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STEMI Gender Differences

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by

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Date	Date

Abstract

The purpose of this study was to look at gender differences in a ST elevation myocardial infarction (STEMI), in a population from a large tertiary hospital over one year and three months period to see if there were differences in female and male population. Looking at the time of onset of symptoms to time in seeking treatment and to see if this had an impact on morbidity, treatment modalities, and length of stay in the hospital. The time of onset of symptoms to time of treatment is important because of the time-dependent nature of reperfusion strategies. This can minimize myocardial damage and have a significant impact on mortality and morbidity. Since 1994, the mortality rate has remained higher for women than men. This may relate to the delays in seeking treatment for women.

In this research project the researcher found that there are statistically significant gender differences between men and women. This research has shown that women delay longer than men in seeking treatment for STEMI, their length of stay is longer, but the researcher found no significant differences in morbidity between men and women. This could have been because the population was small and the researcher did not show the differences in ages.

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CHAPTER I

Introduction

“Cardiovascular disease (CVD) is the leading cause of mortality for women in the United States and globally” (Mehta et al., 2016, p.1.). The time from onset of acute myocardial infarction (AMI) symptoms until hospital arrival is important because of the time-dependent nature of reperfusion therapies such as angioplasty and thrombolytic therapies. Timely reperfusion therapy for an AMI can minimize myocardial damage with positive effects on mortality and morbidity (Lesneski, 2010). Since 1984, the annual CVD mortality rate has remained greater for women than men. There have been significant sex differences in the pathophysiology, clinical presentation, and clinical outcomes of AMIs. This may relate to the delays in seeking treatment in women. Early recognition of symptoms and avoidance of delays in seeking treatment are key elements in preventing morbidity (Lesneski, 2010). Guidelines exist for the management of AMI, yet despite these, significant inequalities exist in the care of these patients. “The elderly, deprived socioeconomic groups, females, and non-Caucasians are the patient populations where practices tends to deviate from more frequently from the evidence base” (Rashid, Simms, Batin, Kurian, & Gale 2015, p. 895).

Significance

CVD remains the leading morbidity and mortality threat affecting millions of American women. Reasons for the increased AMI rates in women are multifactorial and are related to the prevalence of disease and the influence of age, race and ethnicity (Mehta et al., 2016). There has been a marked reduction in CVD mortality in women as a

result of an increase in awareness, more focus on women and heart disease, and the use of evidence-based treatments.

CVD afflicts 6.6 million US women annually. “Regardless of the age, within a year of a first AMI, more women than men will die (26% of women and 19% of men); within five years of a first AMI, more women than men will die (47% of women and 36% of men), have heart failure (HF), or suffer from a stroke “(Mehta et al., 2016, p.2). Compared with men, women have longer hospitalizations and higher in-hospital mortality, have more bleeding complications, and have up to 30% more readmissions within 30 days after the AMI (Mehta et al., 2016).

There are influences in age and racial/ethnic disparities with women and AMIs. Women are often older when they present with their first AMI, at an average age of 71.8 years compared with 65 years for men. The older age of onset of CVD in women compared with men is thought to be due to the protective role of circulating estrogens on the vascular endothelium (Mehta et al., 2016). This is resulting from the observation that the occurrence of AMI rises substantially in postmenopausal women but it is difficult to assess the effect of age from that of menopause. “Racially and ethnically diverse women with AMI have distinct experiences in terms of presentation, risk factor burden, evidence-based care, and long term outcomes (Mehta et al., 2016, p.3). The prevalence of MI is higher in black women than in all other racial and ethnic groups of women (Safford et al., 2012). Black women also have a higher incidence of sudden cardiac death (SCD) as the first manifestation of coronary heart disease (CHD) than white women and their survival rate after out-of-hospital-arrest is about one third that of whites (Chan et al., 2009).

The symptoms of a myocardial infarction may begin with mild pain or pressure in the chest, which could extend through the shoulders, arms, back, teeth, and jaw. Other symptoms may include light-headedness, shortness of breath, nausea and vomiting, fatigue and fainting. Shin, Martin, & Suls (2009) performed a meta-analysis of symptom presentations and found a magnitude of gender difference associated with ACS symptoms. The symptoms may vary and may be similar to symptoms of other diseases. Therefore, they may wait too long before calling 911 or going to the hospital.
Even individuals who are aware that there are experiencing an AMI may delay seeking care due to a number of reasons including fear, concerns about cost, self-treatment with medication, distrust of the health-care system, consulting with family members, and embarrassment about calling emergency medical services if the condition turned out not to be a myocardial infarction (Fang, 2011). Timely treatment is the key factor to reduce mortality from an AMI.

Present therapeutic strategies fall into three major categories: (a) reperfusion (or artery opening) therapies to reestablish blood flow with either thrombolytics or direct angioplasty; (b) conjunctive therapy with aspirin and/or heparin to maximize the reperfusion and prevent reocclusion; and (c) adjunctive therapies to minimize the negative effects of the heart attack with medications such as beta blockers and angiotensin converting enzyme inhibitors (Crumlish & Hand, 1999). The shorter the time period between symptom onset and reperfusion treatment the better the resulting cardiac function due to preservation of heart muscle.

A number of studies have shown that women present later to treatment for AMI than men. Delays in seeking medical care for symptoms plausibly contribute to poorer outcomes for women. Delay in seeking treatment for AMI is often due to lack of awareness of risk, passivity, inaccurate system attribution, and barriers to self-care. Gender differences in experiencing an MI as a result of coronary artery disease are significant, not only with regards to mortality and morbidity, but also in the presentation, diagnosis, course, and treatment of coronary artery disease (Higginson, 2008). Additional factors associated with increased delay in seeking treatment for AMI include older age, female sex, black or Hispanic race, and lower education and socioeconomic levels (Mehta et al., 2016).

Purpose

The purpose of this thesis was to compare women to men in the effect of time to treatment for an acute myocardial infarction and how they compare to length of stay, mortality, and treatment modalities. There is a need to educate women on the risks of delaying seeking treatment. Clinical practice approaches that focus on the unique aspects of cardiovascular care for women are needed to provide necessary resources for the prevention, diagnosis, and treatment of cardiovascular treatment in women (Garcia et al., 2016)

Theoretical Framework

The theoretical framework used to guide the thesis is Leventhal Self-Regulatory Model (SRM) of illness behavior. This model proposes that both internal and environmental stimuli influence the behavior of an individual when faced with a health threat. Internal characteristics include age, gender, ethnicity, and environmental stimuli

include the influence of significant others. The framework suggests that cognitive and emotional systems make independent contributions to health and illness behavior. It outlines three stages of behavior at the time of a health threat (such as having an AMI). The first stage relates to an individual's knowledge, attitudes, and beliefs regarding the threat which can impact on levels of anxiety and whether a symptom is judged to be serious or not. The second stage refers to how the individual responds by formulating an action plan to cope with the symptoms. The final stage describes the evaluation of any action taken by an individual and may include input form significant others (Baxter & Allmark, 2013). The concepts used in this thesis are acute myocardial infarction, time to treatment, and effects of length of stay, treatment modalities, and morbidity. (See Figure 1)

CTE Diagram

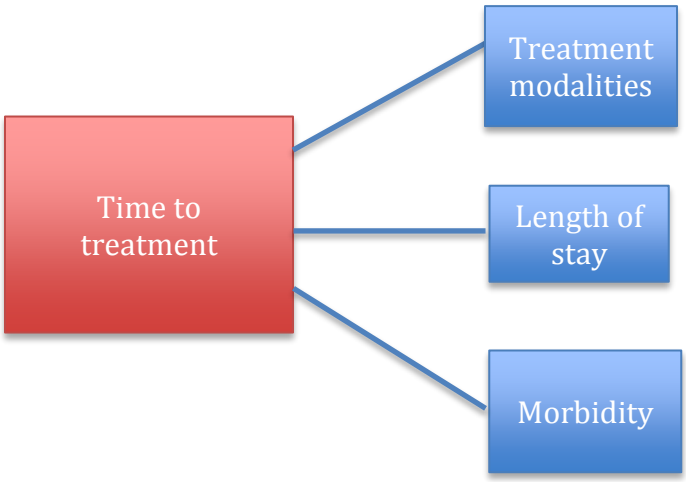

Figure 1. CTE Diagram

Thesis Question

In female AMIs, what is the effect of time to treatment as compared to male AMIs on length of stay, treatment modalities, and morbidity?

Definition of Terms

- Time to treatment is the allotted time from the onset of symptoms in AMI to the time of first medical treatment.
- First Medical Treatment is the place where the first medical treatment began, either EMS or hospital emergency room.
- Length of Stay is the time spent in the hospital.
- STEMI is an acronym for ST elevation myocardial infarction.
- PCI is an acronym for percutaneous coronary intervention.
- Morbidity is a term used to describe a focus on death.
- Treatment modalities is a therapeutic method or agent used, such as PCI, CABG, or Thrombolytic therapy that involves the physical treatment of a disorder.

Summary

There is a significant sex differences in presentation, treatments, and outcomes of AMIs. Women continue to have higher morbidity, delays in seeking treatment, and worse outcomes after AMIs. Clinical practice approaches that focus on women are needed to improve these outcomes. There is also a need to educate women on the risks of delaying seeking treatment.

CHAPTER II

Literature Review

A current review of the literature was obtained by using the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Medline. The purpose of this review is to explore in female AMIs what are the effects of time to treatment as compared to male AMIs on length of stay, treatment modalities, and morbidity. Specific attention was directed in the gender differences with AMIs. The areas that were explored were gender differences in AMIs, AMI in women, morbidity, and patient delays in seeking treatment.

Patient Delays in Seeking Treatment for AMI

A large body of research was found regarding patient delays in seeking treatment for AMIs. A descriptive comparative study was conducted by Lesneski (2010) to examine factors associated with individuals delaying treatment after experiencing symptoms of an AMI. In the multiple regression analysis, the following were predictors of long treatment delays in arrival to the emergency department after cardiac symptom onset: being home, having more ability to control symptoms, and being in a public place. Predictors of short treatment delay were thinking that symptoms were heart related, calling 911, having a high pain scale, and telling someone else about the symptoms.

A qualitative study was conducted by Rosenfeld, Lindauer, and Darney (2005) to describe the period between the onset of symptoms of myocardial infarction and the enactment of the decision to seek care (decision time) and to identify common patterns of cognitive, effective, and behavioral responses to the symptoms. In the study 52 women were asked in semi structured interviews to describe the symptoms and related thoughts,

decisions, and actions from the onset of symptoms of myocardial infarction to arrival at the hospital. Narrative analysis was used to examine the stories and to identify patterns of decision-making behavior. Six common patterns of behavior during the decision time were identified: knowing and going, knowing and letting someone take over, knowing and going on the patient's own terms, knowing and waiting, managing an alternative hypothesis and minimizing. The patterns were further grouped as knowing or managing. Women in the two groups (knowing and managing) differed primarily in their awareness and interpretations of the symptoms and in their patterns of behavior in seeking treatment. Women's delay in seeking treatment for symptoms of myocardial infarction can be categorized into distinct patterns.

A prospective study conducted by Chughtai et al. (2011) was performed to assess the impact of pre-hospital time on the patient's outcome. The study included 60 patients from a city community hospital with ST-elevation myocardial infarction. Starting from the symptom onset, "total time to treatment" was divided into less than or equal to 120 minutes ("pre-hospital time" of < or > 30 minutes prospectively). Adverse patient outcomes were compared in the two subgroups. Their patients had a mean age of 63 years. On the scene time (17.8 minutes) was the biggest fraction of "pre-hospital time". Comparing the groups with "total time to treatment" of >120 minutes vs. 120 minutes ("pre-hospital time" of >30 minutes vs. <30 minutes), mortalities were 4 vs. 0 and transfers to tertiary care facility was 3 vs. 1. Most of the pre-hospital time in STEMI was spent on the scene and they suggested "total time to treatment" as a core measure instead of "door-to-balloon time".

A descriptive study was conducted by Banks and Dracup (2006) to determine factors associated with prolonged delay and the extent to which perceived racism influences prehospital delay in African Americans with acute myocardial infarction. Sixty-one African Americans with acute myocardial infarction were interviewed within one month of hospital admission. Delay times were calculated on the basis of the interviews. The results showed a media delay of 4.25 hours and did not differ significantly between women and men (4.42 vs. 3.50 hours). Most patients (69%) experienced their initial signs and symptoms at home, often witnessed by a family member or friend (70%). Delay was longer for insured patients than for uninsured patients (4.45 vs. 0.50 hours). Single, widowed, or divorced patients had longer delay times than did married patients (5.33 vs. 2.50 hours), and patients with diabetes delayed longer than those without diabetes (7.29 vs. 3.50 hours). Perceived racism did not differ significantly between patients who delayed seeking treatment and those who did not.

A retrospective study was conducted by McGinn et al. (2005) to identify trends in prehospital delay times and the use of the emergency medical service. The time from symptom onset to arrival at hospital and emergency medical service use were abstracted from medical records of 18,928 patients hospitalized for AMI and captured in the community surveillance component of the ARIC study from 1987 to 2000. A cut point of four hours was used to assess clinically relevant delay time recommendations for treatment with current therapies. In 2000, the overall proportion of persons with delays from symptom onset to hospital arrival of > 4 hours was 49.5%. Blacks and women consistently delayed longer than whites and men. Between 1987 and 2000 there were no statistically significant changes in the proportion of patients delaying > 4 hours (relative

change +0.6% in men, -7.4% in women, -2.3% in whites, -8.9% in blacks, -7.9% in persons with diabetes, and -0.8% in persons without diabetes); however there is a noticeable narrowing of gaps between sex, race, and diabetes status over the study period. The percentage of those who used emergency medical services increased significantly over the study period (187 37.1%, 2000 44.5%, p.0001).

A retrospective study was conducted by Brkovic, Novak, and Puljak (2015) that analyzed the most recent trends in myocardial infarction (MI) care, the number of patients treated for MI and their outcomes, cardiovascular risks factors, and pain to hospital times in MI patients. For 778 patients treated for acute MI at the Coronary Care Unit (CCU) of University Hospital split, Croatia the following data were acquired: outcomes during hospitalization (survived, deceased), cardiovascular risk factors, (hypertension, diabetes, dyslipidemia, previous MI, smoking), and pain-to-CCU time.

They found that among 778 patients treated for acute MI, there were 291 (37%) women and 487 (63%) men. Forty-five patients (6%) died during hospitalization, mostly due to cardiogenic shock. An association was found between early intrahospital mortality and the following risk factors: age >70 years, female sex, previous MI, and smoking. Median pain to call time was two hours, and median time from the onset of pain to arrival into the CCU was four hours. There were 59 (7.6%) patients admitted to the CCU within recommended 90 minutes. Diabetic comorbidities were not associated with early death or with longer times from pain to emergency call.

A retrospective analysis study was conducted by Diercks et al0 (2010) to determine if the increased emphasis on raising the awareness of the signs and symptoms of acute coronary syndrome (ACS) has translated into a decreased time of symptom onset

to hospital presentation in women having non-ST segment MI (NSTEMI) who were included in two large national ACS registries. The study population comprised patients who presented with non-ST segment elevation myocardial infarction in the *C*an *R*apid Risk Stratification of *U*nstable Angina Patients Suppress *Ad*verse *O*utcomes with *E*arly Implementation of the American College of Cardiology/American Heart Association Guidelines and the National Cardiovascular Data Registry Acute Coronary Treatment and Intervention Outcomes Network-Get with the Guidelines registry. Analysis was done based on the introduction of the educational intervention: pre-intervention 2002-2003, intermediate 2004-2005, and post 2006-2007. Of the 125,262 patients, 50,162 (40.1%) were women. The median time from symptom onset to presentation was significantly longer in women than men: three hours versus 2.8 hours, a difference that remained significant after adjusting for clinical characteristics. There was no measureable reduction in the time from symptom onset to presentation over the period of the awareness campaign: post versus pre-intervention period. After adjustments for covariates, women aged 40 to 60 years had a 3.46% longer time to presentation than men. There was no reduction in time from symptom onset to hospital presentation for myocardial infarction patients since national awareness campaigns were initiated, and a significant gender gap remains.

A cross-sectional questionnaire study was conducted by Lovlien, Schei, and Hole (2008) to explore gender differences in psychosocial aspects in the year prior to first-time myocardial infarction, and the association between these aspects and pre-hospital delay. In the study, patients diagnosed with first-time myocardial infarction were recruited from five Norwegian hospitals over a 13-month period in 2003-2004. Of 738 eligible patients,

149 women and 384 men completed a self-administered questionnaire (response rate 72%). They found that depression, high family stress, high work stress and major life events had no statistically significant impact on patient delay or total pre-hospital delay. Depression, sleep disturbances, and high family stress were reported among more women than men in the year prior to the event. Women and men aged 65 years and younger were more likely to report major depression and major life events than those older than 65. Low education and low partner education predicted prolonged patient delay in men but not in women. Low partner education also predicted prolonged total pre-hospital delay in men.

A qualitative study conducted by Higginson (2008) explored the female experience of MI, focusing on some of the thought processes and coping strategies used by women when having an MI. Using a grounded theory approach, 25 post MI female patients were interviewed about their experiences during an acute MI. Through analyzing and coding data, a number of categories emerged that provide insight into the heath seeking behaviors of women at the onset of an MI. Emergent categories were: a delay in seeking help (main category), an engendered perception of heart disease sub-category), not recognizing symptoms (sub-category), maintaining control through self-medication (sub-category). Analysis of the data suggests that when experiencing an MI, women delay seeking help for a number of reasons, including not recognizing symptoms, perceiving heart disease as a “male” problem and preferring to self-medicate.

A prospective study was conducted by Chen et al. (2015) to assess whether gender difference in health insurance help explain gender differences in delay in seeking care for the patients in the US, with acute myocardial infarction (AMI). They also

assessed gender differences in such prehospital delay for AMI in Spain, a country with universal insurance. They used data from 2,951 US and 496 Spanish patients age 18 to 55 with AMI. US patients were grouped by insurance status: adequately insured, underinsured, or uninsured. For each country, they assessed the association between gender and prehospital delay (symptom onset to arrival). For the US cohort they modeled the relation between insurance groups and delay of >12 hours. US women were less likely than men to be uninsured but more likely to be underinsured, and a larger proportion of women than men experienced delays of >12 hours (38% vs. 29%). They found no association between insurance status and delays of >12 hours in men or women. Only 17.3% of Spanish patients had delays of >12 hours, and there were no significant gender differences. Women were more likely than men to delay, although it was not explained by differences in insurance status. The lack of gender differences in prehospital delays in Spain suggests that these differences may vary by health care system and culture.

A retrospective cohort study was conducted by Balsa et al. (2015) to assess the impact of gender on the access to reperfusion therapy in patients with acute coronary syndrome with ST-segment elevation (STEMI), and to analyze the effect of delay on the differences with regards to hospital mortality. A total of 4,816 patients were included (22.09% women). Women were older, presented with longer patient delay (90 vs. 75 minutes), higher risk profile, and received less reperfusion therapy with longer reperfusion therapy (307 vs. 240 minutes). Women received less thrombolysis (24% vs. 29%) and longer door to needle time (85 vs. 70 minutes). They found no differences regarding primary percutaneous coronary intervention or door-to-balloon time. Women

also had higher hospital mortality, which persisted after controlling the effect of patient delay, age, risk, and reperfusion. Compared with men, women with STEMI have worse access to reperfusion and higher hospital mortality. The impact of the differences in accessibility on mortality gap remains uncertain.

Gender Differences in AMI

A prospective registry study was conducted by Pilgrim et al (2015). They investigated patients included into the Acute Myocardial Infarction in Switzerland (AMIS) registry presenting to one of 11 centers in Switzerland providing primary PCI around the clock, and stratified patients according to gender and age. A total of 4,723 patients presented with AMI between 2005 and 2010; 1,319 (28%) were women and 2,172 (54%) were > 65 years of age. More than 90% of patients < 65 years of age underwent primary PCI without differences between genders. Elderly patients and particularly women were at increased risk of being withheld PCI as compared to males <65 years of age. An increased risk of delay in door-to-balloon time .90 minutes was found in elderly males and females, as well as females <65 years as compared to males < 65 years of age, with significance differences in circadian patterns during on and off duty hours. They observed discrimination of elderly patients and females in the circadian provision of primary PCI.

Gillis, Arslanian-Engoren, and Struble (2014) conducted a systematic review of literature to synthesize the published literature (2000-2012) to examine the initial ED presentation of older adults with confirmed acute coronary syndrome (ACS), identify knowledge gaps, determine whether gender differences exist in the presentation of ACS, and describe recommendations for practice and research. The review suggested that the

older adults with ACS report chest pain more commonly when arriving to the emergency department. Older adults have higher in-hospital mortality rates than adults aged younger than 65 years. However, older adults reporting an absence of chest pain on arrival are twice as likely to die compared with older adults with chest pain. With regards to gender differences, they noted that men are more likely to present with chest pain whereas women are more likely to present with nausea. Women have higher in-hospital mortality both with and without chest pain presentation. Delay in time to arrival, as well as delay to primary percutaneous intervention, is reported for older adults with and without chest pain.

A retrospective cohort study was conducted by Leifheit-Limson et al. (2015) called the VIRGO Study, to compare cardiac risk factor prevalence, risk perceptions, and health care provider feedback on heart disease and risk modifications between young women and men hospitalized with AMI. They studied 3,501 patients age 18-55 years enrolled in the VIRGO (Variation in recovery: Role of Gender on Outcomes of Young AMI Patients) study in the US and Spanish hospitals between August 2008 and January 2012, comparing the prevalence of five cardiac risk factors by sex. Modified Poisson regression was used to assess sex differences in self-perceived heart disease risk and self-reported provider discussions of risk and modification. Nearly all patients (98%) had >1 risk factor, and 64% had >3. Only 53% of patients considered themselves at risk for heart disease, and even fewer reported being told they were at risk (46%) or that their health care provider had discussed heart disease and risk modification (49%). Women were less likely than men to be told they were at risk or to have a provider discuss risk modifications. There was no difference between women and men for self-perceived risk.

They found that despite having significant cardiac risk factors, only one-half of young AMI patients believed they were at risk for heart disease before their event. Even fewer discussed their risks or risk modification with their health care providers; this issue was more pronounced among women.

A meta-analysis was conducted by Shin et al. (2009) to assess the magnitude and direction of associations among gender and acute coronary syndrome (ACS) symptom presentations, and to evaluate the potential role of the type of symptom measurement strategy. They performed a systematic review of articles and dissertations from between 1966 and 2207. Effect sizes were calculated and meta-analyzed, using random affect models. They found gender differences of moderate or larger magnitude were evident, and women were more likely than men to report back pain, palpitations, nausea/vomiting, and loss of appetite. For most symptoms, the magnitude of effects did not vary across different symptom-assessment strategies. Their conclusions demonstrated substantive effects in the magnitude of gender differences in ACS symptoms that were consistent, irrespective of measurement approach.

Mortality

A retrospective analysis conducted by Zang et al. (2015) assessed gender differences in in-hospital mortality according to age in 91,088 patients (35,899 with STEMI, 55,189 with NSTEMI) who were 18 to 89 years old and had acute MI as their primary diagnosis. Patients with STEMI had significantly higher in-hospital mortality than those with NSTEMI. Compared to men women were older, had higher co-morbidity scores, and were less likely to undergo revascularization during hospitalization in the STEMI and NSTEMI population. In patients with NSTEMI the difference between

younger women and younger men was not statistically significant; however, older women (>70 years old) had better survival than men. In conclusion, higher risk of in-hospital mortality in younger women compared to younger men is more evident in patients with STEMI.

A prospective study was conducted by Bufe et al. (2010) to investigate if women treated predominately with percutaneous intervention (PCI) in myocardial infarction after seven years had the same prognosis as men. Between 1999 and 2001, 500 consecutive patients at the Wuppertal Heart Centre were treated with PCI after acute STEMI. A long-term follow-up (up to seven years) was achieved in 97% of the patients. In comparison to men, women were seven years older (65 vs. 58) and had significantly more diabetes mellitus. The time between onset of symptoms and interventions tended to be longer in women than men. There was no difference in 30 day mortality (8.9% vs. 6.6%), cardiac late mortality (3.6% vs. 3.2%), and long term cardiac overall mortality up to seven years (12.1% vs. 9.6%). Stepwise regression analysis did not identify female gender as an independent predictor of late mortality. The quality of life was comparable. In conclusion, there is no gender related difference in the long-term outcome if patients were systemically treated with PCI in STEMI. PCI in STEMI has a long lasting positive effect in women, and should be the treatment of choice for women with acute myocardial infarction.

A population based retrospective cohort study was conducted by Izadnegahdar et al. (2014) to provide a sex and age–specific, population-based analysis of ten year trends in AMI, hospitalization rates, with a particular focus on younger adults, and to determine whether in recent years there is any evidence of excess mortality risk in younger women

compared with younger men, after AMI hospitalization. They assessed trends and sex differences in AMI hospitalization and 30-day mortality rates using negative binominal and logistic regression. From 2000 to 2010 there were 70, 628 AMI hospitalizations in adults >20 years, in British Columbia, Canada, with 17% of cohort being <55 years of age. Overall, age-standardization AMI rates declined similarly in men and women. However, these trends differed accordingly to age with increased rates observed only in younger women. The 30-day mortality rates declined similarly for women and men. Yet, younger women continued to have excess mortality risk, compared with younger men, even in the most recent period. In conclusion while the overall AMI hospitalization and 30-day mortality rates significantly declined in women and men, hospitalization rates in women <55 years increased and their excess risk of 30-day mortality persisted.

In a retrospective cohort study Khera et al. (2015) sought to determine the temporal trends and sex differences in revascularization and in-hospital outcomes of younger patients with STEMI. They used the 2004 to 2011 Nationwide Inpatient Sample databases to identify all patients age 18 to 59 years hospitalized with STEMI. Temporal trends and sex differences in revascularization strategies, in-hospital mortality, and length-of-stay were analyzed. From 2004 to 2011, of 1,363,492 younger adults (age <60 years) with acute myocardial infarction, 632,930 (46.4%) had STEMI. Younger women with acute myocardial infarction were less likely than men to present with STEMI. Younger women with STEMI were less likely to receive reperfusion therapy as compared to younger men. From 2004 to 2011, use of percutaneous intervention for STEMI increased both in women and men. In-hospital mortality was significantly higher in younger women compared to men (4.5% vs., 3.0%). There was an increasing trend in

risk-adjusted in-hospital mortality in both younger men and women during the study period. Length of stay decreased in both younger men and women. Younger women are less likely to receive revascularization for STEMI and have higher in-hospital mortality as compared to younger men. Use of percutaneous coronary intervention for STEMI and in-hospital mortality has increased, whereas length of stay has decreased in both sexes over the past several years.

Treatment

A prospective study was conducted by Ferraz-Torres, Brlzunegui-Otano, Marin-Ferandez, Matinez-Garcia, & Ibanez-Beroiz (2015) to analyze the differences in the treatment and evolution of acute coronary syndromes according to the gender of the patient and to determine the likely causes of those differences. This study was conducted on 56 patients treated in the hospital emergency service of the Hospital Complex of Navarra, Spain from 1 January 2012 to April 2013 with acute coronary syndromes. A bivariate and logistic analysis was made by adjusting the age and severity of process to know the differences by gender. A total of 71.8% (n=428) were men, and the remaining 28.2 5 (n=168) were women. The mean age of men was 66 years, and the mean age for women was 72. They found that antiplatelet drugs, blockers, ACE inhibitors, fibrinolysis and primary angioplasty were less frequently administered to women compared to men. They observed an additional delay in the demands for health care in women with acute coronary syndromes compared with men. They found there is an association between treatment differences in gender. The delay in the request for health care in women was observed to be the largest correlating factor, in addition to voluntary discharge in women affected by acute coronary syndrome.

A prospective analysis was conducted by Moriel et al. (2008) to assess gender aspects of contemporary treatment and adherence to ACC/AHA Class I Treatment Guidelines in patients with acute coronary syndrome (ACS). They studied 2,024 consecutive patients (519 women, 26%); 1026 (51%) with ST-elevation (STEMI) and 998 (49%) patients with NSTEMI, during a nationwide ACS-survey, conducted during two months in 2004. Women were older than men, and had worse cardiovascular risk profiles. At discharge, fewer women received ACE-inhibitors/ARBs. Among NSTEMI patients, fewer women received IIb/IIIa-inhibitors and clopidogrel at discharge. No gender differences were noted in utilization of aspirin, beta-blockers or statins. Age-adjusted and covariate adjusted mortality rates were comparable in women and men with STEMI (at seven-days 4.3% vs. 4.1%, and at one-year 13.8% vs. 9.8%; in women and men with NSTEMI (at seven-days 1.3% vs. 2.1% and one-year 12% vs. 11.3%). In 2004, adherence to ACC/AHA Class I Treatment Guidelines in ASC patients was satisfactory. Relative underutilization of acute perfusion was noted among STEMI patients, without gender differences after age-adjustment. At discharge, fewer women received ACE-inhibitors/ARBs. Among NSTEMI patients, less women than men received IIb/IIIa-inhibitors, and clopidogrel at discharge.

Theoretical Framework

A conventional systematic review of published evidence was conducted by Baxter and Allmark (2013) to investigate the theoretical frameworks underpinning studies exploring the issue of why people having a heart attack delay seeking professional medical help. The study used standard review methods to identify papers meeting this inclusion criterion, and carried out a synthesis of data related to theoretical underpinning.

Thirty-six papers from the 53 in the original systematic review referred to a particular theoretical perspective, or contained data, which related to theoretical assumptions. The most frequently mentioned theory was the self-regulatory model of illness behavior. Papers reported the potential significance of aspects of this model including different coping mechanisms, strategies of denial, and varying models of treatment seeking. Studies also drew attention to the potential role of belief systems, applied elements of attachment theory, and referred to models of maintaining integrity, ways of knowing, and the influence of gender.

An analysis of a focus group discussion conducted by Nymark, Mattiason, Henriksson, and Kiessling (2009), describes the care-seeking process for interpretation of an initial symptom to the decision to seek medical care in patients with an acute myocardial infarction. A focus group discussion with patients who had had a recent acute myocardial infarction was analyzed and the self-regulatory model of illness behavior inspired the transcribed text. Patients with acute myocardial infarction describe problems to identify the exact time of onset of often-vague symptoms. Their experiences of symptoms did not meet their expectations. These patients exhibit self-regulatory illness behavior that seems to cause a considerable delay in care seeking. They found indications of a pertinent shift in appraisal and coping-strategy when a patient changes from self-regulative illness behavior to seeking care-the turning point. This shift seems to be affected by several partly contradictory influences and it takes a considerable time for a person to reach this stage. All aspects of the patients' self-regulative illness behavior have to be considered if we want patients to seek medical care more rapidly.

A qualitative study conducted by Dullaghan et al. (2013) explored and compared patients' illness perception and motivation for behavioral changes following myocardial infarction treated by different methods. Semi-structured interviews (n=15) based on the common sense model of self-regulation, were conducted with three groups of MI patients within four weeks of diagnosis; (a) primary percutaneous coronary intervention (PPCI) (n=5); (b) thrombolysis (n=5); (c) non-ST elevation MI (NSTEMI) (n=5). Framework analysis was used to identify and compare themes between groups. The patients presenting with a ST-elevation MI (STEMI) receiving either PPCI or thrombolysis had similar perceptions of their illness as a serious, life-threatening event and were determined to make lifestyle changes. In contract, patients with a NSTEMI experienced uncertainty about symptoms and diagnosis, causing misconceptions about the severity of their condition and less determination for lifestyle changes. Patients with NSTEMI in this study expressed very different perceptions of their illness compared to those with STEMI. Patients' clinical presentation and treatment experience during an AMI can impact their illness perception, motivation for behavioral change and uptake of cardiac rehabilitation.

Summary

The review of the literature showed that there are a large amount of studies that show there are gender differences in the effects of delaying treatment in acute myocardial infarction. The literature showed that women have higher mortality than men in regards to acute myocardial infarction, especially in younger women. The literature also showed that there are treatment differences in women compared to men. Studies showed that there continues to be a gender gap in regards to acute myocardial infarction.

CHAPTER III

Methodology

Female acute myocardial infarctions (AMIs) are the leading cause of death for females. The time to onset of symptoms to treatment is important in the effects of mortality, treatment, and length of stay. The purpose of this thesis is to compare women to men in the effects of time to treatment.

Study Design

This is a retrospective quantitative study that looks at data collected from a data collection tool for acute myocardial infarctions (AMI) that was put in a database in a large tertiary care center that treats AMIs. The differences in male and female data will be observed over a one year and three months' time frame.

Setting and Sample

The setting for the study is a large tertiary care center that treats AMIs. The sample includes STEMI patients from a 1,000 bed hospital and rural counties in the surrounding area that sends patients to this hospital. The hospital accepts STEMI patients regardless of bed status from several surrounding counties. Participant information was obtained from a data base registry of STEMI patients from that hospital and those received from the outlying region. The criteria used for collecting data, was any patient that presented to that hospital having an AMI or STEMI.

Design for Data Collection

The research design consists of a team of data collectors that are trained to extract data from the patient's medical record that are placed into a nationwide registry. There

are no patient identifiers except medical record. No informed consent was obtained since this is a retrospective study.

Measurement Methods

The data collection tool used is the NCDR ACTION Registry-GWTG tool that collects detailed in-hospital clinical, process-of-care and outcomes data for patients admitted with acute myocardial infarction (AMI) in the USA. Approximately 350 fields encompassing patient demographics, medical history and risk factors, hospital presentation, initial cardiac status, medications and associated doses, reperfusion strategies, procedures, laboratory values, and outcomes (Peterson et al, 2010). Main outcomes measures include American College of Cardiology/ American Heart association myocardial infarction performance indicators, as well as in-hospital patient outcomes.

Data Collection Procedures

The data elements that are central to the ACTION Registry-GWTG include the ACC/AHA performance measures and Class I recommendations of the ACC/AHA clinical practice guidelines. Other data elements include patient demographics, presenting features, pre, acute, and discharge medications, and timing of care delivery, laboratory tests, procedures used, and in hospital patient outcomes. Data are limited to only the in hospital admission (Peterson et al, 2010). Trained data collectors that specifically collect data for the hospital collect the data. The data is collected from patients with a primary diagnosis of ST-segment elevation myocardial infarction (STEMI) or non-ST-segment elevation myocardial infarction (NSTEMI) is eligible for enrollment into the database. These patients must have: (1) ischemic symptoms at rest, lasting 10 minutes or more,

occurring within 24 hours before admission or up to 72 hours for STEMI; and (2) EKG changes associated with STEMI (new left-bundle branch block or persistent ST-segment elevation >1mm in two or more contiguous ECG leads; or (3) positive cardiac markers associated with STEMI within 24 hours after initial presentation. Therefore, only confirmed AMI are entered into the database.

Protection of Human Subjects

Prior to conducting the study, the researcher obtained permission from the University's Internal Review Board (IRB) as well as from the hospital that obtained the data. All subjects are anonymous at the level of analysis. There is no risk to the subjects. Consent was not necessary since no personal health information was obtained.

Data Analysis

Data was gathered from an excel spreadsheet that was provided to the researcher from the data collectors and placed in a statistical analysis program such as SPSS. The researcher looked at key outcomes of length of stay, and morbidity, secondary outcomes of PCI (percutaneous intervention), CABG (coronary artery bypass grafting), and Thrombolytic therapy. The predictor variables were delay in seeking care, sex, and diabetes.

CHAPTER IV

Results

Delay in seeking treatment in AMIs is important to the outcomes of length of stay, morbidity, and treatments. The purpose of this thesis was to compare women to men in the effects of delay in seeking treatment.

Sample Characteristics

The final sample size was 630 AMIs that presented to the hospital for treatment over one year and three months. The descriptive statistics were obtained for delay in seeking treatment in minutes, length of stay in days, age, gender, race, diabetes, morbidity, PCI, CABG, and thrombolytic therapy. Of the population (n=630), 436 (69.2%) were male, and 168 (26.7%) were female, 584 (92.7%) were of white race, 20 (3.2%) were non-white, and 157 (24.9%) were diabetic. In the population, 583 (92.5%) were alive at discharge, and 21 (3.3%) were deceased. The mean length of stay was 3.98 days. The mean time for symptom onset to treatment (delay in seeking treatment) was 244.06 minutes. Of the population regarding treatment modalities, 518 (82.2%) received a percutaneous coronary intervention (PCI), 39 (6.2%) received a CABG (coronary artery bypass grafting), and 31 (4.9%) received thrombolytic therapy.

Major Findings

The purpose of this thesis was to compare women to men in the effect of time to treatment for an acute myocardial infarction and how they compare to length of stay, mortality, and treatment modalities. In regards to delay in seeking treatment the difference between the mean for female (316.90 minutes) and the mean for male (215.56

minutes) is statistically significant at the 0.01 level. ($t = 3.56$, $p < 0.000$ two-tailed). (See Table 1 and Figures 2 and 3)

Table 1.

Delay in Seeking Treatment in Minutes

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Delay in Seeking Treatment in Minutes	Male	414	215.56	265.510	13.049
	Female	162	316.90	393.457	30.913

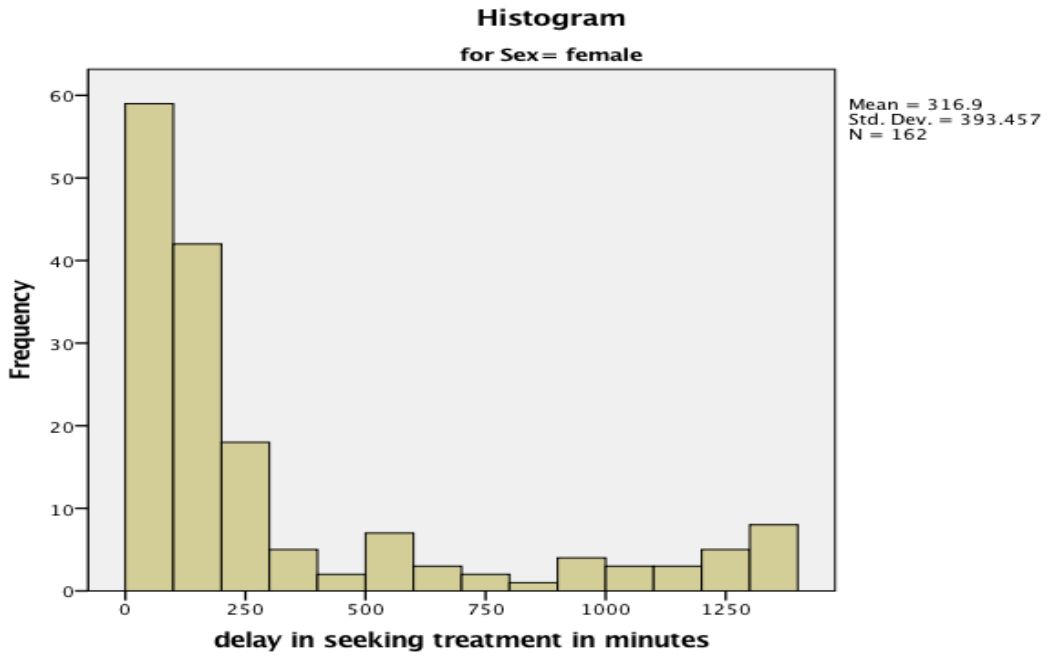

Figure 2. Delay in Seeking Treatment in Minutes Histogram for Females

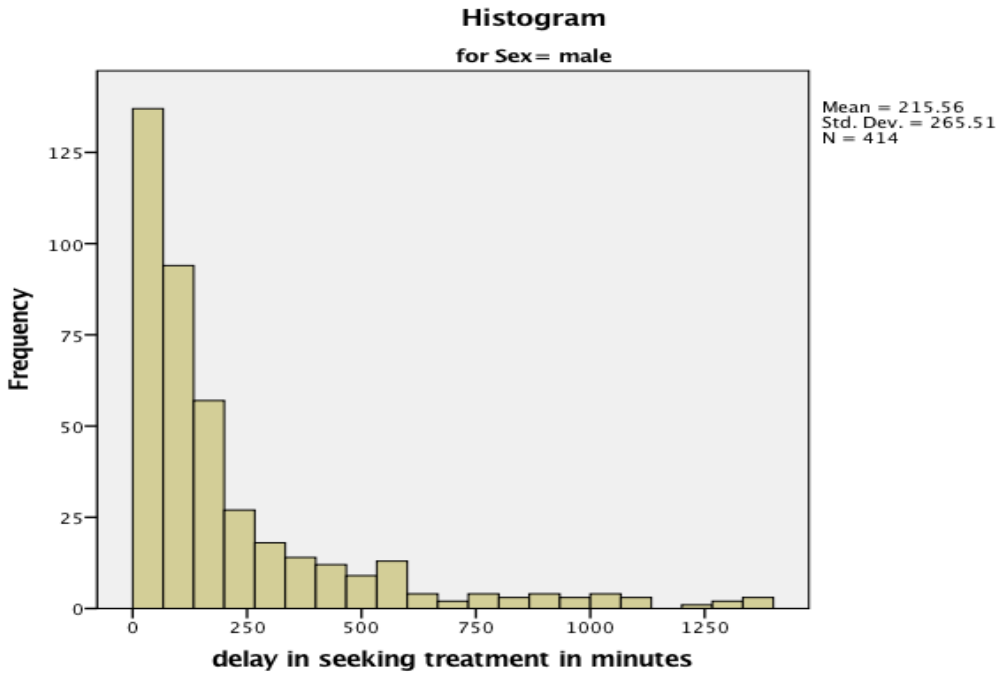

Figure 3. Delay in Seeking Treatment in Minutes Histogram for Males

In testing if delay in seeking treatment effects length of stay, we do not reject the hypothesis that delay in seeking treatment effects length of stay ($t = 0.143$, $p < .001$, two-tailed). When comparing male to female in length of stay there was no significant difference. ($t = -0.988$, $p < .323$, two-tailed). (See Table 2 and Figures 4 and 5)

Table 2

Length of Stay

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Length of Stay	Male	436	3.90	3.070	.147
	Female	168	4.18	3.136	.242

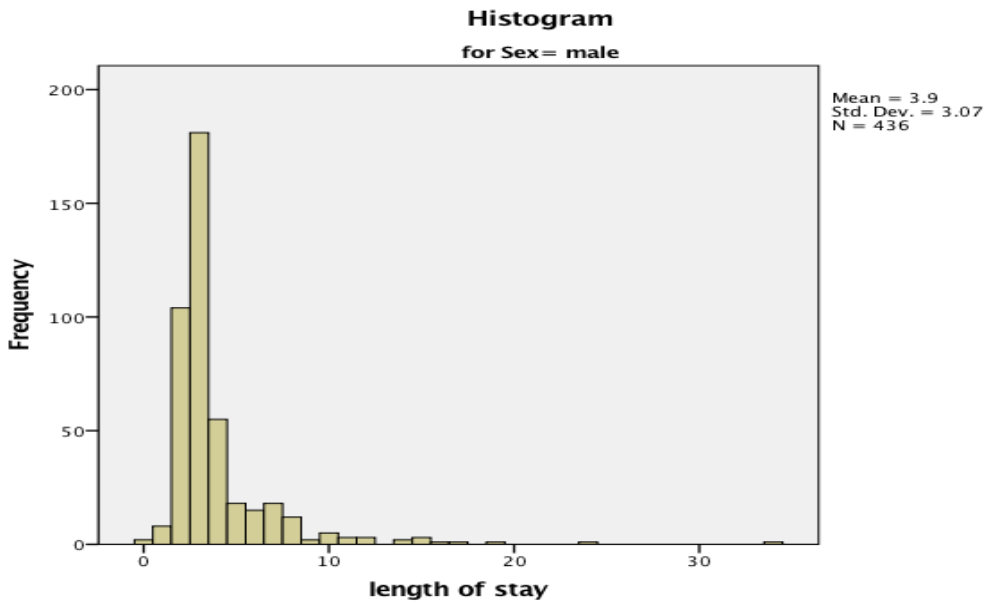

Figure 4. Length of Stay Histogram for Males

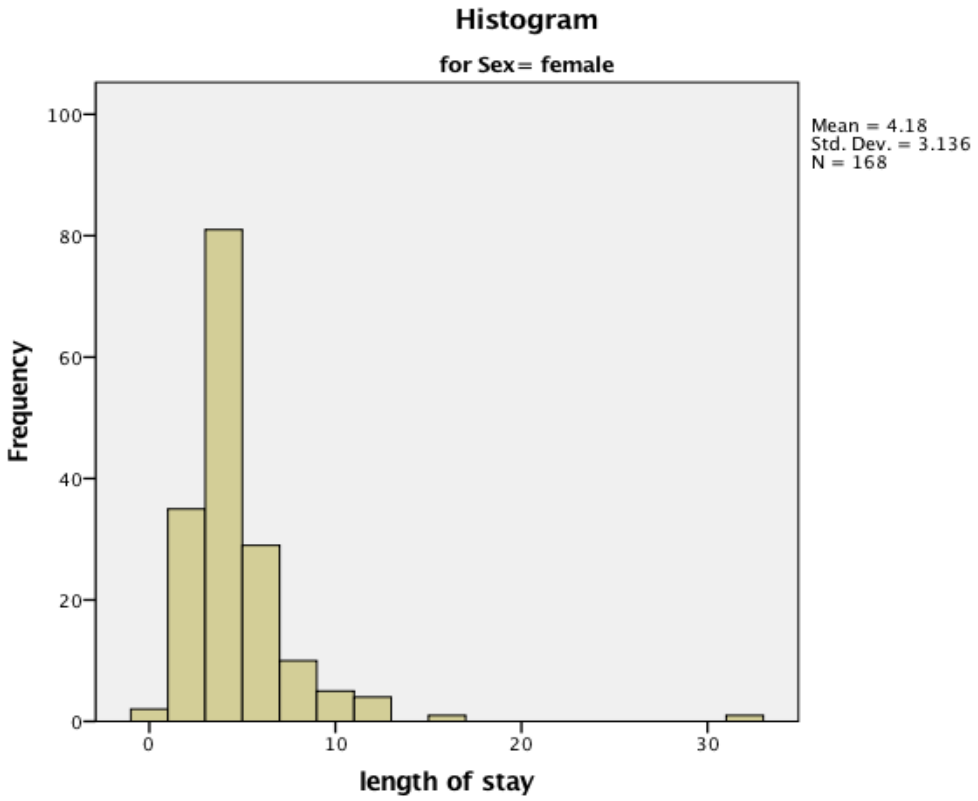

Figure 5. Length of Stay Histogram for Females

When comparing delay in seeking treatment and mortality there is a statistically significant difference in those that lived and those deceased ($t = -2.4$, $p < .014$, two-tailed). Looking at the difference in male and female and morbidity, a Chi-Square Test was performed with a p value < .117, so there was no statistically significant difference in male and female morbidity. (See Table 3)

Table 3

Delay in Seeking Treatment and Mortality

	Mortality	N	Mean	Std. Deviation	Std. Error Mean
Delay in Seeking Treatment in Minutes	Alive	557	238.21	303.937	12.878
	Deceased	19	415.74	427.733	98.129

In regards to treatment modalities, a linear regression was performed to examine the association of PCI, CABG, and thrombolytic therapy and the following set of predictor variables of delay in seeking treatment, sex, and diabetes. The research found that with PCI a R-Square of .024, and a statistically significant p value of 0.029. The odds ratio for delay in seeking treatment was 1.697. The research found with thrombolytic therapy there was a R Square of 0.034. Delay in seeking treatment had a statistically significant p value of 0.037 and an odds ratio of .443.

Summary

When comparing female to male AMIs there were some significant differences and there were some differences that were not significant. The research found that women significantly delay longer than men in seeking treatment with AMIs. This research found that it did effect some outcomes and morbidity.

CHAPTER V

Discussion

According to the research purpose, to compare delay in seeking treatment in women and men acute myocardial infarctions (AMI) and the effect it has on length of stay, morbidity, and treatment modalities, the statistical data revealed that there were some significant differences in women delaying longer than men, delaying in seeking treatment does effect length of stay, and delay in seeking treatment does effect the morbidity. There was no significant data to suggest that women have a higher morbidity than women in this population.

Implications of Findings

The literature showed that delay in seeking treatment can affect the outcomes in AMIs. The results found in this research showed that it effected outcomes except for the morbidity in women. The literature showed in younger women morbidity was higher. This research did not specify age differences. There are gender differences in AMIs that need to be addressed with education in the communities to increase awareness in women. Delay in seeking treatment has detrimental outcomes to those having an AMI.

Applications to Theoretical Framework

The theoretical framework for this study was Leventhal Self-Regulatory Model (SRM) of illness behavior. This model proposes that both internal and environmental stimuli influence the behavior of an individual when faced with a health threat. Internal characteristics include age, gender, ethnicity and environmental stimuli include the influence of significant others. The researcher found that the study showed that the

theoretical framework supported the theory. The delay in seeking treatment for an AMI is supported by this theory.

Limitations

The limitations of this study include the time frame could have been longer to get a larger population. This study only included the AMIs that made it to the hospital and were treated, those AMIs that died at home and in the field were not included in the data registry. This study only included the population in one large hospital in one state.

Implications for Nursing

The findings of this study showed that there are gender differences in AMIs. Teaching in the community and to health care providers the importance of including these differences, and to be aware of differences in presentation, is important in recognizing an AMI. Clinical practice approaches that focus on the unique aspects of cardiovascular care for women are needed to provide necessary resources for the prevention, diagnosis, and treatment of cardiovascular disease in women (Garcia et al., 2016).

Recommendations

The researcher felt that the study could have been improved by including more than one hospital, and have the study include a larger time frame. In the future, recommendations would be made to have a larger sample and to include age differences and include those AMIs that die before they get to treatment.

Conclusion

Delay in seeking treatment is an important element to look at with AMIs. This study and the literature review showed that delay in seeking treatment has a bad outcome

for those having an AMI. This study and the literature review showed that delay in seeking treatment effects morbidity, length of stay in the hospital, and treatment modalities.

Women also have significantly higher delays in seeking treatment. The literature showed that younger women had higher morbidity than others. This study did not look at age differences in the population. This study did not show a significant gender difference in morbidity. With future studies, the researcher recommends a larger population, a longer timeframe, include those that do not make it to treatment, more hospitals than just one tertiary center, and look at age differences in morbidity.

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