser, 1997; Moser et al., 2005; McKinley et al., 2000). Both the original and modified instruments have content validity (Dracup & Moser, 1997).

Data Analysis

The dataset was analyzed using SPSS version 18 (SPSS, Chicago, Illinois). In order to decrease the possibility of making a Type I error, level of significance was set at \( p < 0.05 \). An alpha of .05 is considered standard (K. Wallston, personal communication, March 16, 2005) and is consistent with the level of significance of the original studies that contributed to this secondary data analysis (DeJong et al., 2004; Frazier et al., 2002; Fukuoka et al., 2007; Sheahan et al., 2006).

To obtain a normal distribution of delay time, the original investigators providing this dataset utilized the logarithmic value of delay time because the numerical values of delay time obtained during data collection were skewed by a number of extreme observations (Moser et al., 2005). If the logarithmic transformation was not calculated,
using a parametric test such as ANOVA or regression could lead to misleading results; therefore, the logarithmic value of delay time was used in this data analysis for prehospital delay time (www.udel.edu/mcdonald/stattransform accessed 11/19/2009).

According to Dracup et al. (1995) and Zapka et al. (2000), age and years of formal education have been associated with an increase in prehospital delay time; therefore, these potential confounders were controlled for as covariates throughout the data analysis. The subjects interviewed for this secondary data analysis represented four different countries and at least four different ethnic groups (refer back to Table 2); therefore, the impact of site on prehospital delay time needed to be determined and if significant, controlled for.

A separate factorial ANCOVA (controlling for age and education) was conducted to evaluate whether site had a significant main effect on prehospital delay time and to determine if site needed to be treated as a covariate in subsequent analyses. As will be shown in the results chapter, there was a significant main effect of site on prehospital delay time, $F(3,744) = 30.46, p < 0.001, \eta^2 = 0.109$. Therefore site, along with age and education, was controlled for as a covariate throughout the remaining data analyses. For that purpose, since site was a categorical variable, three dummy variables (representing Korea, Japan, and the United Kingdom) each with two levels (coded “1” if the respondent was from the named site and coded “0” if the respondent was not from the named site) were constructed using the United States as the reference site.

Descriptive analyses were used to describe the sociodemographic and clinical variables as well as the coping responses to the Modified Response to Symptoms Questionnaire.
A diagram depicting the relationship of gender and a previous cardiac event and their interaction, cognitive, emotional, and behavioral coping responses, and prehospital delay time is shown in Figure 10. It is proposed that these variables have a statistically significant relationship to one another. Therefore, the following analyses were done in sequential fashion.

Question 1 involves the relationship between the exogenous variables and prehospital delay time. The exogenous variable previous cardiac event was coded “1” (Yes) if the respondent indicated he/she had a previous AMI or a previous PCI (including stent) or a previous CABG; otherwise, previous cardiac event was coded “0” (No). The exogenous categorical variable gender (or sex) was coded “1” if the respondent was a male and “2” if the respondent was a female. Because this dissertation explored the degree of interaction between the two categorical variables of gender and a previous cardiac event on the continuous variable of prehospital delay time, a 2 X 2 Factorial ANCOVA was used to test for the degree of the main effects of the exogenous variables as well as their interaction, controlling for age, education, and site.

Question 2: Because the five variables currently included in the behavioral response of first action taken--i.e., first ignored symptoms, first tried to relax, first told someone, first self-treated, and first accessed healthcare provider--are categorical and mutually exclusive, they were recoded into five dummy variables each with two levels (Yes = 1; No = 0). To examine the relationships between gender and previous cardiac event and the interaction of gender and previous cardiac event on the five behavioral variables, five separate univariate analyses of co-variance were conducted controlling for age, education, and site.
Question 3: To examine the relationship between gender and previous cardiac event as well as the interaction of gender and previous cardiac event on the three variables within the cognitive coping response (symptom attribution, perceived severity of symptoms, and perceived ability to control symptoms), three separate univariate analyses of co-variance were conducted, controlling for age, education, and site.

Question 4: To examine the relationship between gender and previous cardiac event as well as the interaction of gender and previous cardiac event on the emotional coping response (level of anxiety), a single univariate analysis of co-variance was conducted, controlling for age, education, and site.

Question 5: To examine the impact of the five variables within the behavioral coping response of first action taken on prehospital delay time, five separate univariate analyses of co-variance were conducted. The five coping behaviors (first ignored symptoms, first tried to relax, first told someone, first self-treated, and first accessed healthcare provider) represented five different independent variables with two levels (Yes vs. No) with the logarithmic value of prehospital delay time as the dependent variable and age, education, and site as covariates.

Question 6: To examine the impact of the variables within the cognitive coping response (symptom attribution, perceived severity of symptoms, and perceived ability to control symptoms) on prehospital delay time, three separate univariate analyses of co-variance were conducted. The three coping behaviors represented three different independent variables with symptom attribution having two levels: Heart (1) and Not Heart (0), and perceived severity of symptoms and perceived ability to control symptoms
having five continuous values each ranging from none (1) to extremely (5). Age, education, and site were controlled for as covariates.

Question 7: To examine the impact of the emotional coping response (level of anxiety) on prehospital delay time, a single univariate analysis of co-variance was conducted. Level of anxiety functioned as the independent variable with five continuous values ranging from not at all (1) to extremely (5). Age, education, and site were controlled for as co-variates.

After the analysis of questions 5-7, a multiple linear regression was conducted (controlling for age, education, and site) to determine the amount of variance each of the significant coping responses are contributing to prehospital delay time (if any significant coping responses are present). The significant predictor variables were entered into the regression equation at the same time. Due to the possible collinearity between two of the predictor variables, perceived severity of symptoms and level of anxiety, two additional multiple linear regression equations were conducted. In one of the analyses, seriousness was omitted and anxiety was included. In the other analysis, anxiety was omitted while seriousness was included. In addition to the F-statistic, R and Adjusted R square, Beta, and p-values from the multiple linear regression equations are reported.

Questions 8 and 9: To examine the impact of the variables within the cognitive (symptom attribution, perceived severity of symptoms, and perceived ability to control symptoms) and emotional (level of anxiety) coping responses after AMI symptom onset on the five variables within the behavioral coping response of first action taken (first ignored symptoms, first tried to relax, first told someone, first self-treated, and first accessed healthcare provider), twenty separate analyses of co-variance were conducted.
The three cognitive and one emotional coping response functioned as independent variables, one per analysis, and the five behavioral responses of first action taken functioned as dependent variables. Each of the 20 analyses controlled for age, education, and site as covariates.

In addition to reporting the F-statistics, degrees of freedom, and p-values of the ANCOVAs, eta-squared ($\eta^2$), signifying the observed effect size, is reported.
CHAPTER IV

RESULTS

As stated earlier, site was found to have a significant main effect on the log of prehospital delay time and thus was controlled for as a covariate. The specific impact of site on the log of prehospital delay time demonstrated that compared to the United States as the reference site, each of the other countries had a longer log of prehospital delay time: Korea: $F(1,753) = 79.30, p = <.001, \eta^2 = .095$; Japan: $F(1,753) = 114.58, p = <.001, \eta^2 = .132$; and the United Kingdom: $F(1,753) = 65.33, p = <.001, \eta^2 = .080$. The mean log of prehospital delay time and the median prehospital delay time in hours are shown in Table 4. While the United States had the lowest mean value for the log of prehospital delay time, the United Kingdom had the lowest median value for prehospital delay time in hours. The mean values shown in Table 4 for log prehospital delay time are adjusted for age and education, while the median values for delay time in hours are not adjusted for those covariates.

Table 4. Prehospital Delay Time by Site.

<table>
<thead>
<tr>
<th></th>
<th>United States</th>
<th>Korea</th>
<th>Japan</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of Prehospital Delay Time (Mean)</td>
<td>1.46</td>
<td>2.47</td>
<td>2.51</td>
<td>2.24</td>
</tr>
<tr>
<td>Median Prehospital Delay Time (Hrs)</td>
<td>3.46</td>
<td>4.29</td>
<td>4.17</td>
<td>2.27</td>
</tr>
</tbody>
</table>
Question 1:

How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact prehospital delay time?

After controlling for age, education, and site, neither the main effects nor the interactive effect of gender and previous cardiac event had a significant impact on prehospital delay time. The comparison of mean prehospital delay time between males and females with and without a previous cardiac event is provided in Table 5 below. None of the mean delay times-in the four cells of the design differed significantly from each other.

Table 5. Comparison of mean log prehospital delay time by gender and history of a previous cardiac event.

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>No Previous Cardiac Event</th>
<th>With Previous Cardiac Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>$M = 1.94$</td>
<td>1.98</td>
<td>1.91</td>
</tr>
<tr>
<td>Females</td>
<td>$M = 1.87$</td>
<td>1.88</td>
<td>1.87</td>
</tr>
<tr>
<td>Previous Cardiac Event</td>
<td>$M = 1.93$</td>
<td>$M = 1.89$</td>
<td></td>
</tr>
</tbody>
</table>
Questions 2, 3, and 4:

2. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact the behavioral coping responses of first action taken (ignored symptoms, tried to relax, told someone, self-treated, and accessed healthcare provider) to AMI symptoms?

3. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact the cognitive coping responses (symptom attribution, perceived severity of symptoms, perceived ability to control symptoms) to AMI symptoms?

4. How do the main effects of gender and previous cardiac event as well as the interactive effect between gender and previous cardiac event impact the emotional coping response (level of anxiety) to AMI symptoms?

A summary of the behavioral, cognitive, and emotional coping responses upon AMI symptom onset specific to questions 2-4 is provided in Table 6.
Table 6. Coping responses to onset of AMI symptoms by gender and history of a previous cardiac event.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>PCE</th>
<th>No PCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 780)</td>
<td>(N = 504)</td>
<td>(N = 276)</td>
<td>(N = 211)</td>
<td>(N = 569)</td>
</tr>
<tr>
<td><strong>First Thing You Did (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignored symptoms</td>
<td>22.3</td>
<td>20.4</td>
<td>25.7</td>
<td>16.6</td>
<td>24.4</td>
</tr>
<tr>
<td>Tried to relax</td>
<td>16.5</td>
<td>17.9</td>
<td>14.1</td>
<td>15.2</td>
<td>17.0</td>
</tr>
<tr>
<td>Self-treated symptoms</td>
<td>31.9</td>
<td>33.3</td>
<td>29.3</td>
<td>42.2</td>
<td>28.1</td>
</tr>
<tr>
<td>Told someone</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>11.8</td>
<td>10.5</td>
</tr>
<tr>
<td>Accessed healthcare provider</td>
<td>13.5</td>
<td>12.7</td>
<td>14.9</td>
<td>7.6</td>
<td>15.6</td>
</tr>
<tr>
<td><strong>Symptom Attribution (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td>37.2</td>
<td>25.0</td>
<td>34.4</td>
<td>58.3</td>
<td>29.3</td>
</tr>
<tr>
<td>Not heart</td>
<td>57.9</td>
<td>36.8</td>
<td>59.8</td>
<td>36.0</td>
<td>66.1</td>
</tr>
<tr>
<td><strong>Perceived Seriousness of Symptoms (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not serious</td>
<td>16.4</td>
<td>14.5</td>
<td>19.9</td>
<td>12.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Mildly serious</td>
<td>22.2</td>
<td>24.6</td>
<td>17.8</td>
<td>24.2</td>
<td>21.4</td>
</tr>
<tr>
<td>Moderately serious</td>
<td>22.6</td>
<td>23.2</td>
<td>21.4</td>
<td>24.6</td>
<td>21.8</td>
</tr>
<tr>
<td>Very serious</td>
<td>15.1</td>
<td>16.7</td>
<td>12.3</td>
<td>19.4</td>
<td>13.5</td>
</tr>
<tr>
<td>Extremely serious</td>
<td>19.4</td>
<td>17.5</td>
<td>22.8</td>
<td>13.3</td>
<td>21.6</td>
</tr>
<tr>
<td><strong>Perceived Ability to Control Symptoms (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not able</td>
<td>37.7</td>
<td>35.3</td>
<td>42.0</td>
<td>37.9</td>
<td>37.6</td>
</tr>
<tr>
<td>Mildly able</td>
<td>16.4</td>
<td>17.7</td>
<td>14.1</td>
<td>16.1</td>
<td>16.5</td>
</tr>
<tr>
<td>Moderately able</td>
<td>15.9</td>
<td>14.1</td>
<td>19.2</td>
<td>20.9</td>
<td>14.1</td>
</tr>
<tr>
<td>Very able</td>
<td>16.2</td>
<td>18.5</td>
<td>12.0</td>
<td>14.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Extremely able</td>
<td>9.0</td>
<td>10.3</td>
<td>6.5</td>
<td>4.7</td>
<td>10.5</td>
</tr>
<tr>
<td><strong>Level of Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not anxious</td>
<td>16.3</td>
<td>16.7</td>
<td>15.6</td>
<td>14.2</td>
<td>17.0</td>
</tr>
<tr>
<td>Mildly anxious</td>
<td>21.9</td>
<td>23.6</td>
<td>18.8</td>
<td>26.5</td>
<td>20.2</td>
</tr>
<tr>
<td>Moderately anxious</td>
<td>19.9</td>
<td>20.8</td>
<td>18.1</td>
<td>19.0</td>
<td>20.2</td>
</tr>
<tr>
<td>Very anxious</td>
<td>18.8</td>
<td>19.0</td>
<td>18.5</td>
<td>17.5</td>
<td>19.3</td>
</tr>
<tr>
<td>Extremely anxious</td>
<td>18.6</td>
<td>16.1</td>
<td>23.2</td>
<td>17.1</td>
<td>19.2</td>
</tr>
</tbody>
</table>

A summary of the results of the ANCOVAs to determine the significance of the main effects of gender and previous cardiac event as well as the interactive effect of gender and previous cardiac event on the behavioral, cognitive, and emotional coping responses to AMI onset is shown in Table 7. The majority of the effects examined were nonsignificant.
Table 7. Summary of significant main effects of gender and previous cardiac event and their interactive effect on the coping responses after AMI symptom onset.

**Coping Responses**

<table>
<thead>
<tr>
<th>Previous Cardiac Event (PCE) (%)</th>
<th>Ignored Symptoms?</th>
<th>Self-Treated?</th>
<th>Symptom Attribution</th>
<th>Symptom Severity</th>
<th>Symptom Control</th>
<th>Level of Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>No PCE 27% Yes PCE 17%</td>
<td>No PCE 29% Yes PCE 44%</td>
<td>Heart 65% Not Heart 31%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No PCE M 27% No PCE F 34%</td>
<td>No PCE M 2.80 No PCE F 3.20</td>
<td>PCE M 70% PCE F 59%</td>
<td>No PCE M 3.21 No PCE F 2.97</td>
<td>M = 2.49 F = 2.20</td>
<td>M = 2.90 F = 3.30</td>
<td></td>
</tr>
</tbody>
</table>

However, in respect to Questions 2-4, compared to individuals without a history of a previous cardiac event, individuals with a previous cardiac event were significantly less likely to ignore symptoms, $F(1, 727) = 6.33, p = .012, \eta^2 = .009$, twice as likely to attribute the symptoms to the heart, $F(1, 727) = 68.42, p = <.001, \eta^2 = .086$, and almost twice as likely to self-treat those same symptoms, $F(1, 727) = 12.73, p = <.001, \eta^2 = .017$.

The female subjects perceived their ability to control AMI symptoms as lower than males, $F(1, 727) = 5.35, p = .021, \eta^2 = .007$, and their level of anxiety was higher, $F(1, 730) = 10.43, p = .001, \eta^2 = .014$.

When gender interacted with a previous cardiac event, males with a previous cardiac event were significantly more likely to attribute the symptoms to the heart as compared to females with a previous cardiac event (Figure 11), $F(1,727) = 4.89, p = .027$,
\(\eta^2 = .007\); they were also more likely to perceive the symptoms as serious, \(F(1, 731) = 7.61, p = .006, \eta^2 = .010\). Compared to females who had not experienced a previous cardiac event, males who had not experienced a previous cardiac event were significantly less likely to attribute their AMI symptoms to the heart, \(F(1, 727) = 4.89, p = .027, \eta^2 = .007\), as well as perceive those AMI symptoms as serious, \(F(1, 731) = 7.61, p = .006, \eta^2 = .010\).

Figure 11. Interactive effect of gender and previous cardiac event on symptom attribution.
Questions 5, 6, and 7:

5. How does the first action taken (ignored symptoms, tried to relax, told someone, self-treated, and accessed healthcare provider) after AMI symptom onset impact prehospital delay time?

   Hypothesis 4: Of the first action taken after AMI symptom onset, ignoring symptoms, trying to relax, engaging in self-treatment strategies, and/or telling someone about symptoms increases prehospital delay time and accessing a healthcare provider decreases prehospital delay time.

6. How do the cognitive coping responses utilized after AMI symptom onset impact prehospital delay time?

7. How does the emotional coping response utilized after AMI symptom onset impact prehospital delay time?

   As shown in Figure 12, questions 5-7 focus on the behavioral, cognitive, and emotional coping responses and their impact on prehospital delay time. In this series of data analyses, age, education, and site functioned as covariates.
Figure 12. Diagram of the impact of the behavioral, cognitive, and emotional coping responses on prehospital delay time after AMI symptom onset.

The mean log prehospital delay time of the behavioral, cognitive, and emotional coping responses that significantly impacted prehospital delay time can be found in Table 8. Results of the analyses for question 5 demonstrated that out of the five behavioral coping responses, two had a significant impact on prehospital delay time. Individuals who ignored their AMI symptoms had a significantly longer prehospital delay time than those individuals who did not ignore their symptoms, \( F(1, 719) = 7.94, p = .005, \eta^2 = .011 \). Individuals who attempted to access a healthcare provider upon AMI symptom onset had a significantly shorter prehospital delay time than those individuals who did not make that attempt, \( F(1,719) = 9.51, p = .002, \eta^2 = .013 \).

Results of the analyses for question 6 demonstrated that individuals who attributed their symptoms to the heart, \( F(1,719) = 21.81, p = <.001 = .029 \) and perceived the symptoms as serious, \( F(4,720) = 5.33, p = <.001, = .029 \) had a significantly shorter
prehospital delay time than those individuals who did not attribute their symptoms to the heart and did not perceive the symptoms as serious. As the perceived severity of symptoms grew from “not severe” to “extremely severe”, the mean log prehospital delay time became shorter.

Results of the analyses for question 7 demonstrated that level of anxiety can significantly impact prehospital delay time ($F(4,719) = 5.34, p = <.001, \eta^2 = .029$). Similar to perceived severity of symptoms, as the level of anxiety grew from “not anxious” to “extremely anxious”, the mean log prehospital delay time became shorter. However, for severity there was a decrease in delay time for each increase in severity, while for anxiety the pattern was slightly different (with moderately being higher than mildly).

Table 8. Mean log prehospital delay time for behavioral, cognitive, and emotional coping responses with a significant impact.

<table>
<thead>
<tr>
<th></th>
<th>Ignored AMI Symptoms?</th>
<th>AMI Symptoms Attributed to Heart?</th>
<th>Accessed a Healthcare Provider?</th>
</tr>
</thead>
<tbody>
<tr>
<td>“No”</td>
<td>1.91</td>
<td>2.10</td>
<td>2.01</td>
</tr>
<tr>
<td>“Yes”</td>
<td>2.15</td>
<td>1.77</td>
<td>1.70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Not at All</th>
<th>Mildly</th>
<th>Moderately</th>
<th>Very</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>2.19</td>
<td>2.13</td>
<td>1.95</td>
<td>1.86</td>
<td>1.74</td>
</tr>
<tr>
<td>Anxious</td>
<td>2.27</td>
<td>1.99</td>
<td>2.04</td>
<td>1.87</td>
<td>1.77</td>
</tr>
</tbody>
</table>
Questions 8 and 9

8. How do the cognitive coping responses utilized after AMI symptom onset impact the first action taken?

9. How do the emotional coping responses utilized after AMI symptom onset impact the first action taken?

The results for questions 8 and 9 are shown in Table 9. In the twenty analyses of co-variance (ANCOVAs) conducted for questions 8 and 9, the cognitive coping response that significantly impacted the behavioral coping responses most frequently was perceived severity of symptoms, while accessed a healthcare provider was the behavioral coping response that was most often significantly impacted by a cognitive coping response and emotional coping response. Perceived severity of symptoms had a significant impact on tried to relax ($F(4,724) = 5.05, p = .001, \eta^2 = .027$), self-treated ($F(4,724) = 3.99, p = .003, \eta^2 = .022$), and accessed a healthcare provider ($F(4,724) = 10.10, p = <.001, \eta^2 = .053$) which was also significantly impacted by symptom attribution ($F(1,723) = 11.15, p = .001, \eta^2 = .015$) and level of anxiety ($F(4,723) = 3.69, p = .006, \eta^2 = .020$).

Subjects who attributed the AMI symptoms to the heart were almost twice as likely (19.5%) to access a healthcare provider as compared to the subjects who did not attribute the symptoms to the heart (10.9%). Data analysis demonstrated that perceived severity of symptoms and level of anxiety were significantly correlated to one another ($r = .631, p = <.001$). If the subjects were very or extremely anxious about the symptoms or perceived the symptoms to be very or extremely serious, they were more likely to access a healthcare provider. Those subjects who perceived the symptoms as serious or
extremely serious were unlikely to relax upon AMI symptom onset. Those subjects who
did not perceive the symptoms to be serious were the least likely to self-treat.

An individual’s perceived ability to control symptoms significantly impacted the
behavioral coping response of telling someone about the symptoms as the first action
taken after AMI symptom onset ($F(4,720) = 4.11, p = .003, \eta^2 = .022$). If the subject
perceived they were unable to control their symptoms, they were more likely to tell
someone about the symptoms. Ignored symptoms did not have a significant relationship
with any of the cognitive coping responses or the emotional coping response.

Table 9. Cognitive and emotional coping responses with a significant impact on
behavioral coping responses of first action taken after AMI symptom onset.

<table>
<thead>
<tr>
<th>Symptom Severity (Mean)</th>
<th>Tried to Relax</th>
<th>Told Someone</th>
<th>Self-treated</th>
<th>Accessed Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>(How serious did you think your symptoms were?)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>29%</td>
<td>21%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Mildly</td>
<td>19%</td>
<td>37%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>16%</td>
<td>38%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Very</td>
<td>11%</td>
<td>42%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Extremely</td>
<td>12%</td>
<td>31%</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptom Control (Mean)</th>
<th>Tried to Relax</th>
</tr>
</thead>
<tbody>
<tr>
<td>(How much ability do you think you have to control your symptoms?)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>16%</td>
</tr>
<tr>
<td>A little</td>
<td>12%</td>
</tr>
<tr>
<td>Moderate</td>
<td>2%</td>
</tr>
<tr>
<td>A lot</td>
<td>13%</td>
</tr>
<tr>
<td>Very much</td>
<td>7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of Anxiety (Mean)</th>
<th>Tried to Relax</th>
</tr>
</thead>
<tbody>
<tr>
<td>(How anxious were you when you first noticed your symptoms?)</td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>9%</td>
</tr>
<tr>
<td>Mildly</td>
<td>11%</td>
</tr>
<tr>
<td>Moderate</td>
<td>10%</td>
</tr>
<tr>
<td>Very</td>
<td>21%</td>
</tr>
<tr>
<td>Extremely</td>
<td>19%</td>
</tr>
</tbody>
</table>
Because five different coping responses (ignored symptoms, symptom attribution, accessed a healthcare provider, perceived severity of symptoms, and level of anxiety) were all found to significantly impact the ultimate dependent variable (prehospital delay time), a multiple linear regression analysis was conducted, controlling for age, education, and site, to determine how much of the unique variance in prehospital delay time could be due to each of the coping responses. See Table 10 for results.

For the regression of prehospital delay time on the five coping responses (ignored symptoms, symptom attribution, accessed a healthcare provider, perceived severity of symptoms, and level of anxiety), all five predictor variables were entered at the same time. Together they accounted for 23% of the variance in prehospital delay time, \( F(10, 716) = 22.75, p < .001 \). In this multivariate analysis, accessed healthcare provider, perceived severity of symptoms, and level of anxiety were not significantly uniquely related to prehospital delay time while symptom attribution \( (Beta = -0.113, p = .002) \) and ignored symptoms \( (Beta = 0.069, p = .043) \) were significantly and uniquely related to prehospital delay time. If symptoms were attributed to the heart, prehospital delay time was shorter than average and if symptoms were ignored, prehospital delay time was longer.

Due to the collinearity between perceived severity of symptoms (Tolerance = .510) and level of anxiety (Tolerance = .575) as simultaneous predictors of prehospital delay time, two additional multiple linear regression analyses were conducted. In the first equation, ignored symptoms, accessed healthcare provider, and symptom attribution were combined with perceived severity of symptoms as predictors and, in the other equation, level of anxiety was substituted for perceived severity of symptoms.
The first of these equations (with perceived severity of symptoms but not level of anxiety) demonstrated that perceived severity of symptoms (Beta = -.096, p = .011), symptom attribution (Beta = -.116, p = .001) and ignored symptoms (Beta = .070, p = .040) were all significant predictors of prehospital delay time (F(9, 717) = 25.12, p < .001, Adjusted R square = .23). The second equation (with level of anxiety but not perceived severity of symptoms) demonstrated that symptom attribution (Beta = -.124, p < .001), ignored symptoms (Beta = .069, p = .042) and level of anxiety (Beta = -.094, p = .008) were all significant predictors of prehospital delay time (F(9,716) = 25.07, p <.001, Adjusted R square = .23).
Table 10. Multiple linear regression of prehospital delay time on five significant coping responses.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R Square Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>df1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>df2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sig. F Change</td>
</tr>
<tr>
<td>1</td>
<td>.494*</td>
<td>.244</td>
<td>.233</td>
<td>.91002</td>
<td>.244</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Correlations</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Part</td>
<td>Tolerance</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>1.514</td>
<td>.253</td>
<td></td>
<td>-.103</td>
<td>.838</td>
</tr>
<tr>
<td></td>
<td>First think the problem was after symptom recognition</td>
<td>-.241</td>
<td>.076</td>
<td>-.113</td>
<td>-3.161</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>First ignored symptoms</td>
<td>.168</td>
<td>.083</td>
<td>.069</td>
<td>2.027</td>
<td>.043</td>
</tr>
<tr>
<td></td>
<td>First accessed healthcare provider</td>
<td>-.137</td>
<td>.106</td>
<td>-.046</td>
<td>-1.294</td>
<td>.196</td>
</tr>
<tr>
<td></td>
<td>How serious did you think</td>
<td>-.044</td>
<td>.034</td>
<td>-.059</td>
<td>-1.284</td>
<td>.199</td>
</tr>
<tr>
<td></td>
<td>How anxious were you</td>
<td>-.047</td>
<td>.032</td>
<td>-.062</td>
<td>-1.433</td>
<td>.152</td>
</tr>
<tr>
<td></td>
<td>Age in years</td>
<td>.006</td>
<td>.003</td>
<td>.069</td>
<td>2.045</td>
<td>.041</td>
</tr>
<tr>
<td></td>
<td>Years of education</td>
<td>-.003</td>
<td>.011</td>
<td>-.010</td>
<td>-.284</td>
<td>.777</td>
</tr>
<tr>
<td></td>
<td>Site10</td>
<td>1.072</td>
<td>.109</td>
<td>.361</td>
<td>9.816</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Site11</td>
<td>1.100</td>
<td>.096</td>
<td>.403</td>
<td>11.455</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Site13</td>
<td>.874</td>
<td>.099</td>
<td>.319</td>
<td>8.858</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Dependent Variable: log base 10 delay in hrs
CHAPTER V

DISCUSSION

The purpose of this dissertation was to examine: 1) the relationship between gender, a previous cardiac event, and their interaction on prehospital delay time; 2) the relationship between gender, a previous cardiac event, and their interaction on the behavioral, cognitive, and emotional coping responses following the onset of symptoms; 3) the relationships among the cognitive, emotional, and behavioral coping responses following the onset of symptoms; and 4) the impact of those cognitive, emotional, and behavioral coping responses on prehospital delay time.

Using Leventhal’s Self-Regulation model as a conceptual framework, this dissertation initially proposed that the impact of gender and a previous cardiac event on prehospital delay time would be mediated by the cognitive, emotional, and behavioral coping responses following symptom onset. For a mediating relationship to exist the two exogenous independent variables (gender and previous cardiac event) and/or their interaction needed to have a statistically significant relationship to the ultimate dependent variable (prehospital delay time) (Bennett, 2000); however in the analysis of data done for this dissertation, results demonstrated that, controlling for age, education and site, the relationships between gender, a previous cardiac event, and their interaction on prehospital delay time were not statistically significant. This was not the result expected when the theoretical model and dissertation were proposed.
One of the covariates in the analysis just described, the geographic location of the
AMI patients, was found to significantly impact and make a large difference in
prehospital delay time. The mean log prehospital delay time of those subjects outside the
United States was 1-1/2 to 2 times longer than those subjects within the United States
(Table 4). Fukuoka et al. (2005) reported that when AMI patients from Europe and South
America were compared to AMI patients from North America or Australia/New Zealand,
you were significantly more likely to delay seeking medical help.

When McKinley et al. (2004) compared the prehospital delay time between
Western countries, which included the U.S. and the U.K., to the Asian countries, which
included Korea and Japan, the median prehospital delay times of the Western countries
were shorter. In this analysis, the site in the U.S. had the shortest mean log prehospital
delay time while the site from the United Kingdom had the shortest median prehospital
delay time in hours. With 406 participants from the U.S., the potential for extreme
variability in the numerical values of prehospital delay time or outliers in the dataset
existed. By using a log transformation, these numerical values or outliers were brought
closer together which resulted in a more normal distribution of prehospital delay time and
a shorter mean log of prehospital delay time. With 134 participants from the United
Kingdom, the potential for variability in the dataset was not as great. In addition, the
health care system in the United Kingdom lends itself to a more standardization of care
which can decrease the variations in treatment-seeking behavior (reducing the need for a
log transformation of data). The resulting median prehospital delay time in hours could
be a reflection of this standardization in care.
According to Fukuoka et al. (2005), different care seeking patterns may be a reflection of cultural differences which may reflect the health concerns prioritized and funded by the local and/or national governments of that particular country. For example, Noureddine, Froelicher, Sibai, & Dakik (2010) report that Lebanon has been experiencing challenging times due to the instability at the political, economic, and national security levels. The Ministry of Public Health in that country sponsors public health campaigns to educate the public about the importance of immunization of children and mammography screening in women while risk reduction behavior for heart disease and actions to be taken in the event AMI symptoms occur have not been addressed.

Therefore, it is possible that the shorter prehospital delay time of subjects from the United States is a reflection of the intense public education efforts by the American Heart Association (AHA) and other health care agencies/organizations over the last several decades. In a survey conducted by AHA in January of 2008, 79% of the lay public claim they are confident in their knowledge of actions to take in the event of a medical emergency and 60% are familiar with cardiopulmonary resuscitation (CPR) (AHA, 2010).

For women, triennial surveys by AHA measuring their awareness, knowledge, and perceptions related to coronary heart disease have been conducted since 1997. These surveys have demonstrated that the awareness of coronary heart disease as the leading cause of death in American women has nearly doubled from 30% in 1997 to almost 60% in 2006 (Mosca, Mochari-Greenberger, Dolor, Newby, & Robb, 2010). In addition, death rates from cardiovascular disease have declined 29.2% from 1996 to 2006 (AHA, 2010).
Independently, these statistics may not be meaningful, but together they may represent a level of awareness and knowledge regarding cardiovascular disease that may have resulted in a change in risk behavior that is present in the United States. This level of awareness may not exist in other areas of the world, which could account for the shorter prehospital delay times in the United States.

Throughout the literature, it has been reported that women have a longer prehospital delay time period than men (Dempsey, Dracup, & Moser, 1995; Dracup & Moser, 1997; Gaspoz et al., 1996; Goldberg et al., 1999; Johansson, Stromberg, & Swahn, 2004; Lefler & Bondy, 2004; Meischke, Larsen, & Eisenberg, 1998; Noureddine et al., 2006; Rosenfeld, 2001; SWHR, 2004). Previous research has demonstrated that this delay has contributed to sub-optimum use of reperfusion therapies which has contributed to increased AMI morbidity and mortality rates for women (Dempsey et al., 1995; Rosenfeld, 2001). Therefore, I expected gender to have a significant impact on prehospital delay time and I hypothesized that the female subjects in this dataset (with and without a previous cardiac event) would have significantly longer prehospital delay times when compared to men. They did not.

Of the 276 female subjects who participated in this study, 198/276 (72%) were from the United States while the remaining 78 were split between the other three countries/sites. In an analysis of co-variance conducted for subjects from just the U.S. where the number of female participants was higher, there was no significant difference in prehospital delay time among the female participants with and without a previous cardiac event. The presence of a previous cardiac event for women might have significantly impacted prehospital delay time had the number of female participants from
the UK, Korea, and Japan been greater which would have increased the sample size. In addition, the four sites contributing participants to this dissertation study reflected four different cultures.

Gender and the social roles attached to gender may operate differently depending on the culture and/or geographic location of the participants; consequently, prehospital behavior associated with AMI symptoms may be manifested differently as a function of site/culture which could have impacted prehospital delay time. According to Fukuoka et al. (2005), individuals have social roles that reveal themselves in the family, work, and the community/culture in which they live. The obligations assigned to these social roles can influence behavior upon the onset of AMI symptoms such as not telling someone, not wanting to trouble others, or suffering in silence at the expense of one’s own well-being.

In addition, the physical location where AMI symptoms were first experienced could impact the interpretation of symptoms and subsequent behavior associated with the symptoms. Noureddine, Arevian, Adra, & Puzntian (2008) found in their study of Lebanese men and women with symptoms of ACS that the prehospital delay time of males was shorter than females. They suggested that because “men are the primary breadwinners in Lebanese families, the wives are concerned with protecting their husband’s health and thus, pushed them to seek care” (Noureddine et al., 2008, p. 34).

As outlined in the literature review, data regarding the relationship between a previous AMI and treatment seeking delay are conflicted. Yet, I hypothesized that men and women with a history of a previous cardiac event would have a significantly shorter prehospital delay time than men and women without a history of a previous cardiac event. I was surprised when this hypothesis along, with the other two hypotheses
associated with Question One, were not supported. Whether or not this was principally due to the significant impact of site -- or the other two covariates, age and education -- on prehospital delay time remains unclear, but further investigation is warranted.

Noureddine, Froelicher, Sibai, and Dakik (2010) reported that in previous studies investigating responses to symptoms of an AMI, ethnic differences have been identified. Americans have sought emergency care more often than the Japanese, and South Asians have sought emergency care more often than the Europeans. Chinese participants not born in Canada have been less likely to seek emergency care when compared to those Chinese participants born in Canada, which also includes indigenous Canadians, British, Scottish and Irish ethnicities.

A diagram demonstrating all of the significant interactions between the two exogenous and one interactive independent variables, coping responses, and ultimate dependent variable is presented in Figure 13. Of the two exogenous and one interactive independent variable, a history of a previous cardiac event had a significant main effect on the coping responses more frequently than gender or its interaction with a previous cardiac event.
As was shown in Table 7 in the Results chapter and in Figure 13 above, upon onset of AMI symptoms, individuals who had a history of a previous cardiac event were significantly less likely to ignore symptoms, more likely to attribute the symptoms to the heart and to self-treat those symptoms. Because individuals with a history of cardiovascular disease often have other comorbid conditions (such as diabetes and hypertension), they may learn to self-treat their condition, which can cause the severity of AMI symptoms to be minimized when they occur (Zegrean et al., 2009).

These results are contrary to research conducted by Fox-Wasylyshyn et al., (2007) and Pattenden et al. (2002) who found that patients who had experienced a previous
cardiac event such as a PCI or CABG believed they were not at risk for an AMI and, thus, upon AMI symptom onset, did not attribute symptoms to the heart or the symptoms were misinterpreted. Caldwell and Miaskowski (2002) state that past history of an AMI can make an individual less sensitive to the signs and symptoms of another AMI and when symptoms are acknowledged, prescription or nonprescription medications, and/or rest may be used to alleviate the symptoms and/or lessen the pain (Johansson et al., 2004; Pattenden et al., 2002; Zerwic, 1999).

Alonzo and Reynolds (1997, 1998) claim prior history of coronary heart disease is not a catalyst to seek care faster and can lead to a lengthier period of symptom evaluation while denying the sense of urgency. Self-treatment of the AMI symptoms such as through the use of over-the-counter medications or prescription medications (e.g., nitrates) could be a component of symptom evaluation. According to Concannon et al. (2009), delays occur due to the time spent diagnosing the problem because of the uncertainty of cardiac involvement.

Fukuoka et al. (2007) claimed that the strongest predictor of appropriate symptom attribution is history of coronary heart disease, with those individuals with a positive history more likely to attribute symptoms as cardiac in origin when compared to those without a positive history. Similar to Fukuoka et al. (2007), the results of my data analysis demonstrated that patients with a positive history for a previous cardiac event were twice as likely to attribute their AMI symptoms to the heart.

According to Dempsey et al. (1995), the ability to maintain control over the situation drives a woman’s decision to seek care for her AMI symptoms, and prehospital delay time is directly impacted by her ability to maintain control over the situation
Dempsey et al. (1995) reported that, after the onset of AMI symptoms, women maintained control by recognizing the symptoms as atypical, perceiving the symptoms as insignificant and seeking relief through self-treatment strategies rather than calling 911. According to Dempsey et al. (1995), an individual’s level of anxiety can increase when the ability to control the health threat seems out of reach. For the female participants in this dissertation, their perceived ability to control AMI symptoms was significantly lower than that for males and their level of anxiety was significantly higher.

The significant interactive effect of gender and a previous cardiac event on symptom attribution and perceived severity of symptoms found in my analyses supported the research conducted by Meischke et al. (1995). According to Meischke et al. (1995), history of a previous AMI coupled with the perception of symptom severity increases the likelihood that an individual believes they are having an AMI. The males in this study who had experienced a previous cardiac event were more likely to attribute the symptoms to the heart and perceive those symptoms as serious. The significant interactive effect of gender and previous cardiac event on perceived severity of symptoms demonstrated that women who were experiencing AMI symptoms and who had experienced a cardiac event attributed their symptoms to the heart less frequently than men, and did not perceive their symptoms as serious when compared to men. According to Fukuoka et al. (2007), patients with a history of a previous cardiac event are more likely to attribute AMI symptoms as cardiac in origin; however, men attributed severe chest pain to the heart while women were more likely to attribute their AMI symptoms to the flu. Lefler (2004) emphasized that women have repeatedly placed their families and household obligations
before their own health needs causing them to minimize the seriousness of symptoms if those symptoms interfered with family obligations.

When making decisions about how to respond to AMI symptoms, the cognitive and emotional responses described in the Self-Regulation model are important (Johansson et al., 2004). According to Fukuoka et al. (2005), emotional experiences (i.e., fear and anxiety) and cognitive responses (i.e., symptom attribution to the heart vs. not heart) play a pivotal role in whether or not medical treatment is sought promptly.

In my research study, when study participants did not ignore their AMI symptoms, perceived the symptoms as serious, had a heightened level of anxiety about the symptoms, attributed the symptoms to the heart, and then accessed a healthcare provider, it is not surprising that prehospital delay time was shortened (as seen in Table 8). These findings are consistent with those found by Lefler and Bondy (2004) in their metasynthesis in which correct attribution or labeling of symptoms to the heart and perceived seriousness of symptoms impacted prehospital delay. According to Alonzo & Reynolds (1998), Burnett et al. (1995), Dracup et al. (1995), Janz, Champion, & Strecher (2002), Perkins-Porras et al. (2009), Poss (2001), Ryan & Zerwic (2003), and Thuresson et al. (2007), perceived severity of symptoms and the emotional response to signs and symptoms serve as cues for action.

Therefore it is no surprise that in this dissertation, patients who perceived their symptoms as serious and who were anxious about their symptoms had a significantly shorter prehospital delay time. Anxiety is common among AMI patients (DeJong et al., 2004) and as demonstrated in the Results section, perceived severity of symptoms and level of anxiety were significantly correlated to one another and a collinear relationship
existed between the two coping responses. According to DeJong et al. (2004), a precursor of anxiety is anticipation of physical danger. The threatening nature of an AMI produces anxiety; consequently, if an individual perceives the symptoms experienced as serious, the level of anxiety rises. For cardiac patients, this rise in anxiety can result in an increased length of stay in the coronary care unit and can be associated with an increased risk of short-term and long-term complications (DeJong et al., 2004 & Moser et al., 2003).

This dissertation study found that patients who try to relax, self-treat, and/or fail to access a healthcare provider have an increase in prehospital delay time. Dracup and Moser et al. (1997) found that the predominant initial response upon AMI symptom onset was to try and relax which, in this research study, was significantly negatively related to the perceived severity of symptoms. When participants perceived the symptoms to be extremely serious, they did not try to relax but, instead, attempted to self-treat and access a health care provider. According to Johansson et al. (2004), a patient’s subjective feelings regarding the severity of symptoms is an important predictor of delay, and patients who minimize the severity of symptoms prolong delay while those who think the symptoms are serious shorten prehospital delay time.

According to Burnett et al. (1995), symptom attribution to the heart is a distinguishing characteristic that differentiates individuals who request medical assistance in a timely manner. It is a central construct that has been shown to be an important factor in decisions to seek care (Buckley et al., 2007; Zapka et al., 2000). Therefore, it was not surprising to find in this dissertation that when symptoms were attributed to the heart, twice as many accessed a healthcare provider, and symptom attribution to the heart
contributed significantly to a shorter prehospital delay time. These results are consistent with the research conducted by Dracup (1995) and Zerwic (1999) who found that individuals who believe symptoms being experienced are those of a heart attack seek treatment more quickly.

In the first stage of the Self-Regulation model, the health threat is recognized and labeled. This labeling or attribution process is based on episodic and semantic memories that reflect prior experience and/or knowledge. Attribution of symptoms to the heart requires knowledge of signs and symptoms of an AMI and a match between what is experienced and what is expected (Finnegan et al., 2000; Rosenfeld, 2001; Zerwic, 1999) which means that patient and family education (for those with and without a previous cardiac event) remains an ongoing priority in cardiac care.

In the second stage of the Self-Regulation model, an action plan for dealing with the health threat (which in this case is AMI symptoms) is formulated. In this dissertation, the action plan is described as the first action taken after AMI symptom onset which includes ignoring symptoms, self-treating symptoms, accessing a healthcare provider, trying to relax, and telling someone about the symptoms. Results demonstrated that ignoring symptoms and accessing a healthcare provider were the only behavioral coping responses that significantly impacted prehospital delay time. Calling 9-1-1 upon AMI symptom onset results in a shorter prehospital delay time while Johansson et al. (2004) reported that contacting a physician upon AMI symptom onset prolonged delay by one hour.
Limitations

While every effort was made to minimize methodological issues, there are limitations related to this research study that can be grouped under three categories: sampling, measurement, and secondary data analysis.

Sampling. The geographic diversity of the sample, in terms of breadth of study locations and sample sizes, makes it plausible for these findings to be generalizable; however, an obstacle to that generalizability is the imbalance in racial, ethnic, and gender diversity. For the results of this research study to be more generalizable to the United States, the distribution of study participants should reflect the U.S. population, which is becoming more and more ethnically diverse.

The 2005-2009 report from the U.S. Census Bureau states that 74.5% of the U.S. population is White, 12.4% is Black, 15.1% is Hispanic, and 4.4% is Asian with <1% in the Other category (http://factfinder.census.gov retrieved 12/14/2010). In this study, approximately 60% of the study participants were Caucasian while 30% were Asian with half of the remaining 10% Black.

Because four different geographic locations were represented in this study sample, an equal distribution of study participants across those locations would have been desirable; however, over 50% of the sample was from the United States, with the remaining participants divided almost equally among the other three locations. The imbalance in male-to-female participation was almost 2:1 with 65% of the study participants being male and 35% female; in addition, over 70% of the 276 female participants were from the United States. It would have been preferable to have a greater proportion of women in the study with a more equal distribution across study sites.
To be eligible for participation in this secondary data analysis, study participants had to be hospitalized with a diagnosis of a confirmed AMI; however, the intent of this study was to describe and quantify the response of men and women to AMI symptoms. There is a population of patients who were never hospitalized, had symptoms suggestive of an AMI, attributed those symptoms to the heart, accessed a healthcare provider, and yet were not included in this study because they did not have a confirmed AMI medical diagnosis. Including persons in this particular cohort in this study would have increased the sample size and may have increased the magnitude of the observed effects and enhanced the validity of the study results.

Due to missing data, the size of the original sample from these four countries decreased from over 830 to 780. This had the potential to introduce unintentional selection bias that could further limit generalizability of my findings. While the sample size for this dissertation was relatively large, an additional limitation is that the observed effects found with the significant results were small with the eta-squared value of .10 or less.

*Measurement.* For information obtained through retrospective patient and family interviews, the investigators who were the source of the secondary data I analyzed were forced to rely on the memory of individuals who were involved in a highly stressful event. An AMI can be particularly distressing for both the patient and family which can lead to an arousal of emotions that may alter the patient’s memory as well as that of the family. This can lead to inconsistencies in the data reported. However, given the fact that the original researchers stated that patient and family interviews were conducted at
the hospital and were done within approximately 24-72 hours of admission with a confirmed AMI, inconsistencies in the method and time of data capture was minimized.

Even though there was an inter-rater reliability of 94% for the chart abstractions, the original investigators were forced to rely on data contained in the patient’s medical record. Reliance on medical record information forces dependency on documentation by multiple health care providers in multiple locations with the possibility of variations in data definitions and/or terminologies. This can result in variations in documentation that can lead to inconsistencies in coding, and subsequent variations in data entry.

In this dissertation, the behavioral, cognitive, and emotional coping responses of Leventhal’s Self-Regulation model were used to identify those factors associated with prehospital delay. As noted in the Methodology chapter, both the original and modified instruments had content validity; however, no mention was made of construct validity. When measuring psychological constructs, it is preferable that several items be used to measure each construct rather than single items. Because this was a secondary data analysis, I was limited by the instrument and variables available in the dataset for operationalizing the theoretical constructs associated with each of the coping responses.

A regional and international difference in the manner in which the emergency medical system (EMS) is accessed during the prehospital phase of emergency cardiac care has the potential to make comparisons across sites in this dissertation problematic. The method by which a healthcare provider is accessed and who that healthcare provider is could contribute to variations in prehospital delay time in response to AMI symptoms.

Even though items on the MRSQ were translated from English to another language and then back to English, it does not appear that the instrument was designed with
different cultural influences in mind. The possibility of content in key questions to be misunderstood or misinterpreted exists; consequently, the response provided by the patient and family could have literally been lost in translation and the potential for error in data capture or interpretation exists.

In spite of site being controlled for as a covariate, there was no mechanism to control for the influence of culture. According to Fukuoka et al. (2005, p. 2026), “culture shapes individual’s beliefs, values, attitudes, and behaviors. Nationality or ethnicity is not equivalent to culture. However, individuals with a certain ethnicity or nationality share beliefs, values, attitudes, and behaviors and these, influence health practices. Cultural differences may lead to different care seeking patterns in patients experiencing symptoms such as those of AMI.” The influence of site was significant; the influence of site expressing itself through cultural variation in treatment seeking patterns was not quantified in this study and thus, is unknown and could have influenced study results.

For the nine research questions asked in this dissertation, multiple analyses of co-variance were conducted on the same variables (e.g., the behavioral, cognitive, and emotional coping responses functioned as independent as well as dependent variables). The potential for a Type I error grew as the number of statistical tests performed on the same variables increased; however as stated in the Methods chapter, with over 700 subjects in the dataset, this potential was minimized and the large sample provided ample power to detect a meaningful interaction effect (if present).

Secondary Data Analysis. Because this is a secondary data analysis, the questionnaire utilized, the data collection procedure, and instructions for data collections were provided by someone other than the author of this dissertation. A limitation of this study is that I
was not able to supervise and/or control the data entry process, to guarantee data elements were being interpreted accurately and consistently (according to the intent of the research questions in this study) by the research assistants, and to ensure that all data elements were consistently being addressed in the data collection process. Consequently, variables with missing data were found, and had to be dealt with by reviewing each variable pertinent to this dissertation for completion.

The dataset reflected questions asked by the original investigators but not questions specific to this research study; therefore an intensive review process of all the variables was conducted initially and, if needed, variables were recoded to match the conceptual framework as well as the research questions so that appropriate data analyses could be conducted.

According to Nicoll and Beyea (1999), secondary data analysis can not only be a resource for answering questions in nursing research, but it can also be a useful method to gain ideas regarding further research. Consequently as a result of this research study, the following recommendations for future research are suggested.

Recommendations for Future Research

According to DeJong et al. (2004), Moser et al. (2003), and Noureddine et al. (2008), culture can influence an individual’s response to AMI symptoms. In all the data analyses conducted, site was found to have a significant impact on all the behavioral (except for told someone), cognitive, and emotional coping responses, and site was found to have a significant main effect on prehospital delay time (as shown in Table 4); therefore, an area for future research is the impact of culture and/or geographic location
on prehospital delay behavior and, subsequently, prehospital delay time. According to Gärtner, Walz, Bauernschmitt, & Ladwig (2008), on an international level prehospital delay time is the most important factor prolonging the initiation of treatment for an acute myocardial infarction.

The World Health Organization (WHO) reports that, in 2004, approximately 17.1 million people died from cardiovascular disease, which accounted for 29% of all global deaths and represented the number one cause of death worldwide (http://www.who.org retrieved 12/8/2010). Heart disease is the leading cause of morbidity and mortality in developed countries and increasingly in developing countries (Noureddine, Froelicher, Sibai, & Dakik, 2010). It is predicted that, by 2030, almost 23.6 million people will die from CVD, which will leave it to remain as the single leading cause of death globally (http://www.who.org retrieved 12/8/2010). According to Moser et al. (2003), comparisons of psychosocial variables among cardiac patient populations across cultures is rare; therefore, a research study that compares and seeks to understand AMI prehospital delay behavior from different geographic locations and different cultures could prove to be valuable. Dracup et al. (2003) suggests that clinical and sociodemographic factors along with cognitive, emotional, and cultural factors need to be evaluated together.

In the Methods Chapter, a one-way flow of causation was used to depict the conceptual framework of this dissertation. A path analysis, simultaneously involving all of the variables examined in this dissertation, should be conducted to gain a better understanding of the causal relationships among the variables. Since much of the delay in reperfusion therapy happens before patients arrive at the hospital, knowing how the
cognitive and emotional responses interact with gender and previous cardiac event to bring about the behavior that impacts prehospital delay would be useful. Therefore, a recommendation for future research would be to evaluate the behavioral, cognitive, and emotional coping responses to determine if they act as “true mediators” between gender, a previous cardiac event and their interaction on prehospital delay time.

This dissertation study defined a previous cardiac event as an acute myocardial infarction and/or revascularization procedures such as percutaneous coronary intervention and coronary artery bypass graft surgery. Because this study neither analyzed the type of previous cardiac event and coping responses utilized nor compared the difference in prehospital delay time by type of previous cardiac event, an area for future research would be to determine if there are differences in coping responses by clinical subgroup, prehospital delay time by clinical subgroup, and prehospital delay time among the clinical subgroups when gender and previous cardiac event interact with one another.

Approximately 70% of deaths from coronary heart disease occur in individuals who have had a previous experience with cardiovascular disease (Buckley et al., 2007; Zapka et al., 2000); however, there have been few intervention studies focused on individuals with a history of coronary heart disease (McKinley et al., 2009).

Because they have regularly scheduled follow-up appointments with their physician and/or cardiologists, patients with a past history of AMI have been known to feel a sense of protection and, thus, may react slowly to their symptoms (Zapka et al., 200). Knowing the type of coping response utilized by the clinical subgroup of patients who have had a previous cardiac event and knowing the clinical subgroup of patients who have had a previous cardiac event who are more likely to have lengthy prehospital delay times could
assist healthcare providers to provide targeted and individualized patient and family education regarding AMI signs and symptoms and the response to those symptoms.

The type of self-treatment strategy used by the patient upon AMI symptom onset was not identified in this study. Fox-Wasylyshyn et al. (2007) and Zegrean et al. (2009) found that patients with a history of an AMI were more likely to use prescribed medications in response to AMI symptoms while patients without a history of a previous AMI were more likely to use nonprescription medications in response to their AMI symptoms. Therefore, an area for future research would be to compare and contrast the type of self-treatment strategy used by individuals with and without a history of a previous cardiac event as well as by clinical subgroup (for those with a history of a previous cardiac event).

Individuals who have a positive history of a previous cardiac event tend to deny, or underplay, the sense of urgency and engage in lengthy periods of symptom evaluation upon AMI symptom onset (Alonzo & Reynolds, 1997). Knowing the type of self-treatment strategy used most often by the clinical subgroup of those patients who have had a previous cardiac event could enhance patient and family education and provide reassurance about actions that need to be taken during those moments of costly indecision.
CHAPTER VI

CONCLUSION

Given the public campaigns over the last decade regarding women and heart disease, this researcher originally undertook this study to compare and contrast the impact of gender on prehospital delay time. After thoroughly reviewing the literature, it became apparent that a history of a previous cardiac event interacting with gender could impact prehospital delay time; therefore, a focus of research for this dissertation was identified.

However, the results of Question #1 regarding the impact of gender, a previous cardiac event, and their interaction on prehospital delay time were disappointing as no significant relationships were found once I controlled for the influence of age, education and geographical location of the participants (site). What did become apparent, though, was the significant role that symptom attribution plays, for the greatest direct effect observed in this dissertation was the relationship between previous cardiac event and symptom attribution. The interaction of gender and previous cardiac event significantly impacted symptom attribution and symptom attribution significantly impacted prehospital delay time, thus suggesting that gender in interaction with a previous cardiac event had an indirect effect on prehospital delay time.

In addition to symptom attribution, the role of perceived severity of symptoms and not ignoring symptoms when they occur must also be acknowledged. Among the cognitive coping responses, perceived severity of symptoms significantly impacted the
behavioral coping responses most frequently as well as significantly impacting prehospital delay time. Perceiving a symptom as serious is central to the decision to seek emergency care (Rucker, Brenna, and Burstin, 2001). Of the five coping responses that contributed 23% of the variance in prehospital delay time, ignoring AMI symptoms resulted in significantly longer prehospital delay times.

Even though (1) intensive public education campaigns (which began in the 1950s) regarding the signs and symptoms of an acute myocardial infarction have steadily improved the level of knowledge regarding an AMI and AMI risk reduction behavior, (2) the level of awareness regarding the actions to be taken in the event AMI symptoms should occur has increased, and (3) methods to reperfuse the myocardium and reestablish coronary flow have improved survival rates, this study demonstrated that acknowledging the symptoms, attributing symptoms to the heart and perceiving the symptoms as serious significantly decreases prehospital delay time. However, symptom attribution, perceived severity of symptoms, and not ignoring the AMI symptoms are under the patient’s control. According to Buckley et al. (2007) and Zapka et al. (2000), symptom attribution is a key construct that is an important factor in a patient’s decision to seek care.

Our role as cardiac nurses remains to continue to emphasize and remind patients and their families that the symptoms being experienced could be related to the heart and should be treated as serious. For the sake of their survival and/or the survival of their loved ones, appropriate and timely actions need to be taken.

Because the results of this dissertation demonstrated that individuals with a history of a previous cardiac event are twice as likely to self-treat symptoms, nurses need to remember to educate patients and their families regarding the appropriate use of over-the-
counter (aspirin and antacids) and prescription (nitrates) medications should the symptoms of an AMI reoccur. Self-treating AMI symptoms through the use of aspirin or nitrates could be an effective tool in the treatment of AMI symptoms and subsequent evaluation of symptoms; however, in the event that symptoms are not relieved and/or the pain has not subsided, the EMS system must be notified. Knowing that over-the-counter medications are associated with greater decision delay, nursing must tell patients and their families when and how to access the emergency medical system (Dracup et al., 1995; Zegrean et al., 2009).

While gender did not have a significant impact on prehospital delay time, gender did have a significant impact on the cognitive coping response of perceived ability to control symptoms. In this dissertation, females’ perceived ability to control symptoms was lower than males and since the first action taken by those individuals who perceive they have little to no control over the symptoms is to tell someone about their symptoms, it would seem that those individuals could possibly be females. The level of anxiety among the female participants in this study who had been diagnosed with an AMI was significantly higher; therefore, nurses need to remember to tell their female patients who are at risk or who have experienced an AMI that should AMI symptoms occur, the most effective strategy is to neither call a friend nor a family member, but to call 9-1-1. Time is of the essence and for the reperfusion treatment strategies to be effective and to minimize damage to the myocardium, EMS must be accessed immediately after AMI symptom onset.

According to Walsh et al. (2004), the threat of potential disability and death can lead to maladaptive coping mechanisms such as minimization of symptoms, perceived
insignificance of symptoms, and misattribution of symptoms. Fukuoka et al. (2005) tells the story of a high school principal who noticed chest discomfort immediately after lunch; however, he decided to delay going to the hospital until after he had delivered a speech to the graduating class. In the meantime, he tried to relax and took some over-the-counter medications. He did not tell anybody about his symptoms until after the graduation ceremony had ended at which time it was too late. He did not live to attend any post-graduation parties. These responses are under the patient’s control and have the potential to jeopardize the treatment-seeking process that can lead to delayed care and ultimately impacts AMI morbidity and mortality.
Appendix A

ID #_______________
DATE QUESTIONNAIRE COMPLETED ________________
DAY/MONTH/YEAR
TIME QUESTIONNAIRE COMPLETED ________________
TIME (24 HOUR CLOCK)

RESPONSE TO SYMPTOMS QUESTIONNAIRE

People can experience many different symptoms when they have a problem with their heart. By ‘symptoms’ we mean any feeling that was unusual or out of the ordinary (for example, dizziness, chest pain, fatigue, indigestion). Please circle the answer or fill in the blank that best describes how you responded to your symptoms.

1. When did you first notice your symptoms?
   Date_______________    Time_______________
   day/month/year   24 hour clock

2. Where were you when you first noticed your symptoms?
   1. at home
   2. at work
   3. in a vehicle
   4. visiting friends or relatives
   5. in a public place (for example, restaurant, movie, theater, hotel, meeting)
   6. other
3. Living environment
   1. rural
   2. urban
   3. suburban

4. When you first noticed your symptoms were you
   1. alone
   2. with your spouse or partner
   3. with another family member
   4. with friends
   5. with people at work
   6. other

5. How did other people respond to you when you told them about your symptoms?
   
   *(This question refers to lay people—one answer only)*
   1. they said or did nothing
   2. they told me not to worry
   3. they tried to comfort me
   4. they suggested I rest and take medicine
   5. they suggested I get medical help
   6. they called the emergency system to get help for me
   7. they took me to the hospital
   8. they got upset
   9. I never told anyone about my symptoms

   ID #________________

6. What was the FIRST thing that you did when you FIRST noticed your symptoms?(one answer only)
   1. wished or prayed that they would go away
   2. tried to relax
   3. pretended nothing was wrong
   4. told someone
   5. tried not to think about my symptoms
   6. took medication (for example, antacid, nitro, acetaminophen)
   7. called my doctor
   8. tried self-help remedy (changing position, herbs, etc.)
   9. told someone who was nearby (friend, co-worker, stranger, etc.)
10. called the emergency system
11. transported myself or had someone transport me to the hospital
12. drove to the doctor’s office or clinic

7. When you FIRST noticed your symptoms did you think the problem was (one answer only)
   1. your heart
   2. indigestion or stomach problems
   3. muscle pain (includes back pain, shoulder pain, etc.)
   4. fatigue
   5. flu or flu-like illness
   6. dental problem
   7. breathing problem

8. When you first experienced your symptoms how serious did you think they were?
   1 2 3 4 5
   not at all mildly moderately very extremely

9. How anxious (distressed or upset) were you by your symptoms when you first noticed them?
   1 2 3 4 5
   not at all mildly moderately very extremely

10. How much ability to control your symptoms do you think you have?
    1 2 3 4 5
    not at all mildly moderately very extremely

11. How important were the following factors in causing you to delay seeking help for your symptoms?

    You delayed because you waited to see if your symptoms would go away
    1 2 3 4 5
    not at all mildly moderately very extremely
You delayed because you were embarrassed to get help

1  2  3  4  5
not at all  mildly  moderately  very  extremely

You delayed because you feared what might happen

1  2  3  4  5
not at all  mildly  moderately  very  extremely

You delayed because your symptoms came and went

1  2  3  4  5
not at all  mildly  moderately  very  extremely

You delayed because you did not recognize your symptoms as heart symptoms

1  2  3  4  5
not at all  mildly  moderately  very  extremely

You delayed because you did not want to trouble anyone

1  2  3  4  5
not at all  mildly  moderately  very  extremely

You delayed because you did not know the symptoms of a heart attack

1  2  3  4  5
not at all  mildly  moderately  very  extremely

You delayed because you did not realize the importance of your symptoms

1  2  3  4  5
not at all  mildly  moderately  very  extremely
12. How important do you think it is for someone who is having heart symptoms to come to the hospital?

1                              2                                3                                4                          5
not at all                     mildly                    moderately                     very                extremely

13. On a scale of 0 to 10 with 0 being no pain and 10 being the worst pain you have ever felt, how much pain did you have? __________

14. Have you ever heard of a drug that is sometimes used in the hospital to stop a heart attack by dissolving the clot that causes heart attack? The drug is called a thrombolytic or ‘clot buster’.

   a. yes
   b. no
Appendix B

INSTRUCTIONS FOR PATIENT QUESTIONNAIRE

revision 2–10/13/97

General information about the patient questionnaire

The patient questionnaire contains 5 separate instruments. Two of the instruments measure anxiety: the Brief Symptom Inventory on page 1 and the Spielberger State Anxiety Index on page 2. The other 3 instruments measure perceived control and preference for information: the Cardiac Attitudes Index on pages 3 and 4 measures perceived control; the Krantz Health Opinion Survey on pages 5 and 6 measures perceived control and preference for information; and the Cardiac Attitudes Scale on page 7 measures control. The instruments may appear redundant, but we are trying to determine the easiest way to measure anxiety and perceived control so we need to compare the results of more than one instrument.

This questionnaire packet takes most patients about 10-12 minutes to finish if they complete it by themselves. The range of times we saw was from 5 to 20 minutes.

The questionnaire can be completed in 1 of the following 2 ways: 1) it can be filled out by patients after you give some simple instructions; or 2) you can read it to them and they can use the laminated cards to give you their responses. Either method is acceptable. Many of these patients may prefer to have you read the questionnaire to them because it is easier for them. This method often yields more complete data since patients rarely fail to answer an item if you read to them. If you use the reading method, please
make sure that the patient is responding from the laminated card for the page that you are reading from.

2. ID number, and date and time

All of the patient questionnaires will come with a preprinted ID number. This ID number must be transferred to the Sociodemographic and Clinical Data Form linked to this patient.

To protect patient confidentiality, we do not write the medical record number on the patient questionnaire. However, you will want to make a record of the medical record number in case the patient is discharged before you have a chance to finish the Sociodemographic and Clinical Data Form (chart abstract) and you have to retrieve the chart to finish the chart abstract.

It is extremely important that you write in the date and time that the patient completes the questionnaire. Please use military time to record the time. If the date and time are not recorded it will be impossible for us to know the timing of complications in relationship to the time we measured anxiety and perceived control.

3. Administration of the questionnaire

As stated above, you may read the questionnaire to patients or they may fill it out by themselves. Please give each patient both options and let the patient choose the one they prefer.

As an introduction, tell patients that we are interested in their feelings because the period soon after a heart attack is normally a time of intense emotions for most people, and that we are interested in the impact of those emotions. We need to be careful not to
imply that there is something unusual or harmful about intense emotions after a heart attack.

Please remind patients that their responses are confidential. Tell them that it is very important for them to answer each item even if some of the items seem to be very much like other items.

For the 2 anxiety instruments we are asking patients to tell us how they feel now AND how they felt in the 12 hours following their heart attack (i.e. in the 12 hours following admission). In our experience patients have little difficulty distinguishing their feelings at these 2 different time points. We adopted the strategy of asking patients about these 2 time points because we are most interested in the time very soon after myocardial infarction onset that is associated with the most intense emotional response (i.e. the first 12 hours). However, due to concerns about interviewing patients so soon after their heart attack, we usually end up interviewing patients at 24-48 hours. When this happens we miss that time period of really intense anxiety so that is why we ask about anxiety now and anxiety in the first 12 hours. If you happen to interview a patient within about 18 hours of their heart attack it is sufficient to ask them how they feel now only.

If patients choose to complete the instrument on their own, please check to see if they missed any items. Patients are, of course, free to skip any items they choose, but sometimes they just forget an item or have questions. If they did skip items, ask them if they did so intentionally or if they have a question.
4. Patient eligibility and time of administration

Patients of any age and both sexes are eligible to participate in this study if they have suffered an acute myocardial infarction that is confirmed by ECG or enzymes, OR if they received thrombolytic therapy in the emergency department. I would encourage you to try to recruit all eligible women since women are traditionally underrepresented in cardiovascular research. Patients must be pain-free and hemodynamically stable when they complete the questionnaire. They can have been unstable prior to the time that you approach them but need to be stable when they fill out the questionnaire. In fact, we would really like to include patients with severe MI who were initially unstable. Patients must be able to understand English well enough to comprehend the questions. We also have copies of the instrument and consent in Spanish. Patients must be free of cognitive impairment. They cannot have serious noncardiac co-morbid conditions such as stroke, cancer, renal failure (the purpose of this criteria is to exclude patients who are dealing with more than the crisis of a heart attack). Patients with peri-procedural myocardial infarction (e.g. MI during surgery or cardiac cath) and silent myocardial infarction (no pain or other distressing symptoms associated with MI) are excluded.

The questionnaire should be completed by the patient within 48 hours of their admission to the hospital for acute myocardial infarction. Although we include patients up to 48 hours after their myocardial infarction, we prefer to get patients earlier instead of later.
5. What to do with completed patient questionnaires and how to get paid

Keep the completed patient questionnaires with you until you have finished the associated Sociodemographic and Clinical Data Form. Send patient questionnaires and associated Sociodemographic and Clinical Data Forms to Debra Moser at the address on the cover page of these instructions. You will have one patient questionnaire and one Sociodemographic and Clinical Data Form for each patient.

To get paid please send a completed Consultant Payment Form along with the questionnaires. Please be sure to fill out the section of the form for your home address carefully because your check will be mailed to this address. Be sure to mail the form to Debra Moser and NOT to the research foundation. You can expect to receive payment from Ohio State University within 4 weeks. Please call me if you do not receive payment within 4 weeks.

6. Information we need about patients who refuse to participate

In publications from the study, we need to be able to discuss the number of patients who were asked to participate in the study and to summarize the reasons that people gave for refusing to participate. To that end, we ask that you keep track of the number of patients who refuse your invitation to participate and ask them for a very brief reason (e.g. not interested, too tired, too anxious, no time, hate research, etc). We have included a form for you to use to keep track of this information.
Appendix C

INSTRUCTIONS FOR SOCIODEMOGRAPHIC AND CLINICAL DATA FORM (AKA CHART ABSTRACT)

General information

The Sociodemographic and Clinical Data Form (chart abstract) is used to collect data about patient characteristics, past history, therapy during this hospitalization, and complications. It includes a few items that you will need to ask the patient about, but most of the data for the form can be obtained by examining the chart. We have pilot tested this instrument and made revisions that, hopefully, will make it easier for you to use. We are interested in your input and are willing to revise the instrument further to simplify use.

Please feel free to make notes to yourself or comments to us on the form that will help clarify responses.

2. ID code and medical record number (MR #)

Please be certain to put the ID number (from the patient questionnaire) associated with the patient on the Sociodemographic and Clinical Data Form. You should also record the medical record number so that you can retrieve the chart from Medical Records if necessary.

3. Completing the form (overview)

Most of the information needed on this form can be obtained from the chart at the end of the patient’s stay. However, there are a few items in section I (History and
Physical) that require information from the patient. Please carefully fill in correct dates and times whenever indicated.

4. Completing the form (step by step instructions)

I. HISTORY AND PHYSICAL

Items 1 through 9 refer to past medical history. Only a yes or no answer is needed-no dates required. You can obtain this information either from the patient or the chart. However, please be sure to answer each item. If the chart does not indicate either presence or absence of these, please ask the patient.

1. Hypertension
   -- known history

2. Diabetes Mellitus
   -- known history of either adult or juvenile onset, treated by any method

3. Current Smoker
   -- many patients will say that they don’t smoke, but further questioning will reveal that they smoked up until the day of their heart attack; these patients count as a current smoker

4. Previous MI
   -- history of any prior myocardial infarction, either Q wave or non Q wave, regardless of the circumstances under which it occurred
5. Previous Angina

-- history of angina (not just a few episodes of chest pain, but a diagnosis of angina with treatment)

6. Prior CABG

-- prior coronary artery bypass surgery

7. Prior PTCA

-- prior percutaneous transluminal coronary angioplasty

8. Prior stent

-- prior stent placement

9. Known CAD hx without event

-- history of coronary artery disease, but no event (i.e. no myocardial infarction, no CABG, no PTCA, no stent placement, no angina); this category includes patients who were diagnosed by stress test but who have never had a distinct cardiac event

10. Age

-- age in years at the time patient questionnaire completed

11. Sex: 1. Male _____ 2. Female _____

12. Race: 1. African American _____

2. American-Indian

3. Caucasian _____

3. Hispanic _____

4. Asian _____
5. Middle-Eastern Caucasian____

6. Non Middle-Eastern Caucasian____

7. Other____

-- You will note two unusual categories: Middle-Eastern Caucasian and Non Middle-Eastern Caucasian. These are for use by Australian patients who categorize themselves differently than Americans; if other is selected, please indicate what that is

13. Marital Status:  1. married ____

2. single ____

3. divorced ____

4. separated ____

5. widowed

6. co-habitat ____

-- patient marital status; co-habitat is listed primarily as an option for the Australian site where co-habitation is a legal status; however, American patients can feel free to choose this option

14. Yearly Income:  1. <$5,000 ____

2. $5,000-20,000 ____

3. $20,001-40,000 ____

4. $40,001-60,000 ____

5. >$60,000 ____
-- yearly household income before taxes (we realize that this will be an approximation for most people)

15. Years of Education:

-- number of years of education completed

16. Admission Blood Pressure:

-- first blood pressure noted on admission to the emergency department or other admitting department

17. Admission Pulse

-- first heart rate or pulse (in beats per minute) noted on admission to the emergency department or other admitting department

18. Admission Killip Class (I-IV):

I= no symptoms of heart failure

II= mild to moderate failure

III= pulmonary edema

IV= Cardiogenic shock

-- Killip classification on admission; Killip classification is a method of classifying myocardial infarction severity based on degree of failure the patient manifests. This is an important item because it is a way to quantify the severity of patient’s presenting status. This item will require interpretation by you because few, if any, clinicians use this classification system in their charting. You designate the patient as Killip
class I, II, II, or IV based on the physician’s charted admission assessment of the patient.

-- As you can see, patients are rated on a scale from I to IV with higher numbers indicating more severe left ventricular dysfunction. If, on admission, your patient had no signs or symptoms of failure (i.e. no rales, no dyspnea, no CXR evidence of congestion, no JVD) then the Killip class would be a I; if the patient was in cardiogenic shock (i.e. hypotensive requiring vasopressors and/or IABP therapy) then the Killip class would be a IV. These are the easy ones to figure out. Killip class II and III are a little harder. A Killip class II patient is one who has signs and symptoms of mild to moderate failure (i.e. bibasilar rales, S₃, mild dyspnea). A class III is a patient in pulmonary edema (i.e. severe dyspnea, CXR evidence of severe pulmonary congestion, extensive rales).

Don’t spend too much time trying to figure this out. Just look at the admission assessment and go with your best judgment.

19. MI: 1. Q-wave____ 2. Non-Q-wave____

20. MI Location by ECG: (check all that apply)

1. anterior____
2. inferior____
3. posterior____
4. lateral____
5. apical____
6. other____
   -- from ECG

21. Peak CPK:
   -- the highest CPK seen; please be sure to indicate the units
   because different institutions use different units (e.g. IU/L or ng/ml)

22. Peak CK-MB:
   -- the highest CK-MB seen; please be sure to indicate the
   units because different institutions use different units (e.g. IU/L or ng/ml)

23. Pain onset
   -- as exactly as possible, please indicate the date and time
   the patient began having the chest pain that heralded the onset of their
   heart attack; patients may have some difficulty pinning this down, but if
   you help them remember what they were doing when their pain began they
   can often be pretty accurate (also family members can help with this if
   they are available)

23a Hospital arrival.
   -- as exactly as possible, please indicate the date and time
   that the patient arrived at the hospital

24. Mode of Hospital Arrival
   1. private car____
   2. ambulance____
   3. public transportation____
4. Other ___

-- how did the patient get to the hospital?; if other, please indicate what

25. Peak Level of Chest Pain:

Peak level felt during the MI on a 0 (no pain) to 10 (the worst pain ever felt) scale.

-- ask the patient on a scale of 0 to 10, how they would rate the worst chest pain that they felt during this heart attack

II. INITIAL TREATMENT

Items 26 through 33 refer to treatment given or decided on in the emergency department

26. Thrombolytics:

1. t-Pa

2. Streptokinase

-- did the patient receive a thrombolytic in the emergency department?

27. Beta Blockers:

-- did the patient receive a beta blocker in the emergency department?

28. Aspirin:

-- did the patient receive aspirin in the emergency department?
29. Heparin:
-- did the patient receive heparin in the emergency department?

30. Primary PTCA:
-- was PTCA decided on as the primary initial treatment for this patient?

31. Primary CABG:
-- was CABG decided on as the primary initial treatment for this patient?

32. Anxiolytic:
-- did the patient receive an anxiolytic (e.g. valium) in the emergency department?

33. Nitrates:
-- did the patient receive IV, PO, sublingual or topical nitrates in the emergency department?

III. MEDICATIONS AFTER ER, DURING HOSPITALIZATION

Items 34 through 43 refer to medications given after the emergency department (ER)

34. Beta Blocker:

35. Type

36. Dose/Frequency:
-- if taking beta blockers, indicate the name and dose/frequency (e.g. metoprolol 50mg BID); check yes or no after each item as appropriate
37. Lidocaine or any other antiarrhythmic:
   1. prophylactic
   2. in response to arrhythmia

38. Calcium Channel Blocker:

39. Digitalis:

40. Other Inotrope:

41. Nitrates:
   1. oral/topical
   2. IV

42. ACE Inhibitor:

43. Anxiolytic:
   1. PRN
   2. Routine

IV. PROCEDURES

Items 44 through 52 refer to procedures the patient may have undergone at any time during the hospitalization (including emergency department). Please indicate whether they had the procedure by checking yes or no and if yes, also indicate the date and time on the lines adjacent to the procedure. Items 53 and 54 ask about exact dates and times of discharge from the CCU and from the hospital.

44. Temporary Pacemaker:

45. Swan Ganz

46. Ventilator:
47. PTCA:
47a. Stent:
48. CABG:
49. IABP:
50. Cardioversion/Defibrillation:
51. Cardiac Cath:

LVEF _____ %

52. Echo:

LVEF _____ %

53. Discharge from CCU:

-- please indicate as exactly as possible, the date and time of discharge from the CCU

54. Hospital discharge:

-- please indicate as exactly as possible, the date and time of discharge from the hospital

V. COMPLICATIONS

On this page you will document all complications that the patient has. This includes complications that occurred before and after they complete the patient questionnaire. These need to be timed as precisely as possible. Please be sure to use military time.

A patient can, of course, suffer a given complication more than once. Indicate the complications in the third column from the left (labeled actual events). There is no need
to write out the complication, just use the code number of the event from the first column.
In the fourth column, put the date of the event and in the fifth column put the time as exactly as possible. Please be sure to use military time.

The definitions of events are given, when necessary, after each possible event in column two. The most common question about events that RAs have is about the definition of recurrent ischemia. By recurrent ischemia, we mean ischemia that reoccurs after a patient's initial presentation with pain that marked the onset of their heart attack. Recurrent ischemia is present when the patient complains of recurrent chest pain that was accompanied by ST segment deviations (either on bedside monitor or documented on 12-lead ECG) or alterations in hemodynamics (e.g. hypotension and/or tachycardia and/or bradycardia). Sometimes patients have recurrent chest pain that requires treatment with nitrates and/or morphine, but ST segment deviations are not documented because the hospital doesn't have bedside ischemia monitoring or an ECG was not done, and the patient has no hemodynamic changes. This still counts as an episode of recurrent ischemia.
American Heart Association Heart Disease and Stroke Update. (2004). Dallas, Texas

American Heart Association Heart Disease and Stroke Update. (2010). Dallas, Texas


McKinley et al. (2009). The effect of a short one-on-one nursing intervention on knowledge, attitudes and beliefs related to response to acute coronary syndrome in people with coronary heart disease: a randomized controlled trial. *International Journal of Nursing Studies, 46*(12), 1016-1026.


